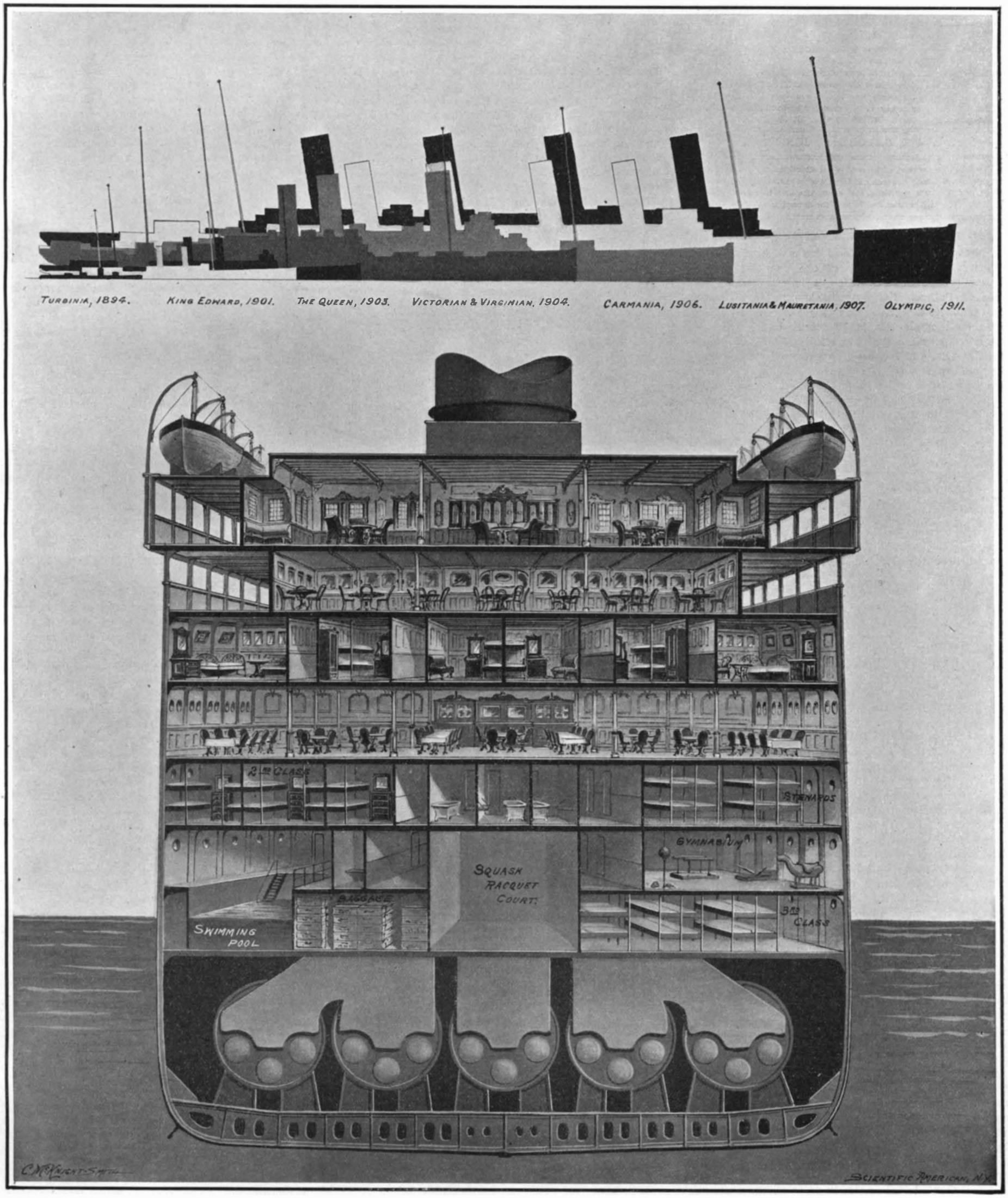
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1909, by Munn & Co.]

Vol. C.—No. 25. ESTABLISHED 1845.] NEW YORK, JUNE 19, 1909. [10 CENTS A COPY $3.00 A YEAR.



Length over all, 890 feet. **Beam,** 92 feet. **Plated depth,** 64 feet. **Displacement** at 37½ feet draft, 60,000 tons. **Horse-power,** 45,000. **Speed,** 21 knots.

Midship section of White Star liner "Olympic."

DEVELOPMENT OF THE TURBINE STEAMSHIP.—[See page 458.]

SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York.
FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York.

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States or Mexico $3.00
One copy, one year, for Canada 3.75
One copy, one year, to any foreign country, postage prepaid, 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845).... ..... $3.00 a year
Scientific American Supplement (established 1876)..... 5.00 "
American Homes and Gardens ..... 3.00 "
Scientific American Export Edition (established 1878). ..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.

Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JUNE 19th, 1909.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

LONGER PIERS FOR OCEAN STEAMSHIPS.

On the front page of this issue will be found some illustrations of the latest of the huge transatlantic liners, the "Olympic," which is now under construction at Belfast. Her extreme length from stemhead to taffrail is 890 feet. The length of the new White Star dock at Chelsea is 800 feet. In two or three years' time, when the ship reaches New York on her maiden trip, and has been warped into her berth with her stem a few feet from the inshore bulkhead line, her stern will project into the channel one hundred feet beyond the end of the dock. The risk of these conditions to the ship itself is only equaled by the serious interference which this one hundred feet overlap will present to the up- and down-stream traffic of the river, to say nothing of the increased difficulty of bringing other transatlantic liners to their berths in the adjoining piers. Despite the strenuous efforts of the Dock Department to keep pace with the demands of the transatlantic passenger service, it is evident that the increase in the size of ships has already outstripped the pier accommodation.

Just here it is fitting to compliment the department on the magnificent stretch of piers known as the Chelsea Improvement, which has recently been completed, and is now being occupied by the leading transatlantic companies. Had it not been for the efforts of the department and the steamship companies, aided by the strong indorsement of the Mayor, these docks would never have been built, at least on their present scale of size and equipment. None of them is less than 800 feet in length, and a few are 825 feet. While the plans were under consideration, an earnest effort was made to secure the permission of the War Department to extend the pierhead line farther into the North River. When this was refused, it was decided to secure the necessary length by excavating into the foreshore, and a wide strip of land, extending the full length of the frontage, was purchased at a heavy outlay.

Whenever the further reconstruction of existing docks on the North River comes up for consideration, the question of length will again be agitated; and it is sincerely to be hoped that some way out of the dilemma will be found, by which the future length may be set at not less than 900 feet. So long as the War Department is in its present state of mind, the possibility of securing an extension of the pierhead line one hundred feet farther into the river is very remote. The War Department is the federal guardian of the waterways of the United States. It is its duty to see that no encroachment is made upon harbor or waterway facilities in the interest of private corporations or other local interests.

In its consideration of the encroachment of piers and bulkheads upon the available width of rivers, channels, and other waterways, the War Department has to determine the line of just compromise between the demands of local docking interests and those of the general water-borne commerce, which naturally asks for as wide a stretch of fairway as possible. In view of the fact that the North River at New York has a clear width between pierhead lines of about 3,000 feet, we cannot but feel that where the question of the future development of ocean steamships is at stake, the narrowing of this channel by the extension of the Manhattan pierhead line one hundred feet farther into the river is a matter which should call for favorable consideration on the part of the War Department. It is true that the current in the North River is at present inconveniently swift; but it is not conceivable that a reduction of the width of the channel by about three per cent would have any material effect in this direction.

If it be found impossible to build piers of the desired length on Manhattan Island, the big ships of the future will be driven to use the new piers which the Dock Department is now building in South Brooklyn, near the Bay Ridge Channel, of which there are six, ranging in length from about 1,200 feet to 1,832 feet. Objections have been urged against the use of these docks by passenger steamships of the larger size, on the ground that the approaches would present certain difficulties of navigation. The more serious objection, however, would be that of the traveling public, who would find the long journey from Manhattan, and especially from the northerly portion of Manhattan, a serious inconvenience. In reply to this the Dock Department points to the fact that the projected Fourth Avenue Subway will pass within two blocks of the new piers. This, however, would make no provision for the transport of personal baggage. From practically every point of consideration of the traveling public and the steamship companies, the piers for passenger traffic should be located either upon or opposite Manhattan Island. If the decision of the War Department to permit no further extension into the river is unalterable, the city should seriously consider the possibility of securing the necessary length by excavation into the foreshore.

LIGHTER THAN AIR.

We described in our last issue the cruise of the monster dirigible balloon "Zeppelin II," from its home on Lake Constance to Bitterfeld near Leipzig, 465 miles away, quite independently of the direction of the wind, and its return under its own power to Friedrichshafen. The perfection of the voyage was marred only by an accident, which, after temporary repairs had been effected, did not prevent the completion of the tour. Later dispatches report great skill, promptitude, and spirit on the part of Count Zeppelin in making repairs, the efficiency of the latter in enabling the balloon to reach home, congratulatory telegrams from the German Emperor and hosts of other friends on the success of a journey involving all those features, and—six weeks required to restore the balloon to its former condition and repair one minute's damage. We are very far from wishing to depreciate either the indomitable spirit or the technical skill of Count Zeppelin. It is a very great feat so to construct an immense gas bag as to navigate it continuously for 36 hours, traversing 850 miles of atmosphere independently of meteorological conditions. It is hardly less a feat to oppose it to a 45-mile gale and to be carried backward at the rate of only seven miles an hour. We cannot deny that the navigability shown by the "Zeppelin II" demonstrates the advantages of the rigid type as applied to balloons, nor that the advantages of Count Zeppelin's compartment system have been shown by the limitation of damage to one section of the balloon and the rapidity of temporarily making sufficient repairs. We venture to think, however, that the moral of this latest journey is not that the rigid-type dirigible balloon represents the *dernier cri* in the conquest of the air, as all Germany appears to think.

Germany, we are told in private advices, is "Zeppelin mad," in a state of hysteria comparable to the British "Dreadnought" scare, and more often attributable to France or America. The usually stolid Teutons, worthily distinguished for the thoroughness of their scientific investigations, are rushing to subscribe hard-earned savings or unearned increment to airship companies or Zeppelin subsidies, and cannot be tempted with gilt-edged bank stock. All other departments in the world of sport are neglected for aeronautics, and aeronautics from Switzerland to the Baltic mean Zeppelin dirigible balloons.

Let us with the perspective afforded by this distance of time and space, review the subject a little more calmly.

Tests of the "Zeppelin I" made in March established satisfactorily the inventor's claims that the airship could be landed successfully on the ground as well as on water. The balloon responded so admirably and swiftly to the steering apparatus, that the pilot was able to bring it down gently and gradually, even without the customary assistance of a file of soldiers to haul it down by ropes for the last few yards. Moreover, it demonstrated its ability to hold its course and achieve its descent in spite of sudden gusts or squalls.

This had been a point of dispute between the advocates and the opponents of the Zeppelin system, and the former scored heavily on this point, since the motors and rudders were able to resist squalls or flurries of wind, whether the direction of the air currents was horizontal or upward.

On the other hand, the hostile critics declared that if the motors were stopped or disabled, the airship would be at the mercy of squalls. And this contention seems unfortunately borne out by the accident which occurred under just such circumstances at the close of the brilliant flight of May 29th-31st above referred to.

The journey of the "Zeppelin I" to Munich on April 1st and 2nd was also highly successful from nearly every point of view, except that the rate of speed was not so great as had been hoped for. The most notable observation made was that the machine was able to ascend dynamically about 1,000 feet higher than it could do by the mere buoyancy of the gas. In all these trials the horizontal rudders worked admirably, the consequent power of swift ascent and descent being one of the strong advantages.

In spite of these successes, however, there has been persistent criticism of the Zeppelin system in military circles, and the military experts no longer favor the Zeppelin craft for use in war. It is claimed that the Gross and Parseval dirigibles are equally good for scouting purposes, have made equally successful long-distance flights (this was before the achievement of May 30th) and have the great advantage of being smaller, cheaper, and more easily transported.

Count Zeppelin excuses the accident of May 31st by saying that a shower of rain had prevented his properly reconnoitering the landing place selected for the balloon. This we understand is intended strictly for a war balloon, a duplicate of which was purchased for a large figure by the German government for military purposes. Are we to understand that the wars of the future are to be conducted only in fine weather, or that war balloons must remain indefinitely suspended until suitable landing places can be reconnoitered? This seems to conflict with stories we have heard of night spying or bomb dropping by balloons.

The very triviality of the cause of the accident, the very nearness of the successful completion of a sensational trip, seem to us to emphasize the unreliability of the monster gas bag. The papers report a mass of aluminium stays tangled in the branches of the tree encountered—damage taking six weeks to repair. If this can be caused by a puff of wind the moment the controlling motors are stopped, it only confirms our opinion that the practicable military airship is not the rigid, semi-rigid, or non-rigid dirigible balloon, whatever the uses of any or all of the latter for pleasure excursions in selected weather. "Trifles light as air," the poet speaks of; and without condemning painstaking and praiseworthy experiments as "trifling," we maintain that nothing lighter than air is going to give us the ultimate solution of the problem of mechanical flight, any more than we are limited to materials lighter than water for navigation of the sea.

THE AWARD OF THE FOURTH-DIMENSION PRIZE.

Prof. Henry P. Manning, of Brown University, and Prof. S. A. Mitchell, of Columbia University, the judges whom the SCIENTIFIC AMERICAN selected to pass upon the essays submitted in the Fourth Dimension Contest, have awarded the $500 prize given by an anonymous friend of the SCIENTIFIC AMERICAN to the essay written by "Essayons," the pen name of Lieut.-Col. Graham Denby Fitch, Corps of Engineers, U. S. A., stationed at Duluth, Minn.

The second best essay was that of "Incredulous Odi," whose real name is Edward H. Cutler, of Linder Terrace, Newton, Mass. The third best essay was written by "Platonides," whose true name is F. C. Ferry, of Williamstown, Mass. The fourth best essay bears the pseudonym "Charles Henry Smith," of Carl A. Richmond, Marquette Building, Chicago, Ill. The essays which were thus accorded second, third, and fourth place are honorably mentioned. The winning essay of Lieut.-Col. Fitch will be published in the SCIENTIFIC AMERICAN of July 3.

Neither the judges nor the Editor knew the real name of the winner until the prize essay had been selected. Each contestant was obliged to write his essay under a pseudonym and to place in a sealed envelope bearing that pseudonym his correct name and address. These envelopes were held in the office of the SCIENTIFIC AMERICAN, and only the essays sent to the judges for examination. When a decision was reached and the prize awarded to "Essayons" the envelope bearing that pseudonym was opened by the Editors and found to contain the name of Lieut.-Col. Fitch. The same procedure was followed in the case of the essays which were deemed worthy of honorable mention.

Considering the character of the subject, the interest shown in the contest has been astonishing. No less than two hundred and forty-five competitive essays were received, not only from American readers of the SCIENTIFIC AMERICAN, but from foreigners as well. The essay wrappers bore the postmarks of Turkey, Austria, India, Australia, France, and Germany. Indeed, almost every civilized country of the world was represented. The contest was therefore thoroughly international, and it is no small gratification to us that an American army officer should have borne off the prize, and that all the contestants who were honorably mentioned should also be Americans.

ENGINEERING.

The new British battleship-cruiser "Invincible" showed remarkable speed on a full-speed run from Queen's Ferry to Portsmouth, averaging over 28 knots and for a part of the run attaining very nearly 29 knots.

Seven bids have been received for the foundation work of the municipal building to be erected in New York city near the Manhattan end of the Brooklyn Bridge. As the building will be twenty-five stories high, and the foundations must be carried to bedrock, the latter work will be costly, the lowest bid received being nearly one and one-half million dollars, and the highest upward of two and one-quarter millions.

The city of London has increased from an area of 0.3 square mile in the year 1200 to 117 square miles in 1908. At present the annual supply of water is about 82,125,000,000 gallons. Liverpool, which had an area of 0.1 square mile in the year 1300, covered 27.8 square miles in 1905. Its present population is 793,000, while the corporation water works provide a supply of 10,801,000,000 gallons to a population of 907,000 people.

The jubilee of the Suez Canal, work on which commenced in 1859, took place on the 25th of April. The canal was opened for traffic in 1869, and at that date the depth of water was 26 feet. The present depth is about 32½ feet, and improvements are now going on which will bring it to 34 feet. The original width was 71 feet on the bottom, and this has been gradually increased, until at present the bottom width is 97½ feet. In 1870 there passed through the canal 486 ships, whose gross tonnage was 654,914. Last year 3,795 ships used the canal, and their total tonnage was over 19,000,000 tons.

The first tests of the McClean-Lissak automatic gun, said to be the largest automatic gun in the world, have recently been made over Lake Erie near Cleveland. The gun has been contracted for by the British government for use in guarding the English Channel. It is mounted on an automobile truck, said to be capable of conveying a supply of ammunition and a crew of ten men at the rate of 25 miles an hour on ordinary roads, and of wheeling into position and shooting before ordinary artillery could be unlimbered. In the trials three-pound shells were thrown three and one-half miles at the rate of 250 per minute.

A new railway bridge has just been completed by the Spokane-Portland Railroad Company, which spans the Willamette River just below Portland. The total length of this new bridge from opposite bank abutments is 1,762 feet. The total cost of the structure exceeded $500,000, and more than a year was required in which to complete the work. The superstructure, composed of structural steel, rests on five massive reinforced-concrete piers faced with granite. The draw-span of this new bridge is 521 feet long from center to center of the end pins, and engineers claim that it is the longest drawspan in the world. The shipping of Portland is very extensive, and an immense draw-bridge is required to accommodate the many vessels.

The dimensions of the power plant now being built for the construction of the Gatun locks, Panama, are characteristic of the great scale of the work on the canal. The building, 150 feet long, 77 feet wide, and 48 feet high, will contain six water-tube boilers and three 1,500-kilowatt vertical steam turbines. During construction, it will furnish power for running cableways for the material wharves and for the cement rock and sand storage pile; for operating the concrete mixers; for running the cars which carry the concrete to the cableways; and for operating three 20-inch centrifugal pumps for the hydraulic construction of Gatun dam. When the canal is in service, the plant will be held in reserve to operate the locks and towing machinery, in case of failure of the hydraulic power plant.

Work is being rapidly pushed on the Manhattan Bridge, the fourth of New York city's bridges spanning the East River and the third largest suspension bridge in the world, in the hope of its completion before the beginning of next year. The first foundation caisson for the Brooklyn pier was sunk in February, 1902, and that for the Manhattan pier eighteen months later, the foundations being completed in March, 1904. The first wire across the river was placed in June, 1908, and the four big suspension cables were shown complete in the Engineering number of the SCIENTIFIC AMERICAN at the end of last year. The stiffening truss, which incloses the roadway, was commenced in March last, the lower deck meeting in midstream a month later. Since that time the work has progressed so rapidly that the upper deck has been completed, and the approaches are expected to be ready by November. About 37,000 tons of material has been used, 3,000 tons for the towers, 8,000 for the cables, 18,000 for the suspended span, and 8,000 for the approaches.

ELECTRICITY.

A bill has been introduced in Congress providing that all steamships carrying over 50 passengers, and making trips of over 200 miles, shall be equipped with wireless telegraph apparatus. A fine of $2,000 shall be imposed in case of a violation of this measure.

The American Railway Association has voted to appoint a committee on electric working, which will be chosen by the president, F. A. Delano. The object of the committee will be to study the use of electricity in the operation of railways. This movement is significant of the progress of electricity in displacing the steam locomotive.

One of the largest steel companies in Germany, namely, the August Thyssen Company, has decided to install electric furnaces of the Héroult type. Two of these will be set up at Deutscher Kaiser Works, and the other at Mülheim. The furnaces will be used in making rails for steel from Thomas converters. After these furnaces have been tried out, others will be installed.

A system of wireless telephony was recently tested by the French navy between the armored cruiser "Condé" and shore stations. It is reported that conversation was carried on over a distance of 100 miles. The inventors of this system are Lieutenants Jeance and Colin of the French navy. Their work is quite remarkable in view of the fact that in our own navy we have had difficulty in maintaining wireless telephone communication over a distance of 20 miles.

Despite the favorable report of C. H. Merz to the Victorian Railway Commission, the latter has decided not to electrify the suburban steam railways of Melbourne, Australia. Mr. Merz was prominently connected with the electrification of the first steam railway in Great Britain, and it was his opinion that there would be no financial difficulties in the way of electrifying the Melbourne railway. However, the Commission has decided that better results would be obtained by overhauling and reorganizing the present equipment of the road, without making so sweeping a change as that of displacing steam with electricity.

A new system of wireless telegraphy, known as the Lepel system, uses a very small spark gap but a very large current. The spark gap consists of two broad electrodes, which are separated by two pieces of paper, in the center of which a hole is punched. A succession of sparks pass across the gap, and gradually burn away the paper. The action of the paper appears to keep the sparking points constantly moving, so that no arc is formed. It is suggested that the products of combustion of the paper produce a gaseous atmosphere about the electrodes, which is similar in many respects to the hydrogen atmosphere of the Poulsen system.

A new system has been developed for the fixation of nitrogen from the atmosphere in which a very long and absolutely quiet arc is used. The air is brought into contact with the arc not at right angles, as heretofore, but in a spiral direction. The arc is formed in a long tube. An iron electrode is used at the bottom of the tube, while the upper end of the tube serves as the other electrode. This part of the tube is water-cooled. At the upper end the arc rotates or gyrates about the tube, owing to the spiral flow of air. There is not the slightest danger of its coming in contact with the sides of the tube below the upper end. The air is warmed before being brought into contact with the arc by passing it through a series of co-axial tubes. The arc is started by means of a small electrode, which is brought in contact with the iron electrode. As the small electrode is withdrawn, the arc forms between the iron electrode and the tube, and gradually works its way up to the top. In use the iron electrode oxidizes and very slowly burns away, but this is the only loss involved in the furnace.

Some time ago mention was made in this column of a mercury-vapor arc in which a quartz tube was used in place of a glass tube. This lamp possesses the advantage that the temperature may be raised to a much higher degree than would be possible with an ordinary tube, and thus the candle-power efficiency is much higher. The quartz tube in which the arc is formed is provided with a cylindrical quartz vessel at each end, in which the mercury is contained. The lamp is started by tilting this tube, so that a stream of mercury will flow from one cylinder to the other, making a path for current, after which the tube is tilted back. The tilting of the tube is accomplished automatically by means of a magnet, and when the current flows through the tube, a solenoid opens the circuit of the magnet, causing the tube to tilt back to normal position. If there is any air in the quartz tube, the arc will be extinguished when the tube is restored to normal position, and the tilting operation will then be repeated automatically until the mercury has been sufficiently heated to provide a mercury atmosphere of a density necessary for maintaining the arc.

SCIENCE.

The Duke of the Abruzzi, at the end of April, climbed Mount Zozila (India) to a height of 10,500 feet during a fatiguing march of four days in a snowstorm. Zozila is famous for its avalanches, one of which in 1908 buried a caravan of forty natives.

Syzygium jambolanum (the jambul tree) is very plentiful on the island of Madura but is also found in Java. Its height is about 50 feet. The fruits are very much like cherries. They have the same color, the same size and about the same taste, but are a little astringent. The seeds are used in treating diabetes.

India rubber under tensile stress contracts strongly when its temperature is raised. Work is done by its contraction at the expense of the energy of the heat. Hence, accordiing to Prof. S. P. Thompson, it would be possible to construct a thermal engine in which the working substance is India rubber, instead of steam or hot air, and operating by contraction, instead of expansion, of the working substance.

A curious property of neon is recorded by Prof. J. Norman Collie, F. R. S. Perfectly pure neon, when inclosed in a glass tube with mercury and shaken, glows with a bright orange-red color. As neon does this at ordinary pressures it appears to be different from other gases. When a silica tube is used and the mercury boiled in it, even at pressures of neon almost as high as atmospheric pressures, the mercury vapor glows bright green.

A German medical journal describes five recent cases of injury inflicted upon the eyes by the rays of mercury vapor lamps. These cases, in connection with others previously reported, leave no room for doubt that the light of the mercury vapor lamps employed in therapeutics and for the illumination of factories and other buildings may injure the eyes, not only by causing conjunctivitis (inflammation of the lining membrane of the eyeball) but also by producing paralysis of the retina.

The severity and sudden changes of temperature of the past winter proved very destructive to the inmates of zoological gardens. Animals in captivity require a fairly uniform temperature. The zoological collections of Antwerp and Hamburg were decimated by the cold, and of 5,748 animals kept at Regent's Park, London, 1,737 perished. The reptiles, especially the smaller specimens, suffered most, although their quarters were heated with great care. The most important losses were those of two great snakes, a boa and a python, which died of pneumonia. Two giant tortoises from the Galapagos islands, one of which was two hundred years old, succumbed to the same disease.

In a German village an underground lead water pipe was found greatly corroded and perforated. Investigation showed that the soil in which the pipe had lain was permeated by very impure water and consequently contained large quantities of ammonia, ammonium nitrate, and other compounds, which had attacked the lead pipe, forming lead carbonate, nitrate, nitrite, and chloride. All of these lead salts, except the carbonate, are more or less soluble in water. The carbonate is insoluble in pure water, but soluble in water containing carbon dioxide. Iron pipes coated with asphalt should be employed for underground conduits. If lead pipes are used, they should be imbedded in asphalt.

Hellriegel discovered, many years ago, that nitrogen is absorbed directly from the air by certain nodules, which are found especially in leguminous plants. An English scientist, Jamieson, has discovered another method of direct fixation of atmospheric nitrogen. He finds that numerous plants are covered with hairs which absorb nitrogen, convert it into albumen, and then wither and become absorbed into the body of the plant. By examining with a microscope series of sections which had been treated with reagents which stain albumen, the migration of the absorbed nitrogen could be approximately traced. The phenomenon is of very general occurrence among plants. Jamieson's results have been completely confirmed by experiments recently made in Hungary with various species of trees.

The waste waters of cellulose factories contain organic matter which is not in itself a source of pollution to streams into which it is thrown, but which may become noxious through fermentation. The best method of preventing fermentation, according to Vogel, consists in diluting the wastes very freely. This may be accomplished by mixing together the ordinary wash water and the alkaline baths in which the raw materials have been boiled for the purpose of freeing the cellulose from other substances. The mixture is then thrown into the stream with violence in order to insure its rapid dissemination through the water. It is not necessary to neutralize wastes laden with sulphurous acid if sufficient dilution is secured, but it must be remembered that fish are killed by one part (by weight) of sulphurous acid in two million parts of water.

STUDYING THE DESERT PLANT BY EXPERIMENTAL METHODS.

BY DR. WILLIAM AUSTIN CANNON.

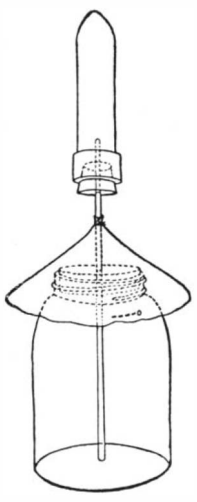
An institution destined to aid in the general upward movement in the West, the only institution of its kind in the world, moreover, is the Desert Laboratory. Established in 1903 at Tucson, Ariz., by the Carnegie Institution of Washington, the laboratory is devoted to the intimate study of the plants of the deserts and semi-arid regions.

It is situated in the midst of nearly 1,000 acres of land, which includes mountain, alluvial plain, and mesa, and is constructed of stones of volcanic origin, gathered in its vicinity. In the main structure are separate laboratories for the half-dozen investigators conducting investigations there, and a glass experimental house.

To describe the work of the staff of the Desert Laboratory adequately in a short paper is impracticable, since it includes so many fields of botanical interest. Broadly speaking, the men at the laboratory are busied with the problems that involve the movements, physiological activities, structure, and characteristics which differentiate desert plants from those of more humid regions.

Between the plants of our arid tracts and those with which they are most familiar, lies a wide gulf. No desert tree, in the conditions which usually prevail, attains a height or extent half so great as the trees in the eastern forests. None forms shade. As a rule they are not closely associated, but grow more or less widely separated from one another. Many of the shrubs are small. Like the trees, none has large leaves. Indeed, certain of them have no leaves at all, and many are provided with organs in which to store against times of need necessary supplies of water. Such characteristics argue reaction through great time to a peculiar environment, of which a leading characteristic is little rainfall.

Time was when the study of botany meant a study of plants as representing different species. At present stress is placed on the structure and various activities of plants, and the relation of these to the environment. Apparatus is devised with which to measure and record as many of these activities and environmental factors as is possible or desirable. Experimental work of this kind is largely in evidence at the Desert Laboratory.



The atometer, an instrument to measure the rate of evaporation. The apparatus consists of a porous clay thimble and a reservoir of water. As the amount of water in the reservoir is measured, any loss, by reason of evaporation from the surface of the thimble, can be accurately known.

The most vital as well as the most interesting relationship of desert plants to desert environment is the water relation. Many cactus seedlings, for example, form storage organs, which later are lost, while other species have, either above the ground or below, reservoirs, which they retain throughout their lifetime. Many cacti, which are desert plants *par excellence*, respond to a better water supply by absorbing rain water with such eagerness that the effect is shown in the distended body within a few hours after the commencement of the downpour. The giant cactus adjusts itself very nicely to varying amounts of absorbed water. The plant has a columnar body, which may reach a height of ten feet before branching, in which body water is stored. In periods of long drought the flutings of the trunk become drawn together by the drying out of the body. When the rains return, the body fills with water, and the flutings are forced farther and farther apart. This device prevents the tearing of the delicate tissues which store up the water, and which lie just under the heavy cuticular covering. The rapid absorption of water, and the advantage from slight rains, is made possible by the superficial character of the root system, which constitutes one of the most pronounced adaptations to desert conditions.

In times of plenty desert plants are profligate of their treasure—water—and give it off, with lavish disregard of consequences, to the thirsty air. The rate of evaporation falls as the rainy period recedes until the water loss in certain plants is practically *nil*. But delicate apparatus, sensitive to a few milligrammes, has been devised by which evaporation can be detected, even if very slight, and its amount estimated. Such an apparatus, which can be used on a plant repeatedly without injury, is shown in the accompanying figure.

The phases of the environment, which are being accurately recorded at the Desert Laboratory, are the rainfall, the relative humidity of the air, the rate of evaporation, the temperature of the air, and the temperature of the soil taken at various depths.

The relative humidity is continuously recorded by a hydrograph. At times the humidity of the air is extremely low, but is increased surprisingly by a very slight fall of rain. This higher humidity may at times be the deciding factor in the life of a plant, even though the precipitation is too little for direct benefit.

The rate of evaporation is determined by the atometer, which, when graduated, gives the amount of evaporation directly. By the use of this instrument the rate of evaporation at various localities in most of the States in this country has recently been studied in co-

Root system of a cactus (cholla), of which the shoot has been removed. The figure shows two superficial roots, which are useful to the plant in permitting the absorption of water, even if the rain is but a slight one, and a group of anchoring roots. Most cacti are well provided with superficial absorbing roots.

operation with the Desert Laboratory. These results have been used for comparison with the rate of evaporation at Tucson. As an illustration of the differences in rate which obtain at different habitats of plants, the following may be cited: For the week ending June 3rd, 1907: Tucson, 289 cubic centimeters; Raleigh, N. C., 126 cubic centimeters; Orono, Me., 123 cubic centimeters; Burlington, Vt., 112 cubic centimeters. The differences in evaporation rate between sunlight and shade, and on different sides of a hill, or different exposures in a gulch, are surprisingly great, which fact is an important, if not the deciding factor in determining what plants will occupy such a variety of habitats and exposures.

The temperature of the soil is recorded continuously by means of the soil thermograph. At the Desert Laboratory there are two thermographs which give the temperature of the soil at the depth of 6 and of 12 inches, and one so placed that the temperature at a much greater depth also is recorded. A study of the records shows that there is a regular daily range, which during settled weather varies little in the amplitude of its fluctuations for days together, but that the advent of change, such as cloudy weather or rains, lowers the curve decidedly, and may greatly alter its character. In summer the 6-inch thermograph usually records higher temperatures than the more deeply placed one, and in winter the opposite is frequently the case. The temperature of the soil is of great moment to the plants, since their power to absorb water, provided there is water in the soil available for absorption, is directly influenced by the changes in the soil temperatures. Generally, higher temperatures favor water absorption, while lower temperatures retard it.

The Desert Laboratory studies show that, aside from plants that inhabit the river flats, all desert plants depend on surface water for their entire supply. This is exactly opposite to the prevailing opinion, and explains the imperative need of the special adaptations

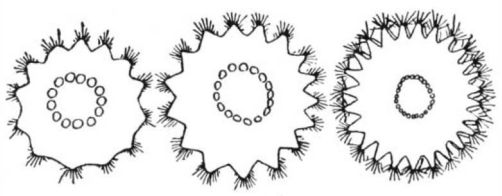
Apparatus for determining the amount of water lost from a plant by evaporation from its surface. The apparatus consists of a delicate hygrometer and thermometer, and a bell glass which covers tightly both the hygrometer and the plant. A shade is employed to avoid high temperatures in the bell. Post-like projections in background are large cacti.

STUDYING THE DESERT PLANT BY EXPERIMENTAL METHODS.

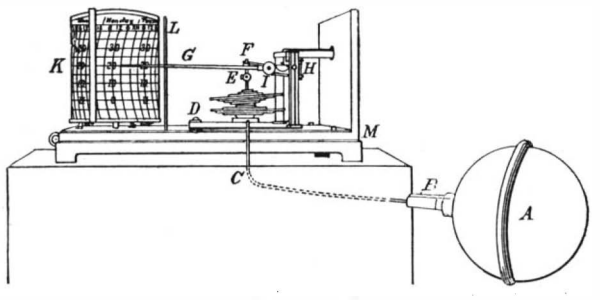
of the plants in relation to water absorption and retention.

In addition to investigating the environment of the desert plants, and their response to their environment, the Desert Laboratory has launched researches on a broader scale on the movements of plants of the arid regions and on the exact effects of acclimation. The paths of migration which the plants of southern Arizona probably followed are being studied, and the natural introduction of plants into the Salton Basin, as the sea recedes from its shores on drying, is being watched with great interest. This latter investigation into the facts which attend the movements of the plants into an area of over 400 square miles in extent, one of Nature's largest experiments, will extend over a long series of years, and will be of great importance in actually demonstrating the paths of plant migration.

The remote ancestor of each desert plant lived under humid climatic conditions in whatever portion of the world it may have grown. That ancestor had a form, a structure, and activities quite similar to plants living under such conditions at this day. In the long stretches of the past, portions of continents became arid, and accompanying this gradual drying out, the plant inhabitants were gradually changed so that they could endure the increasing aridity. How have the plants been able to do this? Were it not for modern methods of investigation, this question could never be answered. With the principle of experimentation to aid, the direction toward the solution is not difficult to find, although the road may be rough. One method of attempting the solution of the problem is that of transporting a plant from one condition of life to another condition, as from a more moist to a less moist habitat, or *vice versa*, and noting the effects. This precise study on acclimation is being undertaken at the Desert Laboratory on an extended scale. Gardens are being planned, and are located under very diverse conditions, such as desert and mountain and seaside, where plants are introduced from a great variety of



Semi-diagrammatic sections through the trunk of a giant cactus taken (reading from the left) 1¼, 5, and 8 feet above the level of the ground. The cactus stem is strengthened by the outer rind, which is very heavy, and the inner bundle of canes, which is the water conductive tissue. Between these two regions lies the tissue in which water isstored in large quantities in times of plenty against times of need.



Soil thermograph. Instrument with cover removed. The bulb, *A*, capillary tube, *C*, and expanding chamber, *D*, are filled with kerosene. On the top of the expanding chamber is the writing and adjusting device, *E* to *I*, which records by a pen on the cylinder, *K*, which is driven by internal clockwork and revolves once a week, the fluctuations in volume of the kerosene in the large bulb. This is the temperature of the place where the bulb is located.

localities and are being studied with care. Such a garden laboratory located at Carmel-by-the-Sea, Cal., where acclimation researches will be carried on, has lately been presented to the Carnegie Institution by the Carmel Development Company. It is at once the most northerly and westerly extension of the acclimation stations.

No Airship Coast Defense.

Our readers will doubtless recall the startling announcement recently made in the daily press of a contemplated coast defense airship division of the United States army. Whether or not the newspaper accounts sprang from the brain of some Washington reporter who found affairs in the Capitol so dull that he felt impelled to create news, or whether some army officer expressed the hope that some day a coast defense airship division would be formed, an expression which served as the basis of the elaborate newspaper reports, we cannot say. At all events correspondence with the War Department for the purpose of verifying the report has brought forth a complete denial. We are assured by a prominent officer of the Signal Service that there is no truth in the report that efforts are being made to form a coast-defense airship division.

An automobile truck recently saved Camptown, Pa., from threatened total destruction, its chauffeur making an emergency run to Wyalusing and bringing back a fire engine with its entire crew of twenty-three.

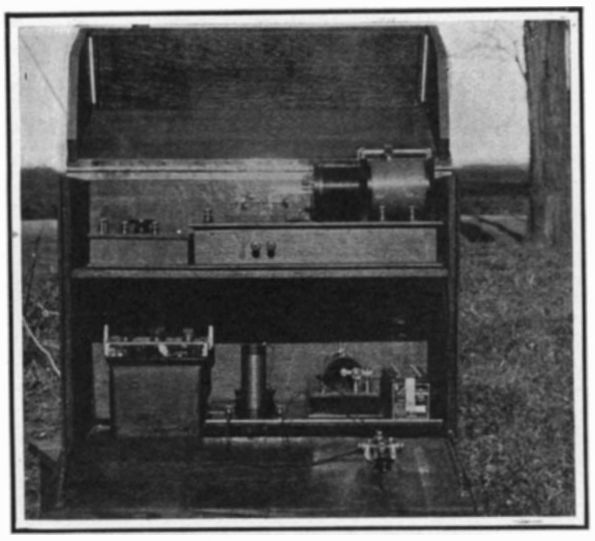
IMPROVEMENTS IN THE DE FOREST SYSTEM OF WIRELESS TELEPHONY.

BY WALTER KENDALL.

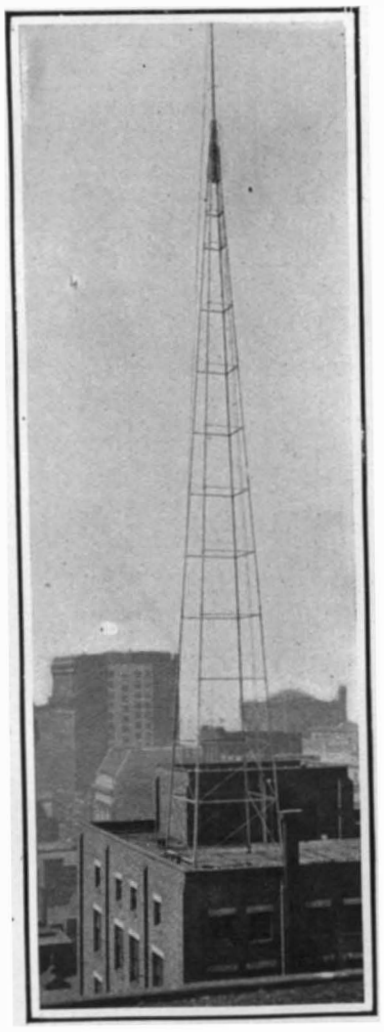
The practical development of wireless telephony stands to-day in very much the same position as did wireless telegraphy ten years ago. At that time Marconi had demonstrated that messages could be sent with ease across the English Channel and over intervals of the ocean, but the practical use of the system was then indicated rather than proved. To-day wireless telephony has been developed by a number of inventors, so that in the United States and Europe there are various systems established. As yet, in spite of successful experiments and long-distance tests, none may be said to have achieved commercial success over any extended length of time. The United States government, after preliminary use of instruments on war vessels and at seacoast forts, is still considering the adoption of a suitable system of wireless telephony for its military and naval establishment, and it demands that inventors undertaking to furnish wireless telephones to the government shall be able to guarantee distinct communication for 100 miles. Bids have been submitted to the Navy Department by several inventors and companies according to the specifications announced, but as yet no decision for a general system has been made by the government.

Dr. Lee de Forest, following the experiments which resulted in the equipping of the Atlantic battleships with instruments suited for communication over comparatively short distances, has continued his researches and experiments, and now on the Great Lakes there has recently been put in operation by the Great Lakes Radio-Telephone Company a number of stations designed to carry on communication between each other and with passenger steamships. Clear telephonic communication between Chicago and Milwaukee, a distance of some 90 miles, has been established and maintained, and the new large steamers "United States" and "Theodore Roosevelt," as well as other lake craft, have been equipped with apparatus which enables them to maintain communication with the shore throughout their trips, this having been successfully accomplished up to some 45 miles.

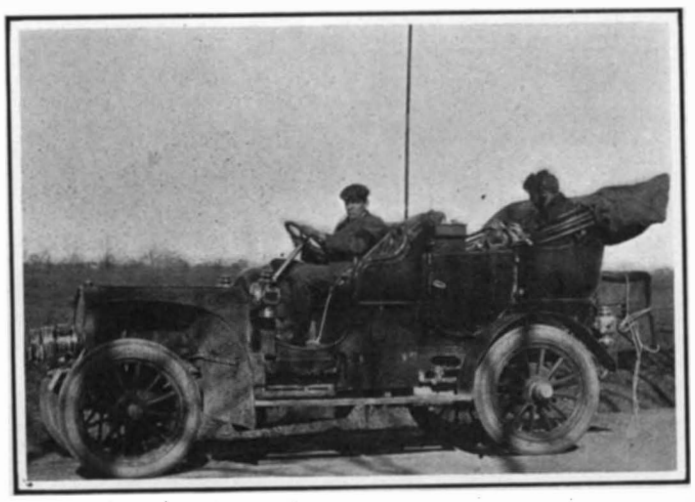
The Great Lakes Radio-Telephone Company now maintains stations at Chicago, Michigan City, Milwaukee, Toledo, and Cleveland, all with towers of suitable height to carry the antennæ, and stations at other places along the shores of the lakes are in progress of construction, so that the ships will constantly be within range of a central station for handling telegrams or telephone messages over the land wires. The De Forest system as installed at these stations makes use of the fundamental features of the standard navy wireless telephone apparatus which has been described in the SCIENTIFIC AMERICAN of September 28th, 1907. But at the same time there have been introduced several improvements which permit of the control of the wave length and a tuning of instruments far more perfect than previously has been achieved.



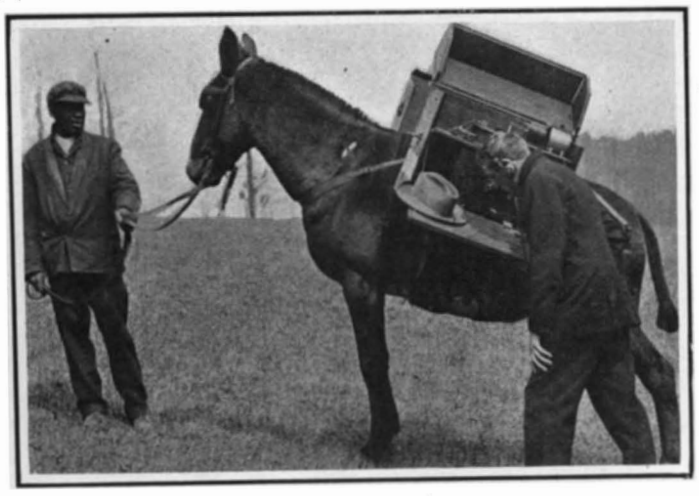
De Forest portable apparatus for wireless telegraphy.



Steel tower for carrying the antenna at the Cleveland station.

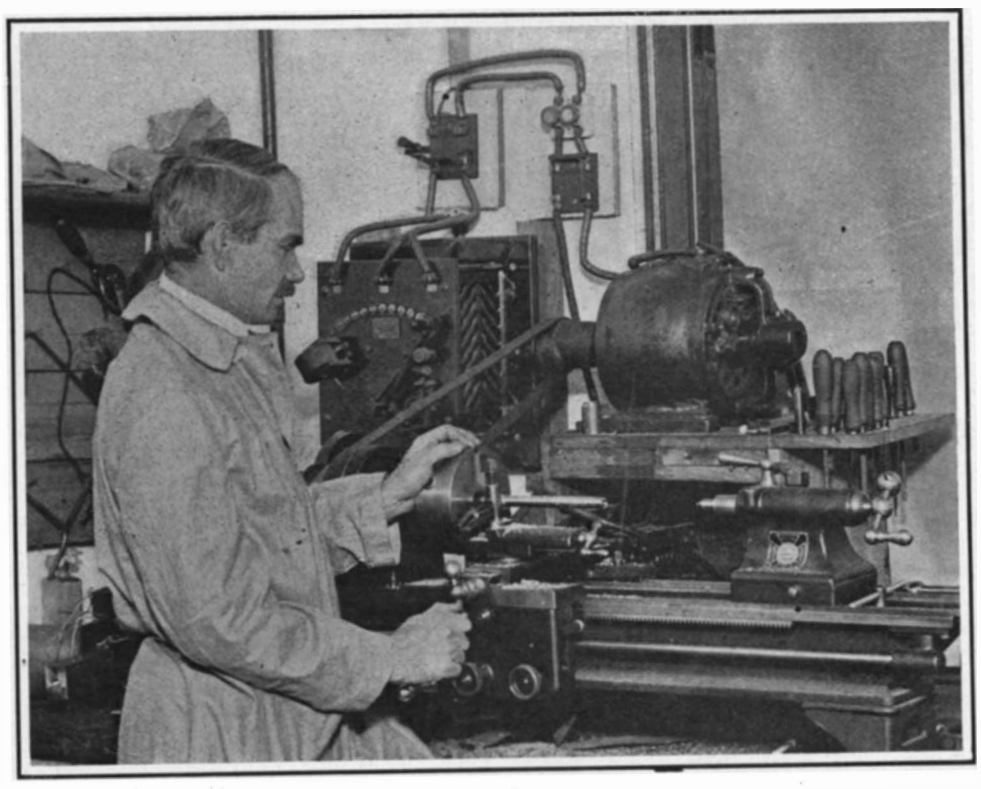


Radio-telephone and telegraph used with an automobile.



Portable radio-telephone and telegraph outfit designed for military use.

Portable radio-telephone for communicating over short distances.



Dr. Lee De Forest, inventor of the radio-telephone, in his laboratory.

The De Forest system makes use of rapid oscillations produced by an arc. In the improved apparatus it has been possible to eliminate the atmosphere of the flame of an alcohol lamp once deemed essential. There is used as a receiving device the "audion," an exhausted glass bulb in which advantage is taken of the ionization of the rarefied gas contained and the change of resistance upon the passage of rapid oscillations. An ordinary carbon telephone transmitter is used in the circuit, and this acts to vary the intensity, not the frequency of the waves, as in the case of the ordinary wire telephone. The tuning devices not only secure greater secrecy, but also can be arranged to produce the clearest possible conversation. In ordinary use a current of about 500 volts is used to supply the arc, and this can be furnished either by a dynamotor or by a special generator driven by an oil engine. But it is not always necessary to have such an amount of power, as a storage battery such as can be carried in an automobile or on the back of a mule will supply power enough for conversation over comparatively short distances.

Such installations suitable for military or other temporary purposes are shown in the accompanying illustrations. It is also feasible to locate these low-power stations on small sailing yachts or other craft, so that one need never be without direct telephonic communication so long as the range of distance is not exceeded. In connection with the De Forest apparatus for wireless telephone, there are wireless telegraph instruments for which the undamped waves produced by the arc are quite as suitable as for the transmission of the human voice. The transmitting device, which is known as the "chopper," permits ordinary telegraph signals to be sent with a key by interrupting the waves, and when received these signals are rendered audible by means of a "buzzer," so that the attention of the operator is attracted at once. The ordinary calling signals of the De Forest system are one of its strongest points, for in this way it can be used by any person on a steamship or other station, and does not require a trained operator with telephone at his ear constantly on watch. In other words, anyone in the pilot house or wireless apartment is warned by an audible signal to take down the receiver and listen for the message transmitted.

The recent developments in the Great Lakes experiments include the invention of a device which will enable the wireless telephone to be used in connection with the ordinary land wire system, and this form of microphonic repeater has worked satisfactorily in preliminary trials. In fact, the inventors believe that it doubtless will be possible to use wireless for long-distance transmission, and then relay the message directly to an ordinary wire line. This would insure economy and advantages to the present efficient distribution system.

In connection with the wireless telephone

(*Cont. on page 468.*)

DEVELOPMENT OF THE TRANSATLANTIC STEAMSHIP.

On July 4th of the present year it will be exactly sixty-nine years since a diminutive, wooden, side-wheel steamer, the "Britannia," smaller than many of the steam yachts of to-day, started from Liverpool for America. Fourteen days and eight hours later she steamed into Boston harbor. This little craft, 215 feet in length and capable of a sea speed of 8.5 knots, was the first steamer to sail under regular government contract for the conveyance of the transatlantic mails. In the accompanying diagram showing the growth in size and speed of the transatlantic steamship, we have commenced with the "Britannia," not because she was by any means the first steamship to cross the Atlantic (she had many predecessors) but because she was the first to do so on a regular schedule. During the following two decades, the development of the steamship was steady. The "Asia," 1850, was 275 feet in length, and had a speed of 12.5 knots; and the "Persia," an iron vessel built in 1855, was 385 feet in length with a speed of 13.8 knots.

Toward the close of the second decade of this development, that great engineer Brunel, whose ideas were always far in advance of the period in which he worked, designed a huge ship, 692 feet in length, 83 feet in beam, 58 feet in depth, and of 28,000 tons normal displacement, whose combined paddle-wheel and screw engines drove her at a maximum speed of 14.5 knots, and a sustained sea speed of about 12 knots.

Although commercially she was a failure, there being neither sufficient passenger nor freight traffic to keep her regularly employed at a profit, the later trend of shipbuilding has shown that Brunel was right, both theoretically and in his constructive methods. Now that the world's trade has developed sufficiently to warrant its construction, the big ship is found to be the most profitable. The greater the size of the ship, the less the cost of carrying a ton of freight a given distance. Moreover, in his construction, Brunel antedated our modern shipbuilders by using the cellular system of construction and steel decks. He was the first to introduce the longitudinal girder method, which, during the past few years, has been reintroduced by many naval architects with a view to securing a stronger construction and one better adapted to meet the stresses to which a ship is subjected in a seaway. About this time the advantages of the screw propeller as a means of propulsion were receiving increasing recognition, and the "China," built in 1862, is a good type vessel of that date. She was 337 feet in length, and maintained a sea speed of about 14 knots. From this time on, all transatlantic steamships were driven by single-screw propellers. There was a rapid increase in size and horse-power, until the maximum for single-screw ships was reached in 1884, when the twin ships "Umbria" and "Etruria" were launched. These vessels, 525 feet in length and 19.6 knots in speed, were provided with engines of 14,500 horse-power, which was developed on a single shaft.

The difficulty in securing reliable propeller-shaft forgings of sufficient size to carry the large horse-power of modern transatlantic liners, coupled with the many advantages secured by the use of twin screws, led to the construction of two vessels, the "City of Paris" and the "City of New York," which were provided with two triple-expansion engines, each driving a separate propeller. These vessels were not only the first of their type, but were unprecedented in size and in the richness of their appointments. They were 560 feet long, 63 feet broad, of 15,000 tons displacement, and their engines of 20,000 horse-power drove them across the Atlantic at a sustained sea speed of about 20.7 knots. They went into service in 1889.

The first vessel to cross the Atlantic at a speed of over 22 knots was the twin-screw ship "Lucania," 620 feet in length and of 19,425 tons displacement, whose engines of 30,000 horse-power enabled her to make a crossing from New York to Queenstown at a speed of 22.1 knots. She was placed in service in 1893.

The part played by the German companies in improving the transatlantic steamship record has been a brilliant one. The first ship to surpass the mark set by the "Lucania" was the "Kaiser Wilhelm der Grosse," 1897, of the North German Lloyd Line. This handsome vessel was the first to carry the four funnels which are now characteristic of fast ocean liners. She was 649 feet long, of 21,000 tons displacement, and her engines of 31,000 horse-power sufficed to carry her from Sandy Hook to Plymouth, under favorable conditions, at an average sea speed of 23 knots.

The first ocean steamship to exceed the "Great Eastern" in length was the "Oceanic" of the White Star Company, which made her appearance in 1899. She is 705 feet in length, 32,500 tons maximum displacement, and she has made the transatlantic voyage at a speed of 20.7 knots.

The first ship to take the record from the "Kaiser Wilhelm der Grosse" was the "Deutschland" of the Hamburg-American Line, which came out in the year 1900. She was remarkable for the great power of her engines, which, in the second year after her appearance, when indicating an average of 37,500 horse-power, earned for this ship the distinction of being the first to cross the Atlantic at an average speed of 23.5 knots.

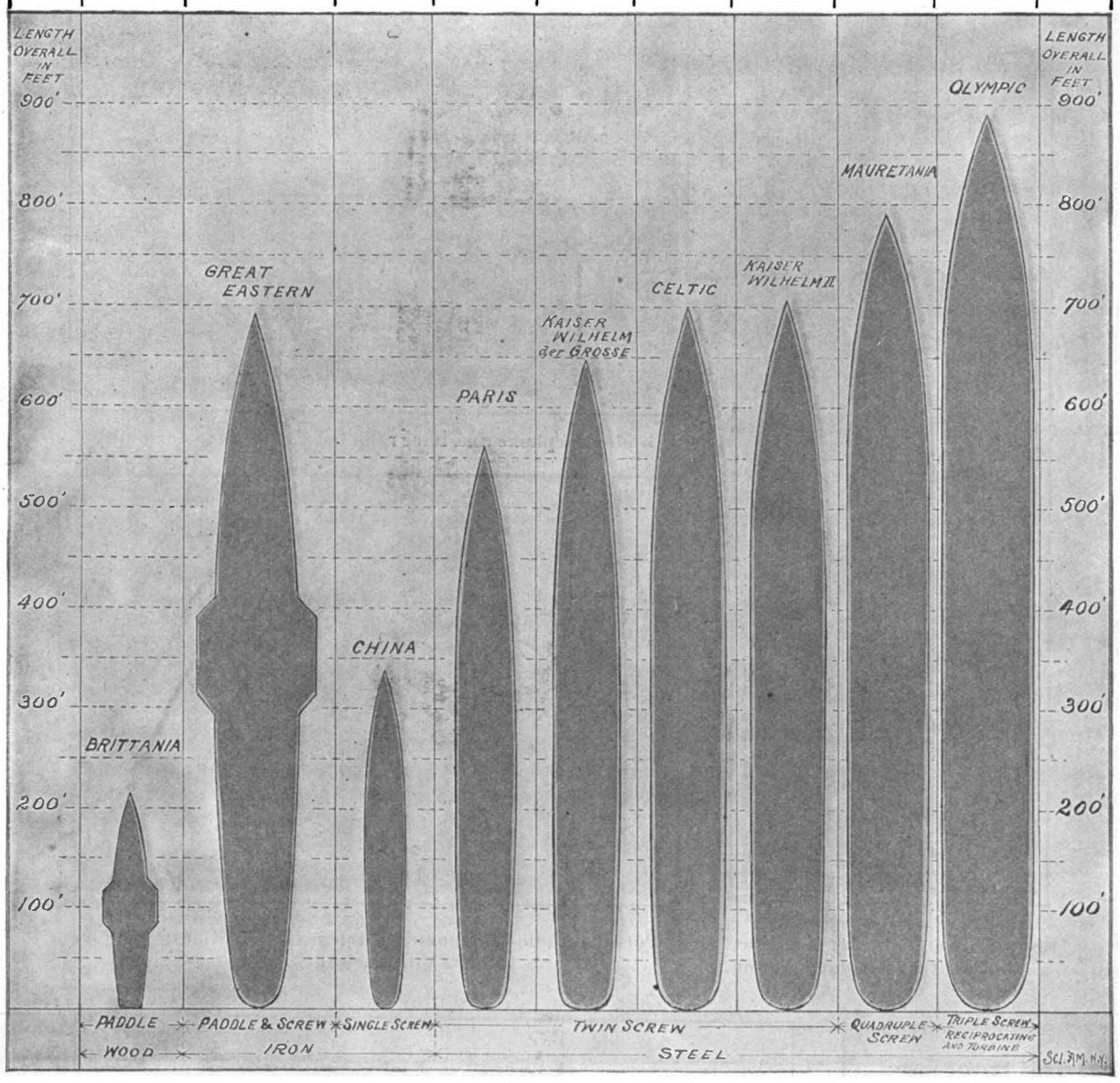
During these years, transatlantic passengers began to show in a very marked way their partiality for a new type of ship of moderate speed and of large cargo and passenger carrying capacity. A good type ship of this era is the "Celtic" (1901) of the White Star Line, a 16-knot vessel of 37,700 tons maximum displacement. In 1903 the North German Lloyd put in service a magnificent ship, the "Kaiser Wilhelm II," 706 feet in length, 72 feet in beam, which, in the early years of her service, crossed the Atlantic at a speed of slightly over 23½ knots.

During the period in which the twin-screw reciprocating engine was giving such fine service in the transatlantic fiyers, the Hon. Charles Parsons in England had been steadily developing a new type of marine motor in the form of the steam turbine. As compared with the reciprocating engine, it had shown marked superiority, except in the matter of coal consumption at low speeds. It was lighter, more economical in coal consumption, and required less engineering staff, and its advantages were particularly manifest when the ship was driven at its highest sustained sea speed. When the Cunard Company determined to build two transatlantic ships of a size and speed far exceeding anything afloat, they decided to install the turbine engine and drive the ships at 24½ knots sustained sea speed with 68,000 horse-power developed on four shafts. The outcome of this was the appearance in 1907 of the "Lusitania" and "Mauretania." These vessels are 785 and 790 feet long, 88 feet beam, and at maximum draft displace 45,000 tons. Both ships have made passages at an average speed of over 25 knots, and at the present writing, the record is held by the "Mauretania," which has crossed to the eastward in four days, eighteen hours, and eleven minutes, at an average speed of 25.7 knots. It is expected that during the present summer, under favorable conditions of wind and weather, this ship will make the trip at an average speed of 26 knots.

When the great Cunard turbine boats made their appearance it was predicted that they marked the limit of dimensions, and that they would never be surpassed in size or speed. In speed they probably never will be surpassed, at least until some lighter and more economical form of motive power, such as the producer-gas engine, has been developed for high-speed transatlantic work. In size, however, they are destined to be greatly surpassed, as our front-page diagram shows, by the "Olympic," which is now under construction at Belfast for the White Star Company. Although this vessel will probably not be in service for two or three years, we are enabled by the courtesy of the company to present the accompanying outward profile, or side view, and cross section, which have been furnished from Harland & Wolff, the builders. These truly enormous vessels (the sister ship will be named "Titanic") will be 890 feet in length, 92 feet in beam, and 64 feet in molded depth. The extreme height of the ship from keel to roof of pilot house will be 105 feet. In general appearance the "Olympic" will not be unlike the "Mauretania." She will have four elliptical funnels, each 28 feet in diameter. Her freeboard will be somewhat greater, being about 52 feet at the bow, 45 feet to the level of the main deck, 62 feet to the boat deck amidships, and 42 feet at the stern. A striking novelty will be the provision of a single pole mast forward of the bridge. At 35 feet draft the roof of the pilot house will be 70 feet above the water.

No attempt will be made to emulate the speed of the famous Cunarders, the 45,000 horse-power engines

Date.....	1840	1858	1862	1889	1897	1901	1903	1907	1911	Date.
Length on Deck.	215 ft.	692 ft.	337 ft.	560 ft.	649 ft.	700 ft.	706 ft.	790 ft.	890 ft.	Length on Deck.
Beam ...	34 ft. 4 in.	83 ft.	40 ft. 5½ in.	63 ft.	66 ft.	75 ft.	72 ft.	88 ft.	92 ft.	Beam.
Molded Depth...	24 ft. 4 in.	58 ft.	29 ft.	42 ft.	43 ft.	49 ft.	43 ft.	60 ft.	64 ft.	Molded Depth.
Displacement in Tons...	1,731	28,000	3,808	15,000	21,000	37,700	27,000	45,000	60,000	Displacement in Tons.
Indicated H. P.	740	8,000	2,250	20,000	31,000	14,000	40,000	70,000	*45,000	Indicated H. P.
Speed in Knots...	8.5	14.5	13.9	20.7	23.0	16.0	23.5	25.70	*21	Speed in Knots.



* This is the contract horse-power and speed.

GROWTH OF THE TRANSATLANTIC STEAMSHIP FROM 1840 TO 1911.

being sufficient, calling for 21 knots sea speed. To secure this, the ship will be provided with combined reciprocating and turbine engines, consisting of two reciprocating engines driving the wing propellers, which will exhaust into a low-pressure turbine driving the center propeller. In point of displacement the "Olympic" will greatly exceed the "Mauretania." Her speed being so much less, it is not necessary to give the hull such fine lines, and therefore her model will "fill the block," as the naval architects say, more fully. On her maximum draft of 37½ feet she will displace about 60,000 tons, as against a displacement of 45,000 tons on the same draft for the "Mauretania."

The Indianapolis Balloon Races.

Nine balloons were cast loose on June 5th at Indianapolis, and sailed off due south, six of them competing in the National Distance Race for the trophy of the Aero Club of America, and three for the cup offered by the Indianapolis Aero Club to the pilot and his aid who remained aloft longest.

The entries in the Indiana endurance race were the following: Dr. H. W. Thompson and W. E. Mast in the balloon "Ohio"; Dr. G. Link and J. R. Irwin in the balloon "Indianapolis"; and C. A. Coey and John Bennett in the balloon "Chicago." The endurance race was won by the "Indianapolis," which remained in the air 22 hours. The "Chicago" was second, and the "Ohio" third. The "Chicago" landed at Scottsville, Ky., and the "Ohio" within 40 miles of the starting point and within two hours after having started. The record for endurance is held by Alfred le Blanc of France, who remained in the air 44 hours in the International Race from St. Louis, October 21st, 1907, for the James Gordon Bennett Cup. Hence this year's showing is by no means remarkable.

The National Race was won by John Berry and John McCullough, of St. Louis, in the "University City," the distance covered being 380 miles. Next came the "New York," 357 miles; the "St. Louis," 321 miles; the "Indiana," 264 miles; and the "Hoosier," 234 miles. The course taken by all the balloons was almost directly south. There was a narrow belt of calm air 30 miles wide. The contestants who became entrapped in this belt lost the race. Indeed, Baldwin and Walsh in the "Hoosier" said that for a long time they stood practically still in the air, and that they could see the shadow of their balloon motionless on the field far below them. The individual experiences of the balloons are as follows:

The "New York."—The "New York," manned by A. Holland Forbes and Clifford B. Harmon, made its long flight as a result of going to a high altitude—about 3 miles—and taking advantage of a north wind that was blowing there. The balloon sailed in an almost direct southerly course from Indianapolis until it nearly reached Linton, Ala., where it was caught by a wind from the east and sailed west to Guin, Ala., and thence in a northwesterly course to Corinth, Miss. (357 miles), where a landing was made, since the balloon was again traveling northward and shortening its distance from Indianapolis. Only about half the ballast was used. The balloon was in the air 25 hours and 10 minutes. Mr. Forbes suffered considerably from the heat during his sky voyage. His face was blistered. The heat which marked the first hundred miles from Indianapolis gave way to extreme cold as higher altitudes were reached. Eventually, both balloonists were obliged to wrap themselves in heavy blankets. Eighty miles north of Birmingham, Ala., the balloon was fired upon by a farmer, a wanton act that certainly should be punished.

The record made by the "University City" falls far below the distance record held by Oscar Erbsloeh of Germany, which was made in the James Gordon Bennett Cup race of October 21st, 1907, the distance covered being 852 miles.

The "University City."—The "University City," with John Berry and P. J. McCullough on board, landed six miles southeast of Fort Payne, Ala. About 380 miles were covered without particular incident. Chattanooga was passed at an altitude of about 10,000 feet, at which height the temperature was 39 degrees. In the neighborhood of Fort Payne the current was lost. In an effort to regain the upper current several sacks of sand were thrown overboard. Three hours were thus lost in a vain attempt to reach a favorable layer of air. Realizing that further effort would be fruitless, a landing was effected southeast of Fort Payne. This balloon was an old one, and it attracted very little attention at the start. The "New York," on the other hand, is a new balloon built by Capt. Baldwin.

The "St. Louis."—The "St. Louis," manned by A. R. Lambert and N. E. Honeywell, landed at Blanche, Tenn., after covering 321 miles. No detailed account of its experiences is at present available.

The "Hoosier."—The "Hoosier," manned by Capt. Baldwin and Charles Walsh, landed at Green Brier, Tenn. The balloonists were caught in the 30-mile strip of comparatively calm air to which reference has already been made, and tried hard to find a favorable current. They frequently dropped low in the hope of catching a breeze. Finally their anchor caught in a tree, and as they were unable to free themselves in the 15 minutes allowed, they landed.

The "Indianapolis."—The balloon "Indianapolis," manned by Dr. G. Link and J. R. Brown, won the endurance race, landing at Westmoreland, Tenn. Dr. Link maintains that he could have remained longer in the air, but, knowing that the "Ohio" had come down soon after the start, and seeing the "Chicago" descend near the Kentucky-Tennessee line, he felt no incentive to remain any longer in the air, particularly since it would have been impossible for the "Indianapolis" to have made a record against the starters in the National Race. As in the case of the other contestants, much suffering was caused by the intense heat.

The "Chicago."—The "Chicago," manned by C. A. Coey and John Bennett, landed at Scottsville, Ky. The "Chicago" was by far the largest balloon that took part in the contest. When inflated the balloon measures 67 feet in diameter, so that its circumference is more than 200 feet. It requires 120,000 cubic feet of gas to inflate the bag fully. The balloon has a flight of more than 500 miles to its credit under favorable circumstances.

The "Cleveland."—The balloon "Cleveland," piloted by A. H. Morgan and J. H. Wade, Jr., came down at the beginning of the race because of a leak. It was overhauled by Leo Stevens, who discovered that the balloon cloth had been ripped. Mr. Morgan and Mr. Wade knew that the balloon leaked and attributed the leakage to faulty stitching.

The "Indiana."—C. G. Fisher and G. L. Bumbaugh, who manned the balloon "Indiana," disqualified themselves because they touched earth twice before they made their final landing at Dickson, Tenn. Their water was unfit to drink and in a temperature of 110 degrees they preferred to quench their thirst to winning the race. Hence they descended. Had not the "Indiana" disqualified herself by touching earth she would have broken the American endurance record, which, as before stated, is 44 hours. Mr. Fisher also reports an experience similar to that of Mr. Forbes. A number of farmers began firing upon the balloon in Brown County, Ind., and the balloon had to run a regular gauntlet of guns down to Tennessee.

The "Ohio."—The "Ohio," manned by Dr. H. W. Thompson and W. E. Mast, landed 35 miles from Nashville because of lack of ballast. The trip seems to have been uneventful.

Taken as a whole, both balloon races were not particularly exciting and produced no new records. Four of the nine contestants landed inside of the first eighteen hours. Perhaps this indifferent showing may be largely attributed to the quality of gas at Indianapolis. Indeed, some of the pilots have not hesitated to declare that their early landings were due entirely to poor gas.

The Current Supplement.

The current SUPPLEMENT, No. 1746, opens with an article by Day Allen Willey on a new type of Great-Lakes ore steamer. Dr. A. Wagner writes on the greatest altitudes attained by unmanned sounding balloons. Prof. Edgar L. Larkin shows the impossibility of signaling to Mars. E. S. Frash contributes an excellent discussion on testing gas engines and motors. In an article entitled "A New System of Wireless Telegraphy," Count Arco describes the new Telefunken system, which is a compromise between the spark and the arc systems. Glass building bricks is the subject of an article which will probably interest engineers and architects. S. Leonard Bastin contributes an excellent copiously illustrated popular essay on giant leaves. Prof. F. R. Moulton writes on possible changes in the form and dimensions of the sun. Interesting researches concerning the action of bodies on a photographic plate in the dark have been carried on by Dr. William J. Russell, F.R.S., with metals, woods, juices of plants, etc., most of them showing the curious property of acting on a sensitized plate in the absence of light. These experiments are described by the English Correspondent of the SCIENTIFIC AMERICAN. The new science of metallography, which may be briefly described as microscopy applied to the study of metals, is discussed by Walter Rosenhain. The usual engineering notes, electrical notes, and trade notes and formulæ will be found in their accustomed places.

Saponification under pressure can be effected very rapidly and there are other theoretical arguments in its favor, but the process is hardly practicable in commercial soapmaking. As much soap can be made in a large open vessel as in a smaller closed autoclave, in the same time and at a much smaller cost. As satisfactory results are currently obtained by open-air saponification with alkaline carbonates, there appears to be no advantage in the introduction of saponification under pressure, especially as the high temperature employed in that process (300 to 320 deg. F.) may injuriously affect the color of the soap.

The Ocean Motor-Boat Race to Bermuda.

With twice the number of entries that have appeared in previous years, the third annual motor-boat race to Bermuda started on June 5th from Gravesend Bay. The voyage was about 670 nautical, or 771 statute miles in length. Four motor boats started, namely, the "Heather" (58.44 feet, 44.32 horse-power), the "Insep" (58.6 feet, 41.23 horse-power), the "Ilys" (50.21 feet, 30.58 horse-power) and "Nereides II" (55.8 feet, 32.92 horse-power). The "Heather" allowed the "Insep" 32m. 59s., the "Ilys" 4h. 15m. 53s., and the "Nereides II" 7h. 23m. 24s. The boats are all trunk cabin cruisers. The "Nereides'" gasoline capacity is but 425 gallons, for which reason two extra tanks were carried along to make up the necessary 700 gallons.

The race was won by the "Heather," the largest and most powerful of the four. The "Ilys" and "Nereides" met with mishaps, which prevented them from making a better showing. The "Nereides" had been launched only a week before the start, and was in such poor condition that she should not have been allowed to start. Her extra tank of gasoline, placed high above the water, did not improve her stability. Even with this extra supply of fuel, she could not finish the race under power. Her captain, Walter Bieling, tried to repair the faulty carbureter of the "Nereides" while the motor was running, fearing that he would lose time if he stopped it. The result was that he succumbed to the gasoline fumes, and was revived only after some difficulty. Near the finish the boat was almost driven on the reefs off St. David's Head by the gale blowing from the sea. In spite of all these accidents and the unfitness of the boat, the "Nereides" would probably have beaten the "Heather" if she had not been compelled to set sail in order to cross the line. She was beaten by 3 hours only if her time allowance is considered.

The "Ilys" made the voyage in exactly four days. At the start of the voyage the connecting rod of her forward cylinder was broken, due to carelessness. Repairs were made, and the boat finished the race running on three cylinders, thereby reducing her speed from 9 to 6 knots. Her actual loss of time was about 6 hours.

The time of the winning boat, "Heather," was 80 hours, 56 minutes, 18 seconds, which corresponds to an average speed of 8.2 knots or 9.75 statute miles. She was the only craft to make the trip without considerable delays, while all of them encountered heavy seas the entire distance. Her time, however, was beaten by 15 hours 17 minutes and 5 hours 54 minutes by the two competitors, "Ailsa Craig" and "Idaho," in the 1907 race, and 14 hours 24 minutes by the "Ailsa Craig" last year. The "Nereides II" was 91 hours 10 minutes making the trip, and the "Ilys" and "Insep" 96:6 and 97:25 respectively. The "Heather" has a 4-cylinder 6 x 8 Standard motor and a 3-bladed, 32-inch diameter, 42-inch pitch wheel; "Insep," a sister craft, a 6-cylinder 6¼ x 8 Jager motor and 3-bladed 38x38 propeller; "Nereides II" a 4-cylinder 6½ x 8 Sterling engine and 3-bladed 35 x 40 propeller, and "Ilys" a 5½ x 6¼ 4-cylinder Hall motor and a 24 x 26 3-bladed wheel. All the engines are of the 4-cycle type. That of the "Ilys" was fitted with a Warner magnetic tachometer indicating the number of revolutions per minute, while this boat also had a Nicholson ship log to measure her speed.

The doubling of the entries this year shows a decided increase in interest in this, the only long-distance ocean race for cruisers; and, although the time was not bettered, decided improvement was shown in the reliability and comfort of these practical sea-going craft.

Presentation of the Aero Club Medals to the Wright Brothers.

The two $1,000 gold medals voted to Orville and Wilbur Wright by the Aero Club of America the first of the year, were presented to them by President Taft in the White House on June 10th. The President expressed his appreciation of their achievements, and gave them due honor for having solved the problem of flight. He made a humorous allusion to his size, saying that although he was apparently not a man of the flying type, he nevertheless had a keen interest in the subject. Miss Katharine Wright was present, and was also honored by the President for the aid and encouragement she had given her brothers in their years of experiment. The medals voted by Congress have just been completed. They are said to be the handsomest medals ever given by Congress. President Taft expects to present these medals during the celebration at Dayton in honor of the Wrights this week. The Aero Club medals were reproduced in our issue of March 27th, 1909. The brothers are busily engaged in getting ready their government aeroplane for the tests at Fort Myer, near Washington, which must be completed before June 28th. A. M. Herring also expects to test his government aeroplane at the same time. This new machine is similar to the Curtiss aeroplane shown on page 460, but it is said to be even smaller and lighter.

THE AERONAUTIC SOCIETY'S FIRST CURTISS AEROPLANE.

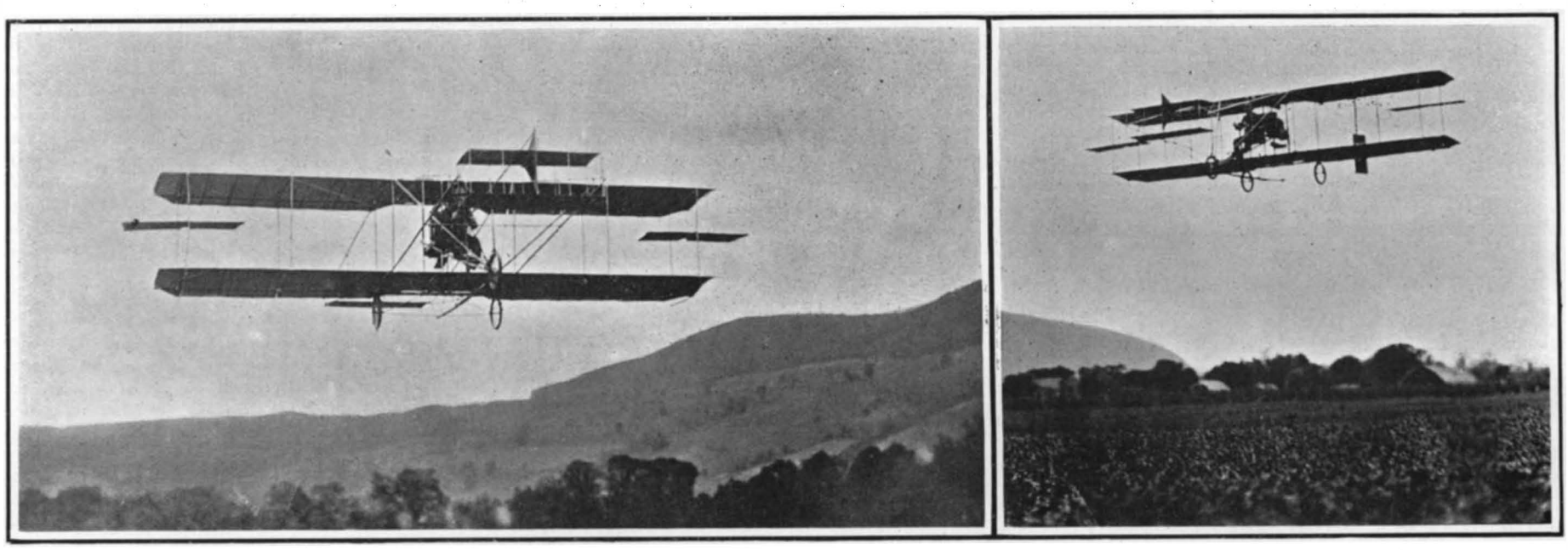
The photographs reproduced on this page show the new biplane which Glenn H. Curtiss has just completed for the Aeronautic Society. This machine, as can be seen from the pictures of it on the ground and in the air, is rather light and small compared with the Wright aeroplane or with most of the numerous biplanes lately constructed abroad. In constructing it, Mr. Curtiss has taken advantage of the practical experience in the art which he had in building the Aerial Experiment Association's four machines last year, while he has also had at his disposal the knowledge of Mr. A. M. Herring, who is now associated with him. The result is a greatly simplified and improved aeroplane and motor.

As with the "June Bug" and "Silver Dart," the planes are attached to a central body portion, mounted upon three 20-inch pneumatic-tired wheels, and carrying the motor and propeller. The two rear wheels are set in forks suitably braced and tied together, while the front wheel is mounted in a strong fork like that used on a bicycle. A single long wood rod extends back from the front wheel to the axle connecting the rear wheels, which are spaced far apart.

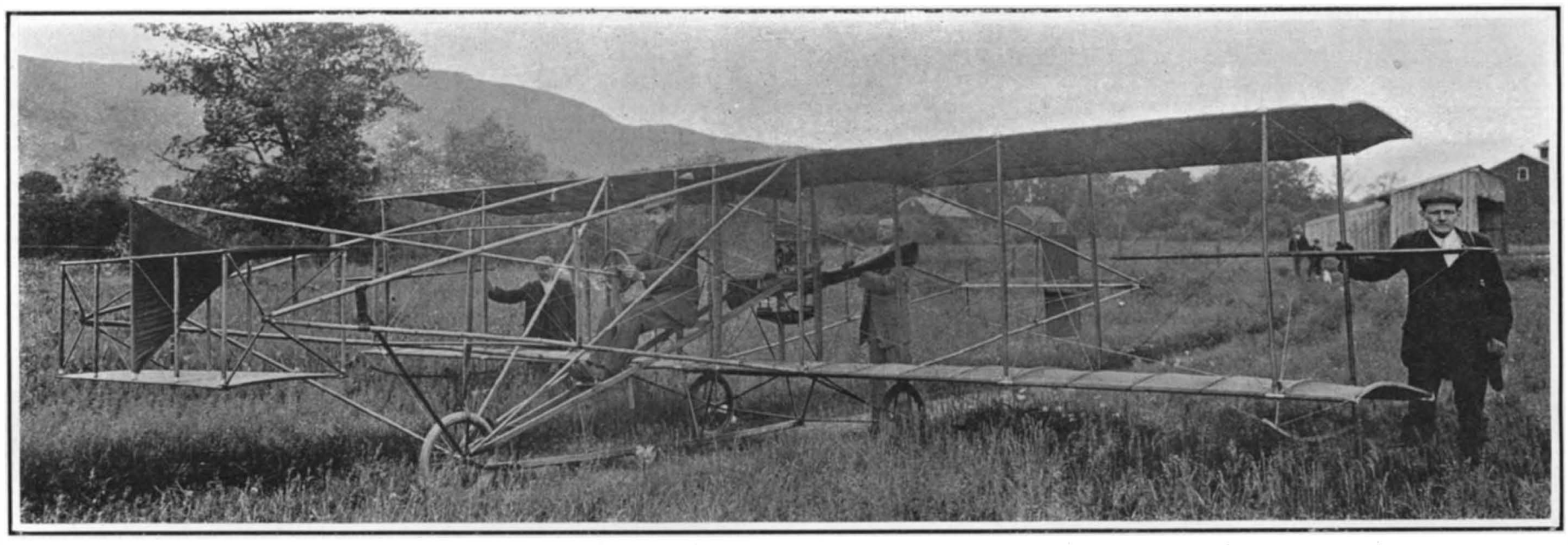
The rubber-coated silk used for the surfaces is laced to the frame in panels, there being four 5-foot panels (two on each side of the 6-foot center one) to each plane. There are also 18-inch extensions on the ends of both planes, so that the total spread of the planes is 29 feet, while their width from front to back and their spacing is 4½ feet. On account of notches cut out of the planes to accommodate the propeller, the total supporting surface furnished by them is only about 250 square feet. A double-surface 2 x 6-foot horizontal rudder having 24 square feet of surface is placed 10 feet in front of the planes, while a single adjustable horizontal surface of the same size, located 10 feet behind them, serves as a steadying tail. The vertical rudder is placed at the middle of this surface; it is 2½ x 2½ feet in size. There is also a large vertical triangular-shaped steadying surface at the center of the horizontal rudder. This surface and the vertical rudder serve to keep the machine from twisting about its center vertical axis when struck diagonally by a wind gust. If such a gust were allowed to turn it, the gyroscopic action of the single propeller might direct it up or down. Movable balancing planes 2 x 6 feet in size are placed at the ends of the planes half way between them. These are operated by the swaying of the body of the aviator by means of a frame fitting around his shoulders. In fitting the rudders and tail, Mr. Curtiss has made liberal use of bamboo. This material combines strength with lightness, and it is surprising that it has not been used more in aeroplane construction. With the exception of Santos Dumont's tiny monoplane, we know of no other successful aeroplane in which bamboo rods are used to form part of the frame. The frames of the planes are of Oregon spruce, and are put together in sections. The ribs are of light laminated spruce spaced about a foot apart. They project beyond the rear members of the frames of the planes and run through pockets on top of the surfaces. A wire runs through the rear edge of each surface and is stretched over the end of each rib, thus serving to keep tight the cloth, which is also wrapped around the front edge of each plane. The surfaces have a slight parabolic curve from front to back, the curvature used being about 1 in 9. The angle of the planes with the horizontal is also slight, being only about 6 degrees as the machine stands on the ground. When in flight, this angle diminishes several degrees.

The motor used is a special 4-cylinder, 3¾ x 4, water-cooled Curtiss aeronautic engine. It develops 26 horse-power at 1,200 R. P. M., which is 1 horse-power per 1⅝ square inches of piston area, or rather more than is usually obtained. High compression is used, though this is by no means abnormal. The cylinders of the engine are of cast iron with a wall thickness of about 5/32 inch. They are surrounded by cast copper water jackets welded to them. The heads of the cylinders are hemispherical, with inlet and exhaust valves set at an angle upon each side of the water outlet, which is in the center. Both valves are operated by a single rocker arm pivoted on top of the water pipe. The inlet pipe extends across all four cylinders with the carbureter placed at one end of it. A gear-driven Bosh high-tension magneto

(*Concluded on page 468.*)



VIEWS OF THE CURTISS AEROPLANE MAKING ITS INITIAL FLIGHTS AT HAMMONDSPORT, N. Y.



Photographs copyrighted 1909 by Benner.

THREE-QUARTER FRONT VIEW OF THE NEW CURTISS BIPLANE BUILT FOR THE AERONAUTIC SOCIETY.

A double horizontal rudder in front is balanced by a single horizontal tail. The 4-cylinder 25 horse-power motor, with radiator in front and propeller at the rear, is shown behind Mr. Curtiss, who is in the aviator's seat. Note the split vertical rudder behind and the fixed triangular vertical surface in front; also the balancing rudders between the planes at each end.

LOS ANGELES 200-MILE CONDUIT WATER SUPPLY.

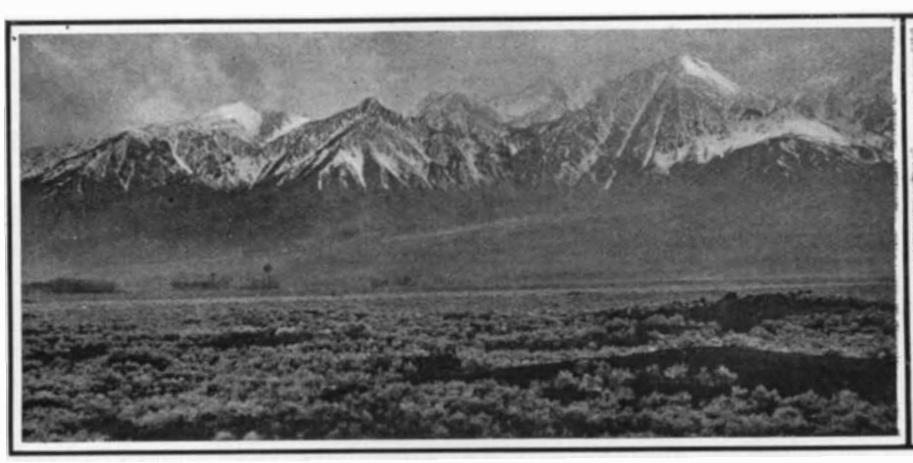
BY DAY ALLEN WILLEY.

The longest artificial water conduit ever planned in America is that which is to increase the water supply of the city of Los Angeles in Southern California, and which is now being completed. While the conduit is notable for its engineering features, it will not only supply water for domestic purposes and for irrigation but the head of water is so great that it will produce electrical horse-power for pumping, manufacturing, transportation, and other purposes, so that the project achieves three different objects.

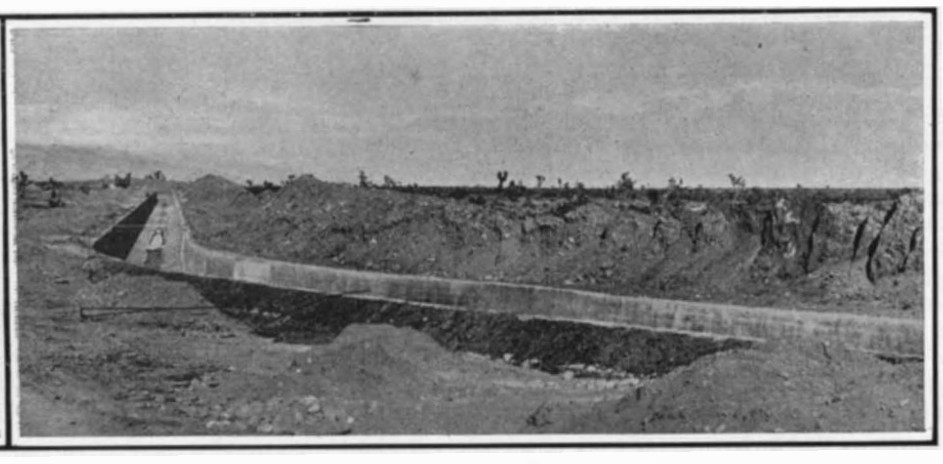
The extensive arid district in Southern California has limited Los Angeles in the past to obtaining water from only one source. The rapid growth of the city in population and its industrial development necessitated another supply, but the nearest considered available was from the Owens River. This stream, which rises in the eastern Sierras of the State, is over 200 miles from Los Angeles, and separated by a country which includes not only mountains but a large area of absolute desert, presenting many difficulties in the way of constructing such a canal. When the necessary surveys were made, it was found that it would be necessary to build a waterway no less than 215 miles in length. Incidentally, it may be said that the total cost of the project represents about $20,000,000, not counting the purchase of property for reservoir sites and other purposes, which, if included, bring the total cost to nearly $22,000,000. This sum has been provided by the sale of municipal bonds, and such has been the public interest manifested, that all of the money has been raised in the city of Los Angeles, its residents taking its securities.

The canal begins at a dam which has been constructed across the Owens River about 40 miles from a lake into which it has hitherto discharged its water. The dam is of the diversion type, and from it extends the main canal for a distance of 60 miles to the Haiwee, the first reservoir in the series planned. On this section is some very difficult work. In a distance of 22 miles the waterway includes no less than 8 miles of tunnel. Three and one-half miles of conduit are composed of heavy steel pipe faced on the outside with concrete. Ten miles of the canal in the same section have walls molded entirely in concrete. The Jawbone

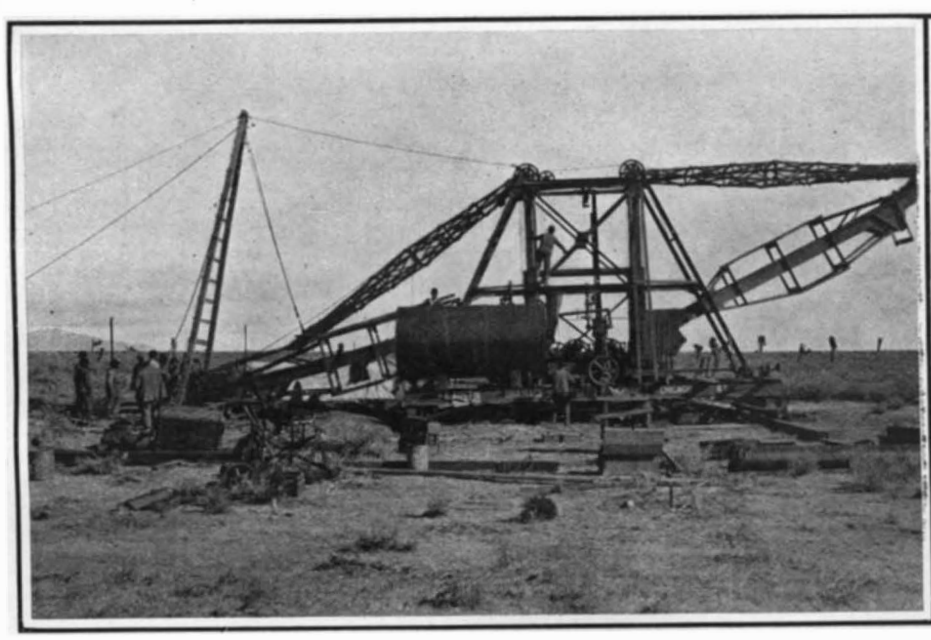
(*Concluded on page 468.*)



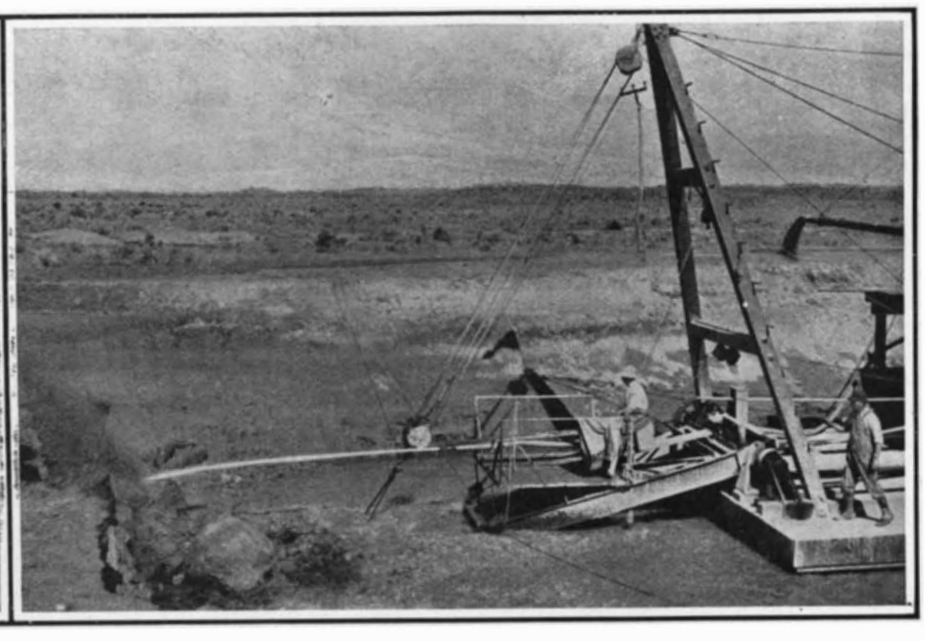
View of Sierra Nevada range, showing part of the watershed of the Owens River.



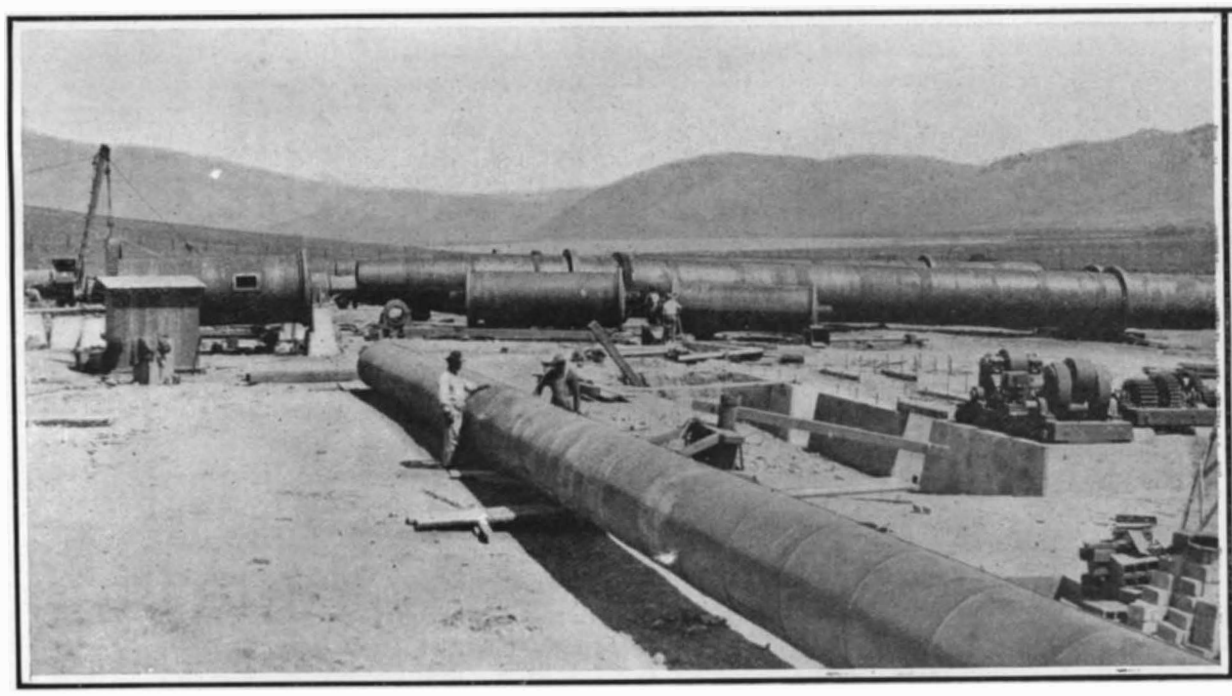
A mile of completed aqueduct through the level desert.



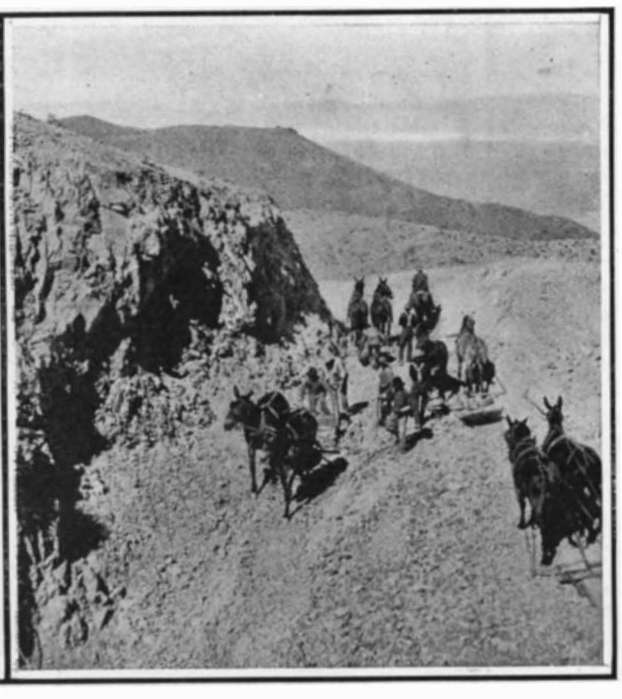
One of the great excavators at work. This machine excavates to the exact shape of the aqueduct and does 150 feet or better per day.



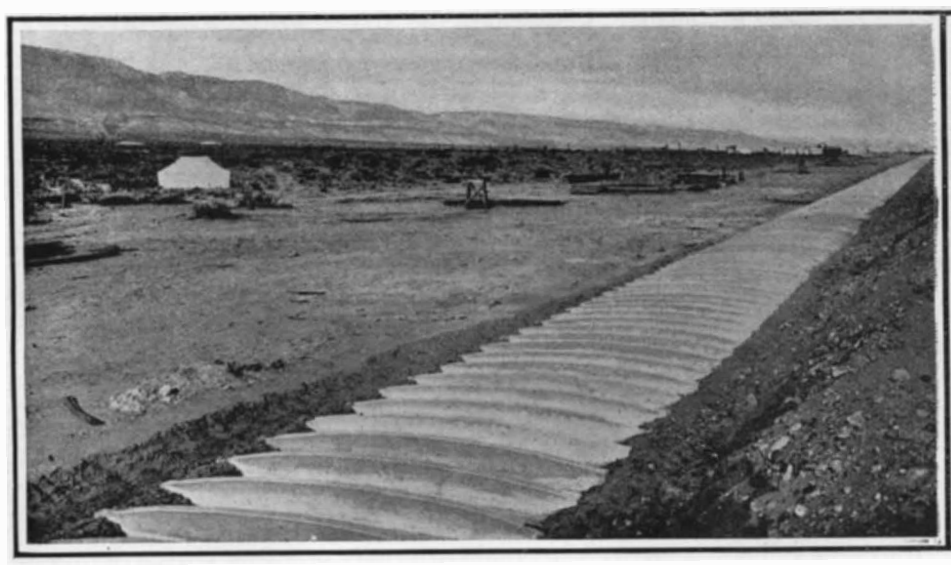
Dredges at work on the canal near the intake in Owens Valley.



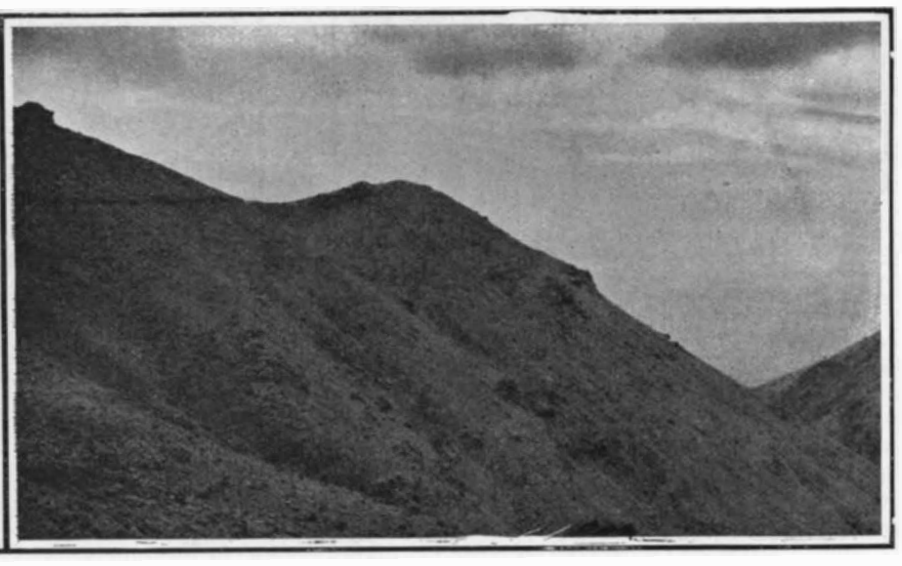
Kilns and other machinery of the aqueduct. Cement plant at Tehatchapi, Cal.



Building roads in the Jawbone section.



The completed aqueduct with its concrete cover. A typical piece of work along the line of the conduit.



The upper depression shows the aqueduct excavation ; 1,200 feet below can be seen the Mojave Desert.

LOS ANGELES 200-MILE CONDUIT WATER SUPPLY.

METHOD OF CORRECTING FAULTY ACOUSTIC PROPERTIES OF PUBLIC HALLS.

BY THE PARIS CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

M. Gustave Lyon, who is at the head of the well-known Pleyel piano manufacturing firm of Paris, has devised a method for remedying the faulty acoustic properties of public halls. One of the largest and at the same time the worst public hall in the city is that of the Trocadero, which seats 5,000 persons. By his method he succeeded in correcting the surfaces to such an extent that about ninety per cent of the disturbances are suppressed. He divides the stage into a number of ruled squares each about 5 feet square. Standing on one of them he makes a loud sound by clapping two pieces of wood together. Auditors are placed in various seats, and when one of them hears the first sound and then a second one or echo reflected by the walls, he raises a large numbered cardboard from which his number is noted. From each point of the stage in turn we thus make a note of the seat numbers.

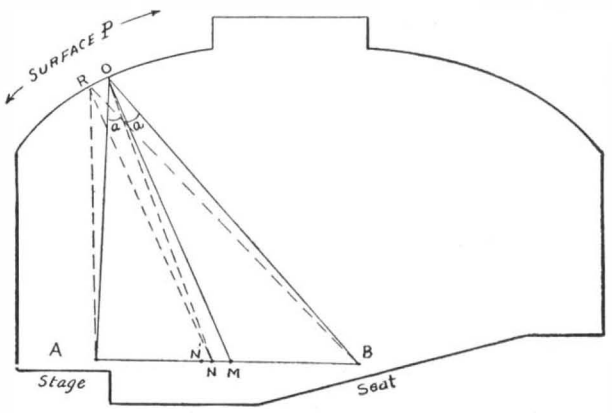
Taking a given case where stage square No. 8 causes the echo in seat No. 25, we must find what points on the wall surfaces reflect the echo. This is done by drawing a line on the plan from the stage to the seat, and then from the middle point of the line a perpendicular to any wall surface *P* of known curvature. From this point as a base we can geometrically locate the spot on the wall which throws the echo to seat 25.

Referring to the diagram, we draw a line from point 8 on the stage to the seat No. 25, on the longitudinal cross-section of the building, which gives the line *A B*. We bisect this line and obtain point *M*. From *M* we draw a perpendicular to any of the large wall surfaces such as the surface *P*, and thus obtain the point *O*. We draw the lines *A O*, *O B* which form the angle *A O B*, and then bisect this angle by the line *O N*. This line intersects the line *A B* at the point *N*. From *N* we draw another perpendicular to the reflecting surface at the point *R* and draw the lines *A R*, *R B*, when it is found for practical purposes that the point *R* is the one which throws the echo, inasmuch as the angle *A R N* nearly equals *N R B*. A closer approximation can be made by repeating the same operation, bisecting the angle *A R B* and finding thus a third point *N'* on the line *A B*, etc. Many of the points fall where they could produce no echo for a given surface, while others are too near to give an echo. An interval of one-tenth second is needed for the ear to perceive the echo after the direct sound, and as sound travels at about 1,000 feet per second, the sound must travel at least 100 feet in order to be heard one-tenth second afterward. Otherwise the direct and reflected sounds will be confounded with each other. Thus the wall point must be one-half of 100 or 50 feet off in order to give an echo, and all points under this value can be discarded.

After plotting on the elevation and plan views of the hall the points which give the reflections as we have just seen and finding the faulty surfaces, it is desired to check up these results by an experimental method, and for this purpose M. Lyon devised a novel acoustic apparatus. It consists of a long metal tube which serves the purpose of a speaking trumpet, and the tube is connected by a rubber hose with a box about two feet cube in which an audible signal can be produced. Such a sound is sent from the tube and is projected along one general direction. For giving the adjustment and measuring the angles of the tube there is used a graduated dial around which a pointer travels mounted on the tube shaft. The whole device is mounted on a circular base. This can be turned around on a pivot after the manner of a surveying instrument.

As we know the position of any of the noted points on the wall on the vertical and horizontal plans of the building, it is an easy matter to calculate the position for setting the angles of the "acoustic theodolite" so as to direct the tube to this particular point. Finding thus from the drawings the angles needed for the point number 32, for instance, we direct the tube to this point by the two graduated scales, and then find whether this is actually the point which gave the echo at say seat number 25, from the square number 8 of the stage. We have only to make the acoustic signal in the box which is mounted on the stage at the proper square, and the hearer finds whether the echo is noted at this seat. By carrying out a series of observations in this way we are able to find the exact points and in consequence the wall surfaces which need to be corrected.

M. Lyon devised another instrument of a larger size which is intended to demonstrate his method in a more striking manner. A small cabin is used which

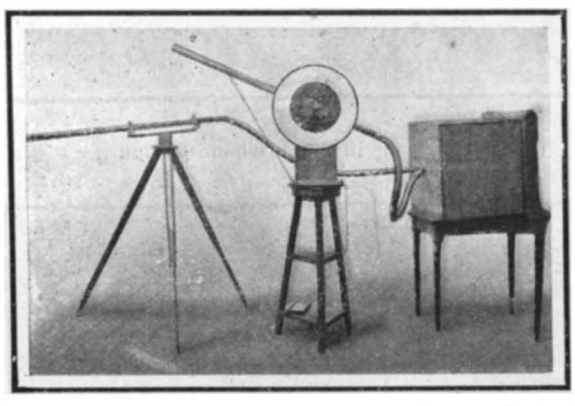


How the reflecting spot on a wall is found.

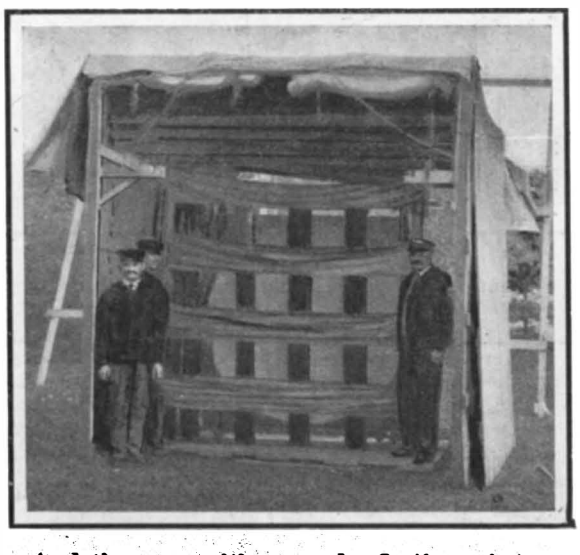
is soundproof, and made so as just to cover one of the squares of the stage. On the sides are openings through which can be inserted two acoustic tubes of large size, as will be noticed. The operator is stationed inside the box. The sound is produced between the two ends of the tubes so that it is given out from each tube. Above the cabin is a support which carries a graduated beam. This holds the tubes at a given angle by wires with which the tubes are hung from the ends of the beam. Previous to this we have already located the points by the "acoustic theodolite" and noted the place of each one by referring to certain details of the ornamentation of the walls. Accordingly we are able to direct one of the present tubes, the rear one, to the same point by means of cross-wires placed at each end of the tube by sighting from the inside of the cabin. In the same way the front tube is directed to the seat in question. Were the front tube to be used alone, the hearer in the seat could perceive only the principal sound given by the operator, but when the rear tube is used, he hears first the principal sound and then the reflected sound. Should the front tube be stopped off, he will hear only the reflected sound. Placing an auditor in the President's box, for instance, we find that the concave part of the wall lying over the organ is the principal cause of the echoes in the hall, and we can explore this region and the other walls so as to make this evident. According to the data which he thus obtained, M. Lyon was able to demonstrate very clearly that 90 per cent of the echoes of the Trocadero hall were produced by this concave surface, and that if it were properly corrected, the hall would have its acoustic properties radically changed. This was in fact the case.

It was thought advisable to cover the wall with cloth or similar covering so as to deaden the echo. In order to find out how to do this, M. Lyon made experiments with a large circular reflecting mirror. The reflector is made of stucco which gives a very smooth surface. It has about 200 feet radius. In the middle is mounted a sighting tube for directing the reflector. At the proper distance in front of the mirror is a closed cabin having a small front window of two feet square, and by making a sound by striking on a suspended steel bar with an electric tapper with the bar placed well back of the window, we send out the sound on a general straight line. It falls on the mirror, being reflected from it to a point lying close to the cabin. There are three hearers placed at this point. When the operator makes the signal in the cabin it is perceived by the hearers directly, and afterward there comes a second sound reflected from the mirror, this being also a strong sound. What is desired is to suspend some kind of screen before the reflector (representing the wall) so as to shut off the sound. Various screens were tried, and one which is seen here is made of crossed strips of cloth. This cut down 50 per cent of the echo, but strange to say, a full cloth covering scarcely cut down the echo at all. On the other hand, it was found that a double cloth with a few inches space between the two, would almost completely suppress the reflected sound. We no doubt have interference phenomena which are not as yet very clear, but the practical effect is certain.

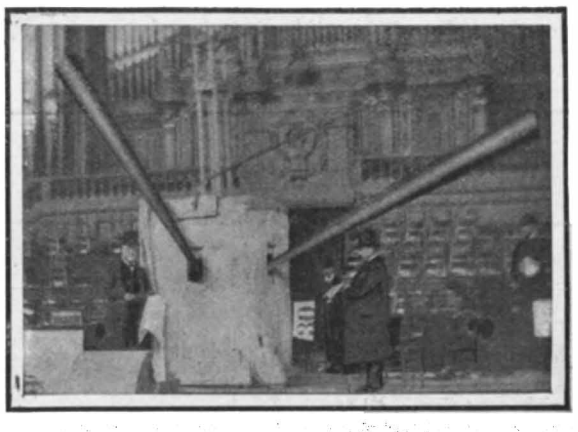
Accordingly, such a double cloth covering was placed over the concave surface of the Trocadero wall above the organ, this being simply hung between two flat pieces of wood strip, leaving a space of a few inches between the two cloths. A fabric of the nature of Canton flannel is found to be best. A very small expense is needed for this work, and in the present case it did not exceed $5,000. At the same time the result is striking, and the acoustic properties of the Trocadero are vastly improved, as 90 per cent of the echoes have disappeared. M. Lyon, who had carried out all work at his own expense, was congratulated for his results by the Secretary of Beaux-Arts, and other officials, who were present at the tests.



Lyon's small apparatus for ascertaining the position of acoustic reflecting points.



A cloth screen with a sound-reflecting mirror behind it.



Lyon's large apparatus employed in correcting the acoustics of the "Trocadero."

Maisine: A New Corn Product.

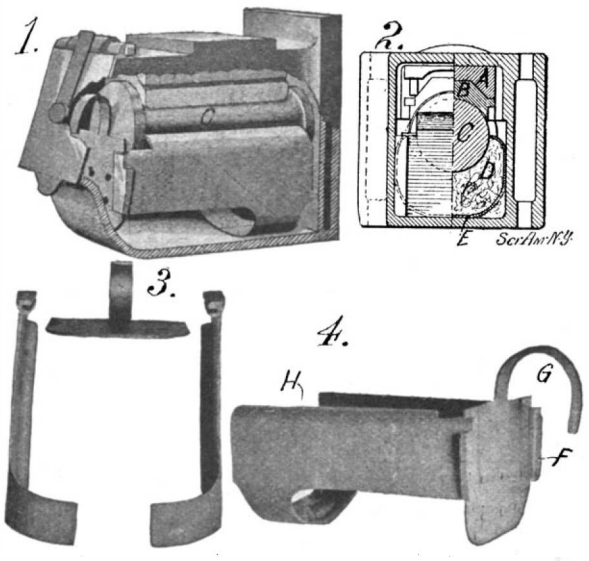
Some time since we had occasion to speak of a product known as "maisine," which is obtained from corn. In fact, it is found that corn flour contains a gluten which is analogous to the gluten of wheat, but differs from it by its solubility in the alcohols, especially in amylic alcohol. The present name was given to the product by Messrs. Donard and Labbé, who studied its leading properties. It is now found that it has a commercial value, and its solutions in alcohol and acetone give upon evaporation a transparent substance which can be used as a plastic material. Maisine is now produced in France on an industrial scale at the Trystram works at Grande Synthe, as a by-product of the corn industry. It can be incorporated with celluloid in the proportion of 20 to 75 per cent, and it thus lowers the price of the celluloid and renders it less combustible. When used above 20 per cent proportion, the product can be heated for 3 minutes at 155 deg. C. without showing decomposition. Maisine has various uses as a plastic material, and either alone or with camphor, and it can also be employed as a food product. Like caseine, it can be treated with alkalies and will thus give glue and sizing products. Thus the new substance will be an advantage in the corn industry, as besides the corn starch and the oil, we can now utilize the albuminous portions of the corn. To prepare maisine, corn flour is exhausted with amylic alcohol. The flour is previously dried, and then freed from fatty matter by treatment with benzine. The amyl alcohol solution is mixed with three parts of benzine, when the maisine is thrown down as a woolly precipitate. It is collected by filtering and dried *in vacuo*. Some 13 per cent of maisine is obtained from corn flour in this way. Messrs. Donard and Labbé find that this product is a mixture of several different albuminous substances which have varying solubilities in alcohol.

The Radium Institute of Heidelberg will be the first of its kind to commence actual work, as an endowment has been secured for it. It is to be opened for work before the end of the year.

Patent Department

WASTE-SUPPORTING ATTACHMENT FOR JOURNAL BOXES.

The object of the attachment illustrated in the accompanying engraving is to keep the waste in a journal box from working forward and forcing open

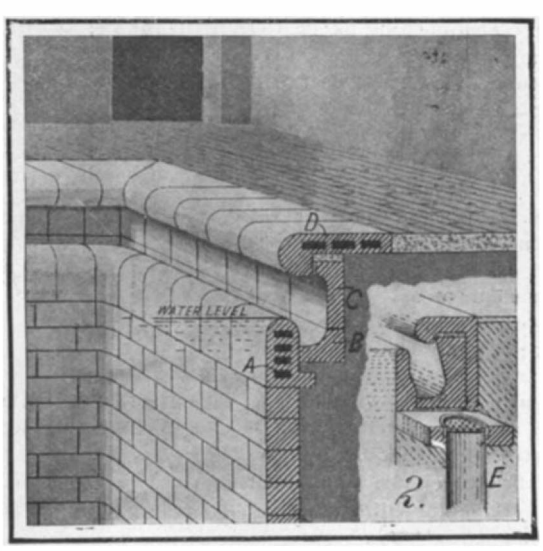


WASTE-SUPPORTING ATTACHMENT FOR JOURNAL BOXES.

the lid, and to prevent it from piling up in front of the journal collar and away from the inner end of the journal. The device also prevents the waste from getting under the journal brass. As the waste is held close to the journal under the brass, the journal is kept lubricated at all times without becoming heated. Furthermore, the device prevents cinders and dust from getting into the packing or waste. Fig. 1 of the illustration shows a journal box provided with the improved attachment. The usual wedge is shown at *A* and the brass at *B*, while the journal is indicated at *C*. The side waste-retaining members *D* are constructed as shown in Fig. 3. They are formed with curved extensions *E*, which serve to support them at the inner end. The front edge of each side member is provided with a lug *F*, in which is a slot adapted to receive the closing gate *G*. The upper edges of the side members are curved inward as shown at *H*, so as to come against the journal, and serve as a stop to prevent waste from being dragged upward under the brass. By this arrangement the packing is entirely concealed, and it is not so apt to be stolen from the boxes by the railroad hands. This attachment has been tried in actual railroad service for some time, and has shown an economy of about 45 per cent saving in packing. Mr. R. A. Billingham of St. Marys, Pa., has secured a patent on this improved attachment.

COMBINED LIFE RAIL AND GUTTER FOR SWIMMING POOLS.

It is very important that swimming baths or pools be provided with a surface drainage, so as to carry off floating grease and scum. The use of separate drains at intervals along the tank is not adequate. The dirt is washed against the walls of the tank by the waves and forms a deposit which can be removed only by scrubbing. The ideal drain is one which extends without a break around the entire tank at the normal water level. Such a drain has recently been invented which serves also as a life rail. It thereby

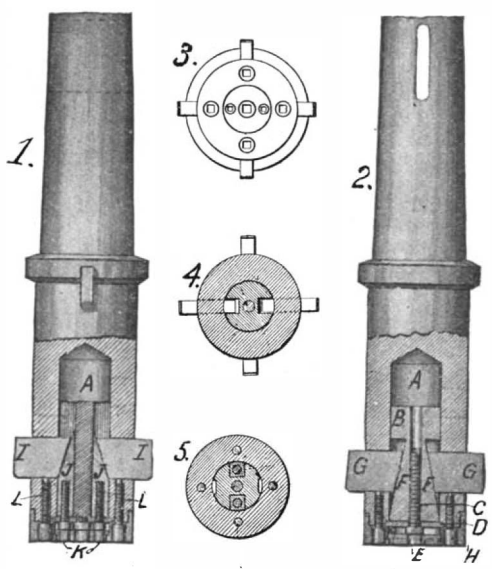


COMBINED LIFE RAIL AND GUTTER FOR SWIMMING POOLS.

overcomes another evil of the ordinary swimming tank. A metal life rail interferes with diving and prevents egress from the tank except at the steps, while ropes decay and become very filthy from constant contact with the scum of the water. The new combined life rail and drain is in the form of a gutter which runs around the entire tank. The construction is shown in the accompanying engraving. It is made up of glazed tiles and consists of a rail and overflow *A*, a gutter *B*, a vertical wall of "bull-nose flatters" *C*, and a cap course of "bull-nose headers" *D*. The water overflows into the gutter and is carried off through suitable outlets as indicated at *E*. The gutter slants toward the outlets to prevent trapping of the water. The cap course slants inward or toward the pool, so that water from the floor will drain into the gutter. This prevents flooding of the floor, and there is no chance for filthy water from the floor to drip into the pool. The gutter can readily be cleaned whenever desired so as to keep the tank in a sanitary condition. A patent on this combined gutter and life rail has been granted to Mr. J. Francis Booream, care of the American Enameled Brick and Tile Company, 1 Madison Avenue, New York.

EXPANSION CUTTER-HEAD FOR BORING BRASS.

The tool illustrated in the accompanying engraving is intended especially for use in boring the hubs of car wheels, although it will be found serviceable in many other applications. It is so arranged that the cutters therein may readily be adjusted in the cutter-head. Figs. 1 and 2 of the illustration show the cutter-head in the form of a mandrel, adapted to be attached to a boring bar or a spindle. The lower end of the cutter-head is provided with a central bore *A*, in which a wedge block *B* is adapted to slide. This wedge block may be adjusted in the bore by means of a screw *C* threaded therein. The latter is formed with a head, which is held between plates *D* and *E*. The plate *E*, which takes the thrust, is secured to the bottom of the cutter-head by a cap ring threaded thereon. The block *B* is formed with wedge faces *F*, adapted to bear against the inner edges of the opposite roughing cutters *G*, which project through the sides of the cutter-head. By adjusting the wedge

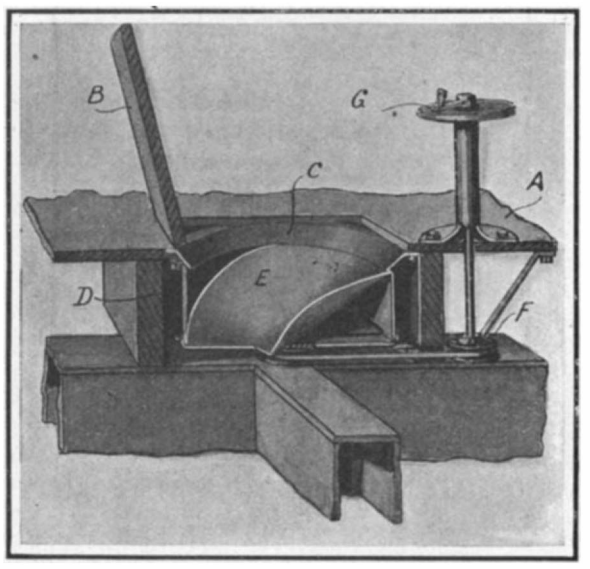


EXPANSION CUTTER-HEAD FOR BORING BRASS.

block into or out of the bore *A*, the cutters *G* are correspondingly advanced or retracted. When the desired adjustment has been made, they are clamped in place by means of set screws *H*. In addition to these cutters, the tool is provided with two finishing cutters, disposed at right angles to the first ones. These are indicated at *I* in Fig. 1, and are adjusted by two wedges *J*, which bear against their inner edges. Two screws *K* are threaded into the wedges *J*, and provide means for adjusting the position of the cutters *I*. These screws are provided with heads, which like that of screw *C* are held between the plates *D* and *E*. The plate *E* is perforated as indicated in Fig. 3, so as to permit of introducing a key therethrough into the square sockets formed in the ends of the screws, so that the screws may be turned to make the desired adjustments. When the cutters *I* have been properly adjusted, they are locked in place by means of set screws *L*. It will be observed that the roughing and finishing cutters may be separately adjusted. The arrangement of the cutters is clearly shown in Fig. 4, which is a section taken on Fig. 1 directly above the cutters. Fig. 5 is a section on Fig 2, taken immediately below the cutters. A patent on this expansion cutter-head has been granted to Mr. Charles M. Buck of Huntington, W. Va.

DISTRIBUTER FOR GRAIN BINS.

With a view to facilitating the dumping of grain and similar substances in bins, a new distributing device has been devised. This distributing device is placed at the intersection of the walls of the bins, so that the grain may be dumped into any one of the four adjacent bins. The accompanying illustration shows the distributer partly in section and set in the dumping floor *A* over the bins. The opening in the floor is normally closed by a trap door *B*. A guide ring is bolted to the bottom of the floor, and is provided with a conical flange *C* which serves to direct the grain into the distributing drum *D*. The latter is formed with a chute *E*, which at its lower end has an opening in the form of a sector of a circle. The drum is pivoted in a bearing plate attached to the upper walls of the bins, and it is belted to a pulley *F*, which in turn is carried by a shaft passing up through the floor. The upper end of the shaft carries an operating

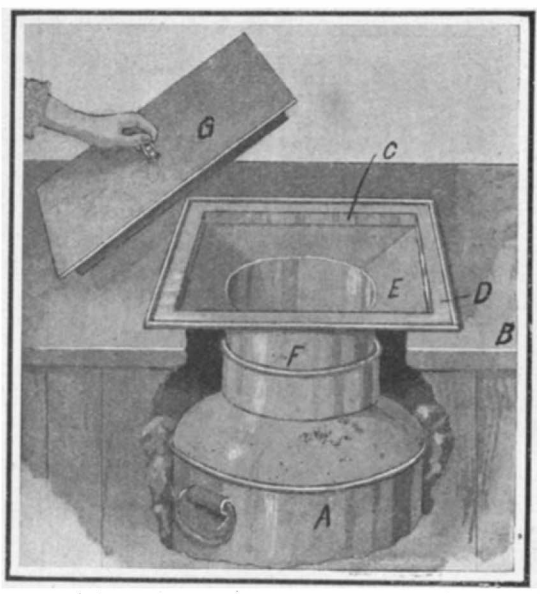


DISTRIBUTER FOR GRAIN BINS.

crank *G*, with a pointer thereon adapted to be moved over a dial. This dial is marked with numbers indicating the four bins in the range of the distributer. As the crank is turned to the different numbers, the chute is moved so as to deliver the grain to the corresponding bin. A patent on this improved distributer has been granted to Mr. J. R. Pattinson of Stafford, Kan.

SANITARY MILK AND CREAM SAVING DEVICE.

In the milk and cream cabinets generally used in lunch rooms, it is impossible to prevent milk or cream which is spilled while hastily filling the glasses, from flowing into the ice chamber around the can. The milk fouls the ice and soon becomes sour, making it necessary to clean out the ice chamber quite frequently, and a large amount of ice is lost whenever the cabinet is cleaned. By preventing the admission of milk into the ice chamber, the cabinet may be kept sweet and sanitary, and it need be emptied and cleaned only at such intervals as the presence of impurities in the ice may demand. The accompanying illustration shows a milk cabinet provided with a device which prevents the milk that is spilled from coming in contact with the ice. The milk can is shown at *A*, directly under the square opening in the top *B* of the cabinet. Fitted into this opening is a rectangular sheet-metal device *C*, which is formed with a flange *D* that rests on the top of the cabinet. This rectangular member is provided with an inclined wall serving as a funnel to direct the spilled milk into the milk can. Connecting the inclined wall *E* with the top of the milk can is a collar *F*, adapted to fit closely into the mouth of the can. It is evident that any milk spilled into this device will flow back into the can, and will have no opportunity of entering the ice chamber. In connection with this milk-saving device, a sheet-metal cover *G* is employed provided with a flange which fits snugly into the rectangular mem-

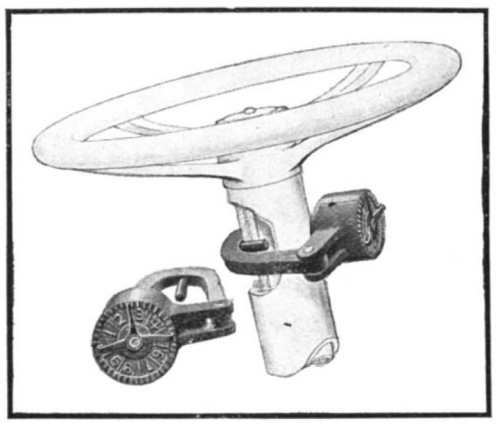


SANITARY MILK AND CREAM SAVING DEVICE.

ber *C*. Mr. Charles C. Cousins of 230 Middle Street, Portland, Me., has secured a patent on this milk-saving device.

A NEW AUTOMOBILE LOCK.

A convenient combination lock has recently been devised which may be attached to the steering column of an automobile so as to prevent it from being operated. A quarter-inch hole is drilled through the outside and inside casings of the steering column, and the hasp of the lock which passes around the column is formed with a lug adapted to enter this hole. When

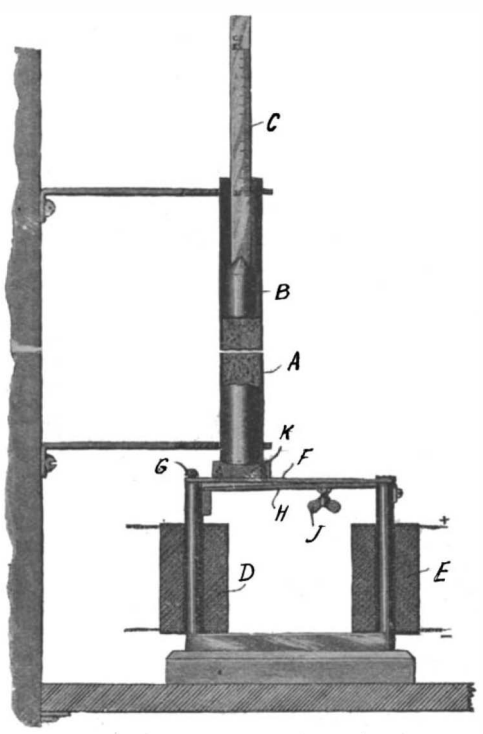


A NEW AUTOMOBILE LOCK.

the lug is locked in this position it is impossible to turn the steering gear, which makes the car utterly useless to any one who is unable to open the lock. The lock is of the three-tumbler type, and is of such form that it may be operated in the dark as readily as in the light. The combination may be changed at a moment's notice. A modification of this lock has been devised which is of the four-tumbler type and may be adjusted for different sizes of steering columns.

APPARATUS FOR DETERMINING DENSITY.

The usual method of determining the density of powdered or granulated materials involves the measuring of a given volume of the material by filling a vessel to a predetermined mark, and then weighing the measured quantity to find the ratio of the weight to the volume. The personal equation enters into this operation to such a large extent that accurate results are very difficult to obtain. The variation is due to the fact that different operators pack or jar the material down in the container to different extents. Further variations may arise from the fact that the material is naturally rough and uneven, and it is difficult to ascertain when the container is filled exactly to a given line or mark. The accompanying engraving illustrates an improved apparatus, in which a given weight of material is placed, and its volume determined automatically. It consists of a tubular container *A*, for the material to be tested, and a plunger *B*, closely fitting the interior of the container, but free to reciprocate therein. An upwardly-extending stem *C*, carried by the plunger, is graduated, so that it is



IMPROVED DENSITY APPARATUS.

possible to determine the amount of the material in the container. In order to pack the material in the container, a vibrator is provided consisting of a wrought-iron magnet, on one arm of which a spool *D* is fitted, while the other arm carries a spool *E*. The spool *E* is connected with a source of direct current, while the spool *D* receives alternating current. The armature *F* of the magnet is normally magnetized by its contact with the arm which carries the spool *E*, and its opposite end is vibrated, owing to the alternating field set up by the coil *D*. The vibration of the armature is limited by a set screw *G*. A spring *H*, which may be adjusted by the screw *J*, serves to assist the movement of the vibrator. The latter carries a button *K*, on which the tube *A* is mounted. In practice 100 grammes of the material is carefully weighed out and placed in the tube *A*, and then subjected to the vibrating action, so as to compact it under the plunger *B* for a definite period of time; then its density may be observed by dividing its weight by the volume indicated on the scale, which is calibrated in cubic centimeters. Mr. William D. Mount of Saltville, Va., is the inventor of this improved apparatus.

AUTOMATIC STARTING DEVICE FOR SIPHONS.

There are many occasions in which it is extremely objectionable to start a siphon tube by sucking with the mouth, for instance in preparing certain saturated

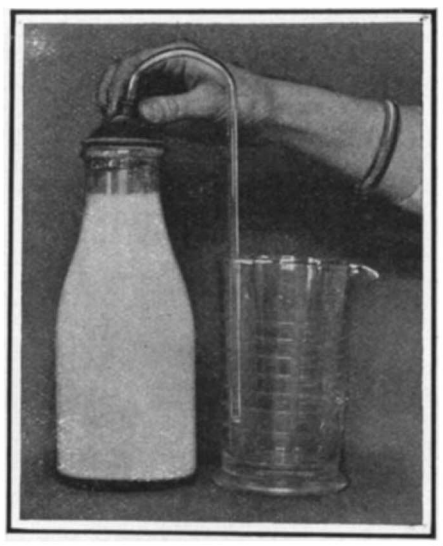


Fig. 1.—THE SIPHON IN POSITION READY TO BE STARTED.

solutions of chemicals which are poisonous or distasteful. Also in preparing infant foods, where it is desirable to draw off the lower part of a bottle of milk, leaving the upper part for modification in the usual manner, it is a decidedly insanitary practice to start the tube with the mouth. In order to obviate such a necessity, a simple starting device has been invented whereby the milk is forced out, not by suction but by compression of the air in the bottle. The device consists merely of a cap of rubber mounted on the siphon tube and arranged to rest on the mouth of the milk bottle as shown in Fig. 1. The neck of this cap is seized between the thumb and finger and pressed downward, carrying the tube with it, until the cap is virtually inverted as shown in Fig. 2. While the cap is being pressed down the air in the top of the bottle is compressed, thus forcing the milk up through the tube without bringing the rubber into contact with the milk. The siphon then continues to run; but as the milk runs out of the bottle a continuous supply of air must run in to take its place, and in order to prevent the cap from being sucked into the

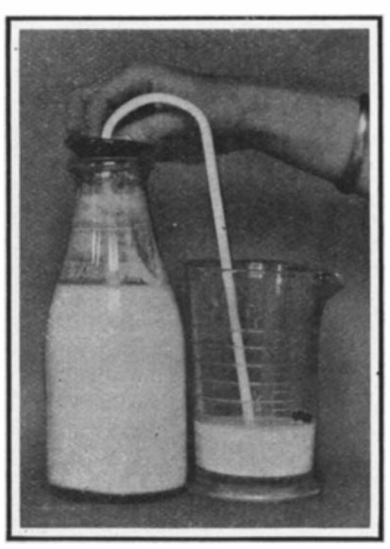
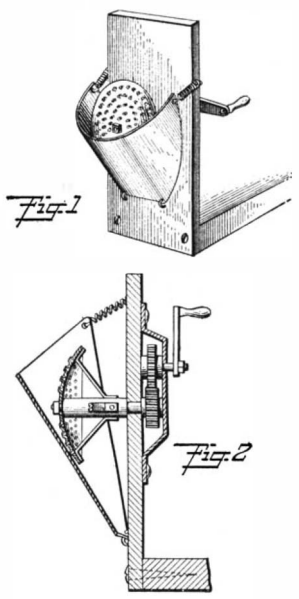


Fig. 2.—THE CAP DEPRESSED AND THE SIPHON STARTED.

mouth of the bottle and sealing it, a series of lugs are provided on the under side of the rubber. When the rubber turns inside out these lugs space it from the edge of the bottle so as to permit the necessary ingress of air. The starting device contains no valves in which the milk may lodge and become sour. The tube may readily be cleaned and sterilized, and in case the cap should become foul it may be slipped off the tube and boiled. It will be understood that the inner leg of the siphon may be lowered to any desired degree so as to draw off top milk, bottom milk, or middle milk. The inventor of this improved siphon is Mr. Walton Harrison of Bloomfield, N. J.

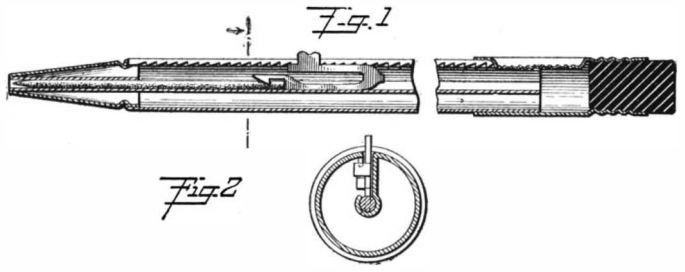
ODDITIES IN INVENTIONS.

Vegetable Grater.—The ordinary method of grating vegetables by rubbing them over a roughened surface is quite liable to injure the hands. As a substitute for this primitive process, a small hand-operated machine has been devised, which is illustrated herewith. It consists of a convexed grating disk, mounted on a shaft, which is connected by a suitable gearing with an operating handle. An inclined hopper is arranged in front of the disk. The hopper is hinged at its lower end, and is held in yielding engagement with the disk by means of a pair of coil springs attached to the upper end. The vegetables to be grated are dropped in the hopper, and when the handle is operated they are grated or ground between the disk and the hopper.



VEGETABLE GRATER.

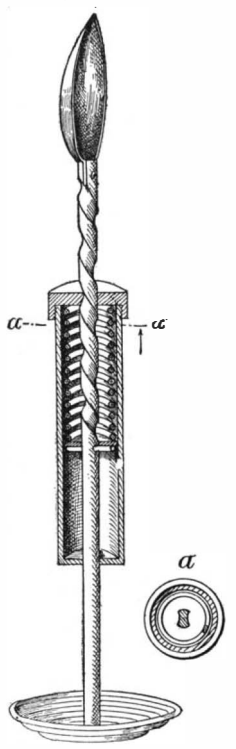
Novel Lead Pencil.—Pictured in the accompanying illustration is a pencil of the type arranged to hold detachable lead crayons. The casing of the pencil is formed of a single piece, as best shown in Fig. 2. The body of the casing is of cylindrical form, with a slot at one side, and one edge of the slot having an inwardly-projecting serrated flange, while at the other side of the slot the metal is bent inward to the center of the cylinder, where it is formed into a receiver for the crayon. A small catch is arranged to slide in the slot, being provided with a hook that engages the



NOVEL LEAD PENCIL.

crayon, and a spring extension, which engages the serrated flange. A thumb piece on the spring member projects through the slot, and enables the operator to release the catch for engagement with the teeth on the flange and allow of moving the crayon to any desired position.

Combined Potato Masher and Spoon.—The accompanying illustration shows a novel implement for use about the kitchen. It consists of a rotating beater or masher for potatoes, combined with a spoon. The spoon bowl is formed on the upper end of a shaft which at its outer end carries a coiled spring that serves as the mashing element. A casing is fitted over the shaft. A spiral groove is formed in the upper half of the shaft which projects through an opening in the cap of the casing. The opening is of the form indicated in the cross-sectional view so that it will engage the spiral groove. A spiral spring in the casing serves to hold the casing normally in the uppermost position. In use the casing serves as a handle for the device, and when it is operated as a masher, owing to the spiral groove the shaft will be given a rotary motion. The coiled spring beater will yield or open on the downstroke of the casing and close on the upstroke, so that in addition to the reducing action resulting from the rotation of the masher it will operate to mash the potato operated upon.



COMBINED POTATO MASHER AND SPOON.

The electric lighting industry is represented in the United States by 5,264 companies and municipal plants.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

GARMENT-CLASP. — L. C. STUKENBORG, Browns, Ala. One purpose of this invention is to provide a simple form of clasp adapted for use in connection with any garment, but which is more particularly adapted for holding up hosiery of all types, and which may be used also in connection with draperies. The invention provides means to prevent puncture or laceration of material in passing in or withdrawal from the device.

Electrical Devices.

INSULATED HANGER.—L. STEINBERGER, New York, N. Y. The hanger admits of general use, and is particularly adapted to be employed for supporting electrical railway trolley wires. The more particular object, however, of this inventor is to produce a type of hanger in which the melting of the insulation, due to leakage from heavy currents or other causes, is unable to cause the line wire or other conductor supported by the hanger, to separate from the same or to fall to the ground.

TOWER OR POLE.—F. MILLIKEN, New York, N. Y. The invention is an improvement in structural steel poles or towers, for electric transmission cables as are designed to conduct electricity from the place of generation to distant points. The poles for this purpose are generally placed a considerable distance apart in order to economize in construction as much as is feasible, and accordingly each pole is subjected to severe strains of varying nature. Mr. Milliken's invention resists these strains.

Of Interest to Farmers.

COVER FOR BEET-FLUMES.—J. R. LEES, Denver, Colo. The invention relates to flumes such as are used in connection with beet sugar mills for floating beets into the mill from the receiving sheds. The object is to produce a cover which can be simply constructed of metal, and which is constructed in such a way as to enable it to be readily removed, and if desired secured in position.

PLANTING-MACHINE.—B. C. MCCOY, Pontiac, Mich. The invention consists in a device comprising a seed separating and distributing device, means for delivering seed therefrom to a discharging device, means for making a furrow and depositing seed therein at predetermined intervals, and means for covering the deposited seed, all of the results being substantially automatically attained. It relates to a machine for which Letters Patent were formerly granted to Mr. McCoy.

Of General Interest.

EYEGLASS-MOUNTING.—H. G. ROSKIND, Columbia, Tenn. In this instance the invention is an improvement in eyeglass mountings, and particularly in that class in which the guards are pivotally mounted and spring actuated and can be opened for the application of the guards to the nose of the wearer and then released to engage by a spring action with the nose.

PACKING-BOX.—G. CERF, New York, N. Y. The aim here is to provide a box collapsible in construction, and more especially designed for packing and shipping dry goods and other heavy pieces and articles of merchandise, and arranged to permit of conveniently setting up the parts or disconnecting the same, for forming a small bundle capable of being stored and shipped in a comparatively small space.

CONCRETE-MOLD. — W. H. ALEXANDER, Long Branch, N. J. The purpose in this improvement is to provide a mold which will more readily permit of a concrete block being formed with its exterior surface of a different mixture from its body; and it also has in view the provision of means to remove the concrete block from the mold with little trouble, and with no danger of breakage.

HORSE-COLLAR. — J. DE W. WHIPPLE, Omaha, Neb. The particular purpose in view in this case is to provide features of improvement for the collar formerly patented by Mr. Whipple whereby the construction is simplified, and the connections to the draft leathers are adapted for self adjustment, to accommodate a difference in the line of draft strain due to a high or low hitch upon the object to be drawn. Furthermore to dispense with objectionable projections from the draft-leathers, and obviate wear of parts by changing their construction while effecting a like purpose.

ENVELOPE.—A. E. HARKER, Windsor, N. J. One of the purposes here is to produce a shapely envelope from a single sheet of paper, that may be rapidly cut, folded into form and secured by an adherent at certain edges thereof, so as to provide two independent pockets therein for the reception of cash contributions, the envelope being especially designed for use in the collection of voluntary offerings for the support of a pastor, and other purposes, and which are usually collected and disbursed by church officers.

METAL CONSTRUCTION.—W. P. LAWRENCE, Colorado Springs, Colo. The invention relates to improvements in metal construction, and more particularly to means for securing together tubular members formed of sheet metal. It may be utilized in various different arts, but is particularly adapted for use in the formation of metal furniture, for instance, in securing the rails of bedsteads and chairs to the uprights thereof.

ARM AND BRUSH FOR BOTTLE-WASHERS.—C. K. VOLCKENING, New York, N. Y. The improvement refers to arms and brushes used in bottle washers, the more particular purpose being to provide a metallic arm made of such form as to be readily struck up or stamped from sheet metal and bent into suitable form, after which a brush of rubber or other resilient material is vulcanized upon the arm.

INHALER.—H. WEIR, Portland, Ore. This device is of a shape as will render it easy of application to the nostrils and protect them from injury. Absorbent material is mounted in two truncated cones, and retains medicine or absorbing organic matter discharged from the nose or even for the purpose of merely filtering the air used in breathing, as the case may be.

Hardware.

TENSION DEVICE FOR SHEARS OR SCISSORS.—W. M. BOWES, New York, N. Y. In the present patent the invention has for an object the provision of a tension device of simple construction having a movable adjusting member, and constructed in such a way that in whichever direction the adjustable member is moved it will tighten the blades.

WRENCH.—J. E. LA DOW, Kellogg, Iowa. An object in this case is to provide an inexpensive wrench for use with pipe or other similar material, which within the limits of the wrench will fit any size of pipe, and which serves to grip the pipe so firmly that the same is not likely to slip between the jaws when being turned by means of the wrench.

Household Utilities.

WOVEN-WIRE BED-BOTTOM.—G. BOEHM, Marshfield, Wis. The bed bottom is so constructed that the tension at the longitudinal center shall be stronger than at the sides, so that when two persons are occupying a bed having this improved woven wire bottom, they will not roll toward the center, and so that when one person is of a less weight than the other each can keep his position without incommoding the other.

CLOSET-FITTING. — W. M. WEATHERLY, Greensboro, N. C. The invention in this case is for use in closets in connection with soil pipe, and makes a direct, solid, safe, and sanitary connection to the soil pipe by the use of the specially made fitting and gasket and bolts at a less cost in time and material than by the use of the lead bends, ferrules and flanges ordinarily used in making closet connections.

FOLDING TABLE.—L. NOLAN, New York, N. Y. In the present patent the invention has reference to folding tables, the more particular purpose being to provide a form of knock-down table having great strength combined with lightness. The table comprises two horses and folding boards resting thereupon, these boards being provided with various detachable braces and other strengthening members.

Machines and Mechanical Devices.

WOVEN PILE FABRIC.—J. K. DALKRANIAN, New York, N. Y. In this patent the invention has for an object the provision of a new and improved woven pile fabric of the oriental rug type having Persian knots, and arranged to strongly reinforce the body of the fabric, thus rendering the latter exceedingly strong and durable.

METHOD FOR FORMING WOVEN PILE FABRICS.—J. K. DALKRANIAN, New York, N. Y. The object of this invention is to provide a new and improved method for forming woven pile fabrics of the oriental rug type, the weave having Persian knots which are formed mechanically in a very simple manner, and preferably on a loom, such, for instance, as shown, and described in the Letters Patent of the U. S., formerly granted to Mr. Dalkranian.

SKIRT-MARKER.—L. D'ELIA, New York, N. Y. More particularly the invention relates to adjustable clamping means for holding the skirt after gripping the lower portion of the skirt, and to constitute a guide for the marker. The object is to provide means for gripping the skirt substantially throughout the circumference of the lower portion thereof and adjustable so as to grip it at any desired height, and adjustable to receive skirts of any size.

APPARATUS FOR WINDING AND CLEANING SILK AND OTHER FABRICS.—E. DUBINI, No. 2 Piazza Belgioioso, Milan, Italy. The aim of the present invention is to facilitate the speedy winding of silk and other textile fibers as well as to unite in one sole operation the winding and cleaning processes, thus causing a considerable saving in the handicraft, and allowing of the production of waste being greatly diminished.

DEVICE FOR HANDLING TYPE-WRITER RIBBONS.—E. C. MAGNUS, Bonn-on-the-Rhine, Germany. The intention in this case is to provide a device which may be used in putting type-writer ribbons on type-writers and in removing the ribbon previous to writing wax stencils, or when worn, without it being necessary for the operator to touch the ribbon with his hands.

HEDDLE-MAKING MACHINE.—C. B. BORGESON, Butler, Pa. This invention refers to a machine for making loom-heddles of a duplex wire composed of two parallel strands soldered together continuously throughout their length; and the object of the invention is to provide an automatic power-driven machine, which is simple of construction, easy to keep in working order, and of great capacity.

HOISTING APPARATUS. — C. CONKLIN, New York, N. Y. In this apparatus the load carrier automatically travels laterally on the boom when it reaches the proper elevation, and after passing to the point of discharge and releasing the load, to be automatically returned to initial position upon throwing the hoisting mechanism out of gear, the point to which the carrier moves outwardly on the boom being capable of adjustment, whereby the carrier may be dropped at the most advantageous point for loading.

STEM FOR BOTTLE-WASHING BRUSHES.—C. K. VOLCKENING, New York, N. Y. The purpose of this invention, generally speaking, is to facilitate the quick withdrawal of the bottle washer brush from contact with any obstruction which this brush meets in washing the bottle, the withdrawal being controlled by the obstruction, but the motive power for effecting the withdrawal being supplied from the power used for turning the stem.

BENDING-MACHINE.—M. J. MCGILL, Park City, Utah. The object of the invention is to provide a bending machine, more especially designed for bending rails, pipes and other articles in a very simple manner and without requiring much physical exertion on the part of the operator, the machine being portable and hence very serviceable for use in mines and other places.

MACHINE FOR GLUING TEXTILE FABRICS.—F. C. SCHRÖDER, 4 Marcus Sidealle, Copenhagen, and J. SEDAL, Jaegersborg Alle, Gentofte, Denmark. The invention comprehends a machine for the automatic continuous gluing of textile fabrics, and is so arranged that in its action it divides into separate groups the various layers of cloth to be glued, and brings the layers together in such manner that each group is glued independently of the others, the pressure necessary for the gluing being utilized in the most effective manner.

CUTTING AND CONVEYING MECHANISM. —S. M. LANGSTON, Camden, N. J. This invention relates to improvements in machinery for cutting or subdividing paper, cardboard, pasteboard, cellular board, or the like, and relates more particularly to a combined cutting and conveying mechanism, whereby the separate pieces may be delivered from the machine intermittently in piles rather than deliver each piece as soon as it is separated or cut off.

SHAFT-ALINER.—A. J. HOLMES, Gouverneur, N. Y. The more particular purpose in this case is to provide a device suitable for ascertaining the so-called "vertical alinement" and so-called "horizontal alinement" of a shaft. The aliner is provided with jaws for gripping a shaft in such manner that, regardless of the diameter of the shaft, the center is always in alinement with a certain portion of the alinement apparatus.

Musical Devices.

STRINGED MUSICAL INSTRUMENT.—A. S. LESLIE, Sapperton, British Columbia, Canada. One of the objects in this case is to improve stringed musical instruments, such as violins, violas, violoncellos, and the like, so that the strings can be easily replaced when necessary and without loss of time, as is the case in an ordinary stringed instrument when a string is broken.

PIANO-PEDAL AND PROCESS OF MAKING THE SAME.—A. L. EBBELS, New York, N. Y. The intention in this improvement is to produce a process for attaching the toe of the pedal to a rod, the general purpose being to decrease the cost of manufacture and to increase the rigidity and strength of the complete, finished article. It relates to pedals for use with pianos, organs, and similar instruments.

Prime Movers and Their Accessories.

VALVE MECHANISM FOR STEAM-ENGINES.—E. L. BOWEN, McComb City, Miss. The invention relates to engines for pumps for fluid pressure brakes, and its object is to provide certain new and useful improvements in valve mechanism for steam engines whereby the admission and exhaust of the steam are properly controlled, to insure easy and positive working of the brake pump.

Railways and Their Accessories.

ROTARY WHEEL-GUARD FOR CARS.—F. S. HUTCHINGS, New York, N. Y. The invention relates to improvements in car fenders or guards, and more particularly to that type of fender in which there are employed rotary cylinders or drums which are positively rotated upon the movement of the car and serve to remove persons or obstructions from the track and prevent the car from passing over them.

ATTACHMENT FOR WOODEN RAILWAY-TIES.—C. H. BENNETT, Corning, N. Y. Mr. Bennett's improvement pertains to railway ties, his more particular purpose being to provide a type of covering therefor, serving the joint purpose of protecting the tie from the effects of moisture, insuring uniformity of distance between the rails and enabling the covering and also the rails to be secured firmly in position relatively to the ties.

STATION-INDICATOR. — H. C. WALLACE, Salt Lake City, Utah. The more particular objects of the improvements are to provide the display mechanism with means whereby it may be operated electrically by the car conductor or other trainman. The invention relates to station indicators of the general type shown and described in a former patent granted to Mr. Wallace.

CAR-FENDER.—H. M. LAMBERT, Portland, Ore. In operation should the bar in front of the roller strike an obstruction having its center of gravity elevated, the obstruction will be thrown on to the fender. Should the center of gravity be near the ground the front part of the fender would be elevated thus dropping its rear end toward the ground, thus bringing the spring arms into position to engage the obstruction after the roller has passed thereover. The present is an improvement over a patent formerly granted to Mr. Lambert.

Pertaining to Recreation.

SWING ATTACHMENT.—M. R. GRANT, Meridian, Miss. By this invention there is provided in connection with a seat of a lawn swing, a crib attachment which may be applied to and removed from the seat and is constructed with an intermediate or main section and end sections, jointed at one end to their respective ends of their immediate sections, and provided at their other or free ends with means for securing the attachment to the swing seat.

PUZZLE.—L. C. KOEHLER, Taylor, Pa., and W. M. BUTLER, New York, N. Y. The puzzle is interesting and will provide a test of one's ingenuity and resourcefulness. It relates to that class of game devices which comprise slides mounted upon a board, which slides must be moved from place to place and rearranged in the solution of the puzzle.

Pertaining to Vehicles.

BRAKE-OPERATING MECHANISM FOR MOTOR-VEHICLES.—P. KRAUSE, Babylon, N. Y. The invention relates more particularly to that type of mechanism illustrated in an application previously filed by Mr. Krause in which he disclosed means for operating a motor vehicle brake from adjacent either the front or the rear side of the vehicle and means for automatically breaking the ignition circuit for the engine of the vehicle upon the applying of the brake.

WHEEL.—G. M. BADGER, Quitman, Ga. In carrying out the invention a wheel body is employed, formed with a hub and a rim, and surrounding this rim and spaced apart therefrom is a tire yieldingly supported from the body by springs so it can operate with a cushion action. Plates support the springs and retain them in desired relation to the rim and tire. Means provide for permitting yielding of the tire in action, for preventing independent circular motion of tire and wheel body; for protecting the wheel body and tire from mud and the like; and preventing the hinge from striking on outer or inner tire in starting or backing.

DRAFT-EQUALIZER.—V. H. BORING, Sumner, Mo. The purpose here is to provide an equalizer, for draft animals hitched in pairs at each side of the line of draft respectively, which will enable the even distribution of draft strain upon each side of the line of draft, respectively, which will enable the even distribution of draft strain upon each pair of animals or impose proportionately less load strain upon a weaker team than the other pair has to pull.

VARIABLE-SPEED GEAR.—P. C. WILLIAMSON, Oakland, Cal. The invention relates to a gear for operatively connecting the motor and the drawing wheels of an automobile, or the propeller of a motor boat or the like, and comprises friction disks, driving and driven rollers movably engaging the disks and simultaneously operable so that the change in the speed of rotation of the driven rollers is a multiple of the change of speed of the driven disks, and in which the disks are operable to release the rollers.

Designs.

DESIGN FOR A DISH.—E. G. GARRISON, Newark, N. J. This ornamental design for a dish is circular in form. Above the base of the dish a wide and slightly slanting rim projects and from this there is a raised low bowl-shaped upper half, the whole comprising a graceful and well balanced article.

DESIGN FOR A BADGE.—J. W. GREEN, Santa Fe, New Mex. This ornamental design comprises a U. S. shield in the center of which is a deer's head with antlers spread across the upper part. In the center of this part amid a field of stars and between the antlers is shown a clock dial. In the deer's collar are the initial letters, B. P. O. E.

DESIGN FOR A BADGE.—E. J. KASSEL, Ballinger, Texas. The design represents a short length of tree trunk, the flat top being decorated by an axe and maul crossed, with a wedge in the center. On the body of the tree are initial letters W O W. The bottom of the badge is made up of an ornamental monogram.

NOTE.—Copies of any of these patents will be furnished by Munn & Co, for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of March 13th or will be sent by mail on request.

(12096) H. E. asks: We have cast life-size statues in Keene cement, and wish to treat same with paint or gilt. Our experience is that the sweating of the cement will loosen the paint within a short time and same will fall off. Can you advise us how to prevent it, or how long it will take to season the Keene cement statues so that the paint will remain on same? A. Cement may be painted with any kind of paint without "sweating" it off, if the condition is right. The older the cement is, the better: it should be a year old before painting, but may be less. Paint the cement first with water glass (silicate of soda and potash dissolved in water), after two coats of which, if the surface is thoroughly *washed,* it will begin to have a glassy appearance, and one more coat should render it quite impermeable, so that it will take any kind of paint or enamel.

(12097) L. E. D. asks: Will you kindly let me know what are the principal objections for railroads not using steel ties, and if there is a railroad in Mexico using them, and how rails are fastened to the ties? If you have a copy of the SCIENTIFIC AMERICAN that will let me know please forward at once. A. The reason for the comparatively small use of metal railroad ties in this country is apparently that in tests made by several of the leading railways over a period of ten years or more prior to 1890, the results unanimously showed that the increase in life and wearing qualities of metal ties was not sufficient to compensate for their higher cost. We are satisfied that a repetition of these tests would reverse this decision, taking into consideration the increasing scarcity of suitable timber, improved method of manufacture of steel ties, and especially the great improvement in roadbed conditions on American railways in recent years. The previous failure of metal ties seems to have been largely due to deficient roadbed. In Europe, where the density of population is so much higher in proportion to the mileage of railway, and where consequently the larger available capital for the building and maintenance of permanent way produced roadbeds with which our railways have only recently begun to compare, metal ties have been successfully and economically used. Metal ties are in use there, still in good condition, which have been in continuous use for upward of twenty-five years, their longer life much more than compensating for their high first cost as compared with wood. Rails are attached to metal ties in a variety of ways, an essential feature seeming to be an elastic pad between rail and tie to prevent crystallization of the latter by vibration. We can send you our issue, No. 1, Vol. 99, describing the use of steel ties, and have a number of others on wood preservation, which has also militated against the introduction of steel ties. Price, 10 cents each.

(12098) W. L. B. writes: The citizens of this city are trying to get drainage for the lands lying west of the city. Can you assist us in arriving at a solution of the problem by answering the following question: How much water per hour will a concrete ditch dispose of or carry away that is 5,330 feet long, 24 feet wide at the top, 12 feet wide in the bottom, and 6 feet deep? The elevation of the water level of the highest lake is 16 feet above the one to be drained into. A. The quantity of water discharged by such a ditch as you describe is figured by the formula $Q = av$, in which Q = quantity in cubic feet per second, a = cross-sectional area of channel, and v = velocity in feet per second. In your case $a = 12 \text{ feet} \times 6 \text{ feet} + \frac{12 \text{ ft} \times 6 \text{ ft.}}{2} = 109$ square feet $\therefore Q = 109v$. The velocity is figured by the formula $v = c\sqrt{rs}$, in which c is the coefficient of friction between the water and the material of the channel (which has to be determined by experiment), r = the mean hydraulic depth or radius, and s = the slope, or the sine of the angle of the slope. In your case $s = 16$ feet (the difference between the levels of entry and discharge of the ditch) $\div$ 5,330 feet (the length of the ditch) $= 0.00303$ nearly, and $\sqrt{s} = 0.055048$; r, the mean hydraulic depth, is the sectional area $\div$ the wet perimeter, in your case $\frac{109}{8.48+12+8.48}$ (supposing the ditch to be running full) or $\frac{109}{29}$ nearly, and $\sqrt{r} = 1.936$. C will be about 142, taking n, the coefficient of roughness, as 0.013 for fairly rough concrete. (For very smooth concrete, higher in cement and well laid, n might be as low as 0.011, in which case C would be nearly 170, and the quantity of water discharged would be greater, but we take the lower figure to be on the safe side.) Substituting these values in the formula $v = C\sqrt{rs}$ we have $v = 142\ (1.936 \times 0.055) = 15.05$ feet per second, and $Q = 109 \times 15.05 = 1{,}640.45$ cubic feet per second, which the ditch is capable of discharging when running full.

Legal Notices

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

June 8, 1909,

AND EACH BEARING THAT DATE

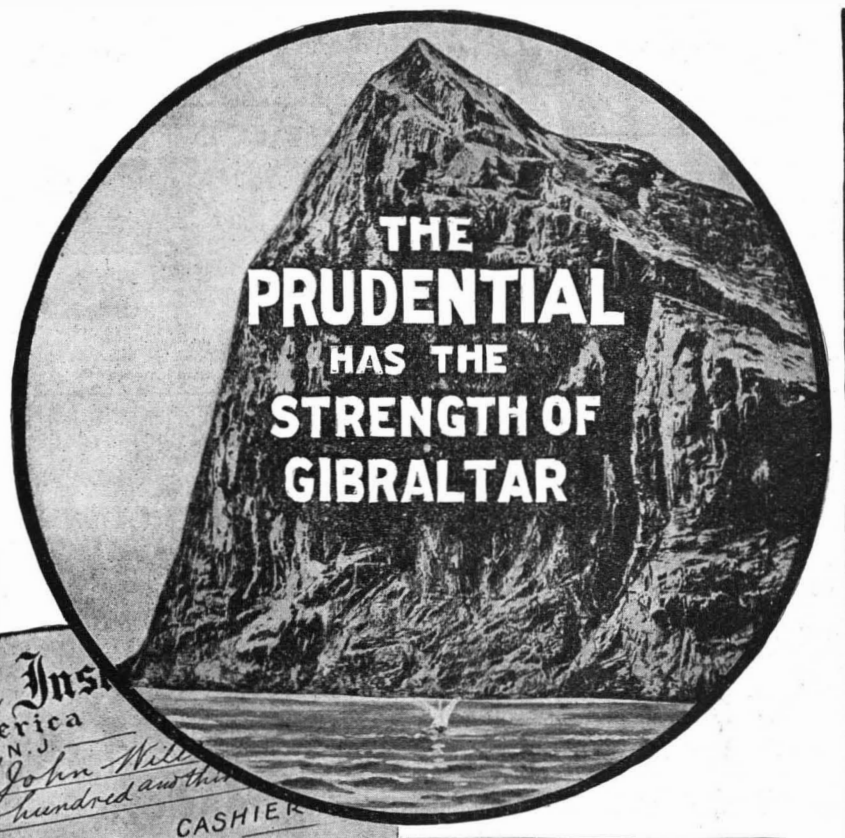
[See note at end of list about copies of these patents.]

Acid, preparing pure lactic, H. Noerdlinger, et al. 924,494
Adding and listing machine, Vincent & Benner 924,118
Adding device, J. A. Cheape 924,320
Adding machine, C. N. McFarland 924,264
Advertising appliance, G. Siff 924,111
Air and vacuum controlling device, H. K. & I. Z. Kriebel 924,617
Air brake piston, J. E. Meek 924,087
Air compressor and driving means therefor, M. C. Sharpneck 924,280
Air, extracting nitrogen from, O. P. Hurford 923,846
Air ship, J. M. Park 924,495
Alligator wrench, S. A. Brockway 923,940
Ammonia and tar, obtaining, H. Koppers, reissue 12,971
Ammunition vehicle, W. Mayer 923,869
Amusement device, illusion, Hicks & Wigan 924,068
Animal trap, O. Kampfe 924,237
Antifriction washer for hinges, etc., E. L. Teich 924,511
Antivapor gland, J. E. Lea 924,618
Atomizer, F. C. Dorment 923,822
Atomizing liquids, machine for, P. Kestner. 923,856
Autographic register, T. C. McGeown 923,990
Automobile running gear, H. J. Hass 924,061
Automobile turn table, C. K. Elmer 923,825
Automobiles, gas lighting system for, E. Timmerhoff 924,513
Awnings, head rod fastener for, J. E. Robinson 923,892
Axle lubricator, J. Aden 924,214
Bag. See Feed bag.
Bag, A. Magui 924,167
Bag, C. C. Miller 924,174
Bait or lure, fish, B. C. Kenyon 923,854
Baking iron for ice cream cones, C. E. Menches 924,484
Baling and compress machine, combined, R. D. Crow 924,223
Baling press, Ritter & McCorkle 924,107
Ball shock absorber, bowling, M. Kern 924,472
Bandage, suspensory, O. M. Morris 924,367
Bandages, forming sacks for suspensory, J. K. Toles 924,294
Barrel filling machines, cut off for, W. A. Hardwick 923,833
Barrel, metallic, S. M. Wright 924,520
Bath appliance, electric light, E. Collins 924,040
Battery, Patterson & Hopper 924,575
Battery and holder, G. L. Patterson 924,574
Battery and holder therefor, G. L. Patterson 924,573
Battery box and holder, G. L. Patterson 924,577
Battery box terminal connection, G. L. Patterson 924,576
Bearing, ball, J. C. Dowell 924,440
Bearing, roller, C. I. Shirley 924,387
Bed, W. Shannon 924,007
Bed bottom, adjustable riser for spring, H. A. Bacon 924,217
Bed, child's folding, J. A. Linn 924,619
Bed, invalid, J. Mackey 924,083
Bedstead attachment, invalid, J. Johnson 924,075
Bell, electric, W. J. Murray 924,180
Belt, elastic, W. Dalton 924,324
Belt fastener, P. & J. McHale 924,490
Belt guide and thrower, J. A. Larson 923,979
Belt shifter, T. J. McVey 924,624
Belting, W. H. Adams 924,213
Berry picker, G. M. Holmes 924,552
Bicycle, I. Di Fabio 924,438
Bicycle seat attachment, A. W. Duck 924,541
Bicycle spokes, machine for making reinforced, E. L. Robergel 924,582
Bicycle stand, O. Jackson 924,047
Bimetals, manufacture of, A. Astrue 924,413
Binder, check stub, J. A. Mudd 924,263
Binder, loose leaf, C. R. Nelson 924,099
Binder, loose sheet pressure, J. W. Meaker, Jr. 924,170
Bit brace, W. P. Johnson 923,848
Blank heating furnace, V. Anderson 924,125
Blooms, producing hollow, J. G. Inshaw 924,615
Boat releasing apparatus, C. E. Stewart 924,201
Boiler flue cleaner, A. Gronvald 924,611
Boot tree, expansion, C. Wiener 924,023
Boots and trousers, combined, D. A. Leffingwell 924,249
Boring machine, Kindleberger & Garretson 924,473
Bottle, antifraud, J. A. Horne 924,230
Bottle blowing machine, A. Schiller 923,898
Bottle filler, S. B. Goff 924,344
Bottle filling and capping machine, G. Kirkegaard 924,360
Bottle, non-refillable, G. B. Fletcher 924,333
Bottle non-refillable attachment, D. Westcott 924,299
Bottle stopper, R. Brown, Jr. 924,532
Bottle stopper lock, J. L. Peters 924,375
Bottle, vacuum insulated, O. A. Boehm 924,138
Bottles, etc., locking device for, R. C. Green 924,347, 924,348
Bowling device, C. Zabel 924,212
Box, G. E. Hosch 914,354
Box, E. G. Reynolds 924,381
Box opener, J. F. Schoettes 924,193
Box retainer, Pine & Taft 923,885
Box seat, folding, G. E. De Vore 924,148
Brake, T. Muir 923,987
Brick and tile cutting table, J. S. Smith 924,113
Broom, S. G. Wilson 923,918
Broom automatic moistening device, A. E. Lotstrom 924,253
Broom hood holder, C. B. Laitner 924,246
Brush, air, P. Thompson 923,910
Brush, bridle, H. P. McMillan 924,623
Brush machine, H. M. Schwartz 924,194
Buckle, trace, E. L. Dodd 923,821
Buggy top cushion support, W. H. Stevens. 923,907
Butter mold, W. S. Kennell 923,853
Cabinet, A. P. Hautsch 923,837
Cabinet, W. R. Wolf 924,027
Cabinet, account book, F. A. Braun 923,939
Cabinet, kitchen, R. H. Shook 924,196, 924,197
Cabinet, record, L. Schmidt 924,002
Cable wheel, expanding, M. Garland 924,338
Cake turner, pan, F. Cottet 924,535
Calculating device for electrical data, etc., L. E. Graves 924,058
Calculating machine, C. H. Herzog 924,066
Calculating machine, A. J. Meier 924,256
Calculating machine, C. D. Ward 924,298
Calculator, J. M. Mason 923,981
Calipers, J. S. Hughs 924,073
Camera, W. F. Folmer 923,827
Camera, G. W. Curtiss 924,147
Cameras, combined shutter and finder for photographic, J. A. Meiser 924,088
Camphene, producing, C. Glaser 923,967
Can, W. Strathmann 924,507
Caoutchouc, gutta percha, and the like, obtaining pure, H. Scholz 924,584
Caoutchouc, preparation of, A. Tixier 924,117
Car construction, E. G. Budd 923,811
Car controller operating handle, electric, E. K. Hofmann 924,463
Car door, Z. R. English 923,961
Car door lock, railway and other, O. Schaller 924,502
Car door securing device, F. J. Gilroy 924,160
Car grain door, J. Henry 924,064, 924,065
Car passenger registering device, W. S. Lytle 924,481
Car, railway postal, P. Kennedy 924,165
Car seat turning mechanism, F. H. Henry 924,458
Car step, extension, U. E. Crofut, Jr. 924,537
Car, street, C. O. Birney 924,420
Car vestibule diaphragm, curtain for, H. H. Schroyer 924,004
Car wheel and manufacture, G. H. Bryant 924,314
Cars, safety vent for tank, W. E. Sharp 924,587
Carbureter, A. C. Stewart 924,200
Card punching machines, protective device for jacquard, J. A. Groebli 924,610
Cards, apparatus for removing burs on worsted, W. & E. Prestwick 924,379
Carpet cleaning machine, J. Dudley 924,542
Carpet sweeper, F. Gaeringer 924,342
Carriage, child's folding, C. H. Smith 924,008
Carrier. See Dish carrier.
Cash register driving mechanism, C. F. Kettering 924,616
Catamenial sack, F. A. Frommann 924,337
Cellar pipe and nozzle therefor, M. H. Hart. 923,835
Cement worker's tool, J. T. Harrop 923,834
Centrifugal separator, J. W. Phillips 924,376
Chain, E. J. Herchert 924,551
Chain rope, C. H. Bryan 924,313
Chair and other article of furniture, I. Karpen 924,239
Chair attachment, A. V. & W. H. Jackson 924,554
Chart, color, G. F. Crosby 924,322
Checking and controlling machine, M. Kuhn 924,245
Chill mold, A. E. Harrison 924,612
Churn, G. A. Hill 924,461
Chute, delivery, G. A. Hitchcock 924,351
Cigar and cigarette holder and smoking pipe, combined, J. Berg 924,418
Cigar, antiseptic mouth protector, J. F. Burger 924,316
Circuit closer, H. C. Williamson 924,123
Circuit controller, thermostatic, H. F. Rice 924,499
Clamp, S. Blake 923,805
Clamp, G. A. Lintow 924,478
Clock, alarm, H. P. Arms 924,127
Clock case, W. E. McGraw 923,991
Clock, electric watchman's, G. B. Fessenden 924,441
Clock repairing device, G. F. Kelley 924,470
Cloth opener and expander, S. Birch 924,595
Clothes drier, W. J. Hall 924,550
Clothes hook, S. A. Brockway 923,941
Clothes line fastener, E. C. Burnard 924,425
Clutch, L. Bauroth 924,306
Clutch, Van Dyke & Rowell 924,404
Clutch and speed regulator, oil, H. Dotzer 923,956
Clutch, friction, J. E. Shearer 923,900
Clutch, friction, H. R. Stacks 924,397
Clutch, mechanical, C. F. Kettering 923,857
Clutch mechanism, C. R. Gether 923,965
Clutch mechanism, motor vehicle, R. H. Bowman 923,938
Coal distributing apparatus, S. B. Fleming. 924,332
Cock, ball, A. C. Gordon 924,345
Cock, plug, J. G. Paterson 924,270
Cofferdam, A. C. Leow 924,362
Coin collector circuit, J. L. McQuarrie 923,877
Coke oven, G. W. Thompson 924,293
Coke ovens, means for supplying air to, J. H. Hillman 924,462
Collapsible box, B. Silverstein 923,903
Collar pad, horse, F. Reinhard 924,581
Comb, C. O. Ensor 924,048
Composition of matter, D. G. Ziegler 923,925
Concrete block for cribwork and the like, W. D. Johnston 923,975
Concrete building blocks having air spaces, mold for making, W. F. Penfield 924,373
Concrete construction, reinforced, E. J. Moore 924,090
Concrete mixer and spreader, P. J. Lyback 923,868
Concrete plant protector, J. H. Haley 924,549
Concrete wall construction, G. W. Vought. 924,405
Condenser, A. Pruessman 923,889
Convertible seat and bed, C. F. Percival 924,374
Conveyer, J. Ashford 924,303
Conveying apparatus, T. S. Miller, reissue 12,969
Cooker, fireless, P. E. Little 923,866
Cooker, steam, W. G. Rusby 923,894
Cooking and heating utensil, C. W. Jackson. 924,162
Cooking apparatus, O. & A. B. Olston 924,185
Cooking utensil, E. W. Kent 924,471
Copper from a solution of a salt of copper, obtaining pure metallic, L. Jumau 924,077
Copper, obtaining pure, L. Jumau 924,076
Corn gathering machine, J. Boda 923,806
Cornet valve, C. G. Conn 923,812
Cotton chopper, T. J. Smith 924,286, 924,287
Cotton chopper cultivator attachment, T. J. Smith 924,288
Cotton picking machine, H. I. McConnell 924,181
Cotton tramper, W. S. Liddell 924,363
Coupling. See Hose coupling.
Coupling, E. E. Gold 924,161
Coupling, C. Nelson 924,368
Coupling, E. E. Gold 924,608
Crate, folding, W. Mable 924,082
Cross tie and rail fastening, metallic, W. J. Stoop 924,399
Cross tie, insulated metallic, W. J. Stoop 924,400
Cross tie, metallic, Dickey & Hoag 923,820
Crossing, movable point, W. M. Henderson. 924,063
Crushing and pulverizing mill, C. A. Dorn, et al 924,439
Crushing mill, N. A. Helmer 924,062
Crushing rolls, A. E. Hogue 924,352
Cuff and sleeve protector, elastic, W. H. Emmert 924,545
Cuff blanks, etc., machine for infolding the edges of, G. J. Dormandy 924,151
Culinary device for preparing omelet, etc., H. R. French 924,336
Cultivator attachment, W. N. Thornton 924,510
Cupola, N. F. Wilshire 924,025
Currycombs, brushes, etc., attachment for, J. S. Sourek 924,010
Curtain fixture, swinging, C. F. Sullivan 924,015
Curtain rod, L. C. Lazear 924,248
Curtain rod, car window, C. O. Birney 924,419
Cushioning device, F. O. Kilgore 923,858
Cuspidor, H. E. Weber 924,515
Cuspidor and rubbish receptacle, combined, N. A. Pennoyer 923,883
Cutter head, J. R. Keene 924,078
Dam, N. L. Hall 923,831
Dam and building the same, D. E. Moran, et al 923,985
Damper regulator, automatic, N. C. Locke. 924,559
Dental appliance, B. Dysart 924,543
Deposit and collection receptacle, H. P. Turner 923,912
Desiccating apparatus, O. Paucksch 924,271
Desiccating apparatus, Mecredy & Hawes 924,561
Desk and seat, combined school, A. G. Cox. 923,814
Die folding, J. Spoljar 924,395
Detergent compound, A. Kayser 923,850
Dichlorethylene, making, Askenasy & Mugdan 924,304
Dish carrier, T. T. & A. D. Blake 924,133
Disinfector and lamp, combined, B. F. Corwin 924,433
Disk cleaner, W. H. Gay 924,053
Display apparatus, I. J. Owen 924,370
Display device, garment, W. Mehler 924,171
Display figures, artificial limb for, L. Wulkan 924,521
Display stand, necktie, W. A. Swann 924,291
Displaying and cooling cabinet, vegetable, J. D. Rush 924,500
Distributer for pulverized substances, S. W. Farnham 924,330
Door bolt, F. Loev 924,081
Door fastener, S. J. Saphier 924,277
Door fastener, sliding, J. Cloos 924,145
Door frame, adjustable, M. M. Moen 924,176
Door lock, G. A. Huber 924,464
Douche or bed pan, I. Schikorra 924,383
Draft appliance, spring, D. R. Davis 923,953
Draft attachment and evener, W. Barto 924,529
Draft gear and coupling, B. Banyay 924,028
Draft mechanism, C. E. Estabrook 924,328
Drag, road, D. C. Boyd 924,311
Dredger for pulverulent material, C. B. Nesbitt 924,491
Drier, F. Foster 924,051
Drier, J. Judelson 924,164
Drier, D. B. Plunkett 924,272
Drill socket, C. A. Simmons 924,388
Drilling machines, automatic feed stop device for, A. W. Wigglesworth 924,120
Drinking glasses, sanitary mouthpiece for, F. E. Blenckstone 924,135
Drum and cymbal beater, E. M. Anderson 924,302
Dust pan attachment, C. W. Grobe 924,059
Dye and making same, red vat, G. Engi 923,959
Dye, azo, Jansen & Neelmeier 924,231, 924,232
Eccentric, adjustable, L. Bauroth 924,307
Elastic webbing, S. Kops, reissue 12,972
Elbow pattern, adjustable, D. W. McDonald 923,875
Electric currents, means for controlling the supply of, G. Henry 923,839
Electric cut out, T. E. Murray 924,092
Electric furnace, Farnsworth & Bartell 924,603
Electrical rosette, C. D. Platt 923,887
Electrically controlled lock, Armel & Legrand 924,126
Electrode, cylindrical positive, E. O. Schneider 924,503
Electrodeposition, forming designs by, F. A. Walter 924,020
Electrolier and reflector therefor, W. H. Spencer 924,289
Electroller switch, C. Tomschik 924,295
Elevator gate operating mechanism, G. H. Johnson 923,847
Embossing and printing press, C. E. Brooks 924,597
Engine indicators, reducing motion for, S. T. Danks 923,952
Engines, electric igniting device for reversing internal combustion, C. W. Askling 923,929
Envelop, W. H. Mullins 923,873
Envelop, cop, F. Moss 924,091
Envelop opening machine, G. Metske 924,562
Equalizing mechanism, C. P. Hidden 924,069
Extension table, pedestal, O. G. Franks 924,446
Eyeglass guard, J. S. Galeski 924,226
Eyeglass mounts, guard plate and bearing pad for, W. G. Fay 923,826
Eyeglass protector for base ball players, etc., R. J. Hellawell 924,613
Fabric. See Knit fabric.
Fabrics, apparatus for impregnating and extracting liquids from, H. Hey 923,971
Fan, electric, Diehl & Becker 924,601
Fan, suction, W. E. & J. H. Watson 923,914
Fastener, safety, G. F. Powell 924,104
Feed and litter carrier, H. L. Ferris 924,154
Feed bag, Kovacs & Csupak 923,859
Feed crusher, J. L. Gibson 923,966
Feed cup, J. M. Pierce 924,377
Feed, system of boiler, T. R. Brown 924,141
Feeding device for horses, street, V. A. Croshier 924,435
Feeding mechanism, C. von Philip 924,103
Fence post, A. W. Sprague 924,505
Fence stretcher, wire, J. C. Hewitt 923,843
Fence stretchers, grip for wire, J. C. Hewitt 923,842
Fertilizer distributer, O. Lewis 924,477
Fibrous material, flexible, G. Lanzendorfer 923,978
File, bill, M. Herbst 923,840
Filter, Perry & Finch 924,497
Filter press, S. K. Behrend 924,131
Finishing machine, Hershey & Huston 923,841
Fire boat, W. I. Babcock 924,128
Fire escape, W. P. Slattery 924,283
Fire extinguisher, A. C. Badger 924,218
Fire extinguisher bottle closure, S. L. Wottring 924,211
Fire kindling compound and making same, W. Geneslaw 924,055
Fires in mines, extinguishing, F. T. Byers. 924,599
Firearm, P. Mauser 924,169
Firearms, light projecting attachment for, H. A. Foss 924,445
Floor covering joint, J. I. Howard 924,355
Flue or tube expander, J. W. Faessler 924,049
Fluids, intimately mixing liquid and gaseous, P. Kestner 923,855
Flying machine, aeroplane, A. Beriozzi 923,936
Folding box, C. E. Wrenshall 924,410
Folding box, G. M. Slack 924,504
Folding chair, J. Spoljar 924,396
Folding machine, W. W. & W. L. Dixon 924,149
Food composition, Abramowski & Rosing 924,411
Force feed lubricator, H. W. Hancock 923,832
Form for ladies' waists, etc., packing, E. F. Simmons 924,281
Frame joint, E. G. Budd 923,810
Fruit evaporator, C. O. Lee 924,476
Fuel feeder, A. Manuel 924,483
Furnace, F. V. Knauss 923,976
Furniture, take-down article of, J. M. Horton 924,353
Fuse case, electric, T. E. Murray 924,093
Game apparatus, G. H. Grounds 923,830
Game apparatus, A. A. Lehr 923,863
Game apparatus, R. Carter 924,088
Garbage disposal apparatus, A. E. Dumas 924,152
Garment marking device, E. Werner 924,516
Garment, union, W. A. Meredith 923,982
Gas burner, G. Smith 924,390
Gas generator, acetylene, Compton & Ramsey 924,533
Gas-making apparatus, air-heating device for, A. H. Blackburn 924,033
Gas mantle attachment, incandescent, M. Herskovitz 924,459
Gas meter, R. L. Dezendorf 924,437
Gas producer connections, cleaning out apparatus for, R. H. Miller 924,564
Gases and separation of air into commercial oxygen and nitrogen, liquefaction of, G. A. Bobrick 924,136
Gases, apparatus for liquefaction of, G. A. Bobrick 924,137
Gate, A. B. Pickett 923,884
Gate, S. A. D. Heston 924,067
Governor, K. Johansen 924,234
Governor, explosive engine pressure, A. Winton 924,301
Grate, R. D. Granger 924,346
Grinding composition, E. B. Gallaher 924,604
Grinding mill, T. L. & T. J. Sturtevant 924,014
Gripping device, E. Kan 924,238
Gum, extraction of, P. C. D. Castle 924,319
Gun sight protector, W. Langstroth 924,475
Guns, cartouche charge for, A. Wratzke 923,922
Hair tonic, A. P. Riggs 923,999
Hair tonic, E. Kearney 924,359
Hame fastener, H. H. Deming 923,955
Hammer, electric power, W. Scribner 924,195
Hammer, pneumatic, H. A. Brockway 924,531
Hand bag, L. Merzbach 924,172
Harrow, F. Hosford 923,845

The Prudential

Newest Monthly Income Policy

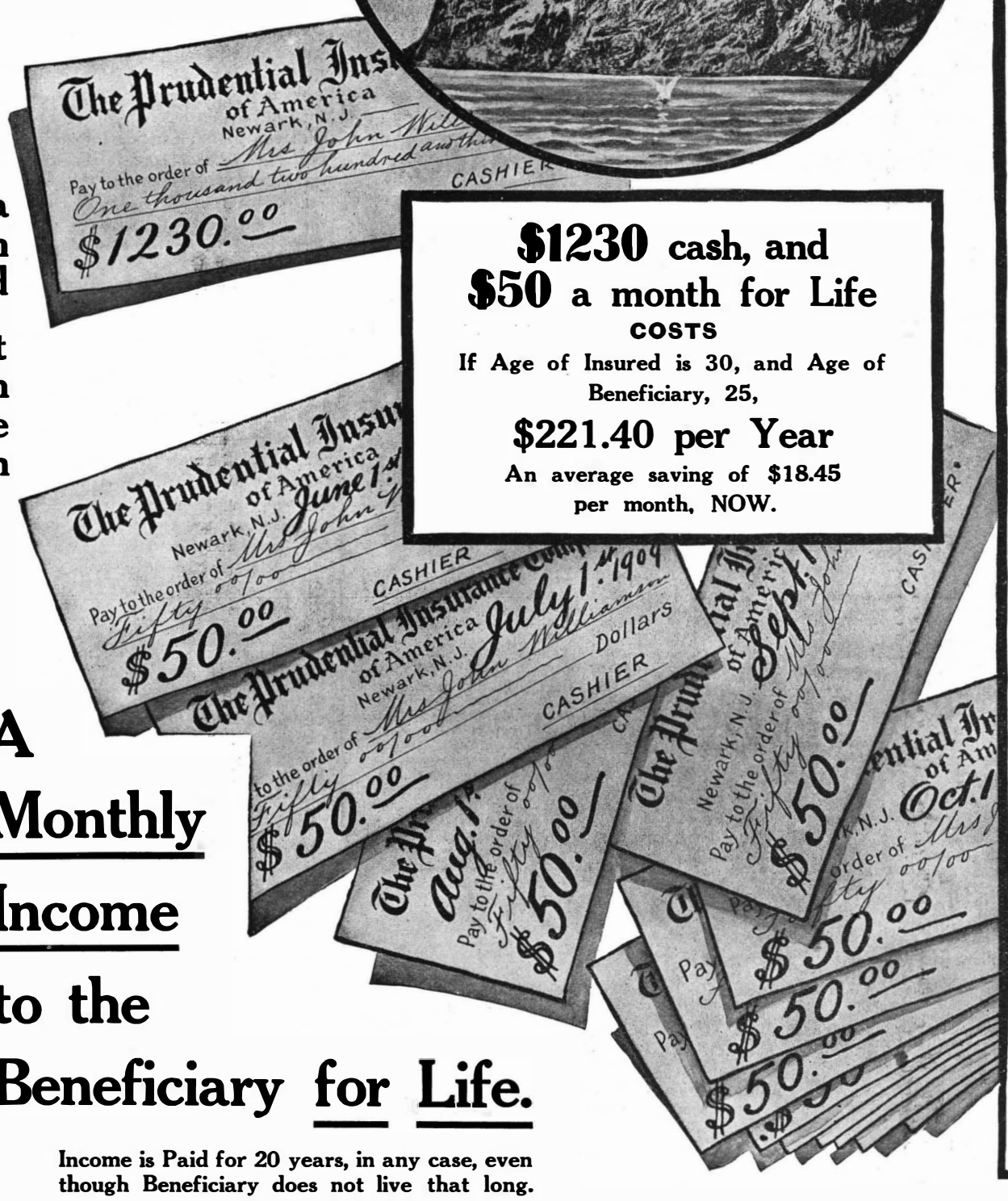
Provides a Cash Payment at Death of Insured



and then

A Monthly Income to the Beneficiary for Life.

Income is Paid for 20 years, in any case, even though Beneficiary does not live that long.



$1230 cash, and $50 a month for Life

COSTS

If Age of Insured is 30, and Age of Beneficiary, 25,

$221.40 per Year

An average saving of $18.45 per month, NOW.

The Greatest Life Insurance Protection ever Offered to the Family.

The one kind of Life Insurance Policy of most practical value to women and Children.

It is the policy your wife would like, because it gives her a **sure Monthly Income for Life.**

This is the Safest Way to leave your life insurance. The Monthly Income cannot be encumbered or depreciated. The principal cannot be lost. All worry about safe investment is eliminated.

The Income can be arranged for in Multiples of $10 per month, up.

Write for Particulars and Cost for You.

Give both your age and age of beneficiary.

Address Dept. 121.

The Prudential Insurance Company of America

Incorporated as a Stock Company by the State of New Jersey

JOHN F. DRYDEN, President **Home Office, NEWARK, N. J.**

IMPROVEMENTS IN THE DE FOREST SYSTEM OF WIRELESS TELEPHONY.

(*Concluded from page 457.*)

Dr. De Forest has made an ingenious application of the principle of directive propagation, a refinement of which has also been developed with great success in Europe by Bellini and Tosi.* It was found that if slanting wires were run from a mast to a boom, the intensity of the waves emitted would be much greater in the direction of the plane of the antenna and practically zero at right angles to it. Accordingly, this afforded them an excellent method of directing the waves; and if the whole arrangement were revolved, any desired direction could be given to the wave fronts emitted from the antenna. Dr. De Forest conceived the idea of using this device for sending out danger signals from a lighthouse or other point, and change the direction of the wave by revolving the projecting apparatus so that any boat which received the signals could immediately ascertain its direction from a danger spot equipped with the "aerophore," as the device has been termed, since the apparatus was designed to transmit intelligible signals which differed automatically with the constantly changing direction of the waves as projected. A simple example will illustrate this. When the apparatus is arranged to transmit waves in a northerly direction a certain telegraphic or telephonic signal would be sent out in that direction, and only in that direction. If that message were received on some ship, it would follow at once that the lighthouse was bearing due south of the vessel. For other points of the compass the signals would be different, while a prearranged code would be employed where the aerophore was installed upon a vessel. Thus with the apparatus in operation on both of two vessels, it would be possible as soon as they came within range of each other to determine their bearing, particularly as the signal is first received by an automatic and audible device, such as a buzzer, which would sound in the pilot house and make evident the necessity of picking up the telephone receiver and learning the exact direction of the signals. Dr. De Forest has recently been working on a type of aerophore where an arc light is revolved behind a parabolic mirror, with the movement interrupted successively at the points of the compass where the signal automatically is sent out by wireless, indicating the direction in which the wave is projected. In addition to these signals a microphonic transmitter is connected with a set of bells tuned to the quarters of the octave which are constantly striking, one after the other, several times a minute. These bells have a varying range of penetration, so that when the observer on a boat can hear four bells he knows he is within a certain range of distance of the source of sound. When only three are heard, the distance, of course, must be less, and so on, so that a fair estimate of the distance from the danger point is obtainable.

An improvement that makes possible the satisfactory working of the system is the adjusting of the sending mechanism of all instruments to a "common tune," which differs widely from that of the receiving part of the apparatus, so that when using a single antenna, it is possible to receive the sound whether the transmission apparatus is working or not. When a signal is received, a small lamp is lighted by induction or a buzzer is caused to sound, so that the operator immediately puts on his head telephone in order to find the whereabouts and name of the transmitting station. Aerophore signals will be erected at all the points of danger on the Great Lakes, and will be used on all the signal towers of the Radio-Telephone Company. The device has been tried on the steamship "Wisconsin," and has worked successfully over a limited range.

* See Scientific American Supplement, No. 1745, June 12th, 1909, page 372.

THE AERONAUTIC SOCIETY'S FIRST CURTISS AEROPLANE.

(*Concluded from page 460.*)

weighing 12½ pounds, as well as a gear-driven oil pump, is placed at the same end as the carbureter, while the gear water pump is at the other, or rear, end. One of the gears of this pump is on the camshaft. The motor is very light and compact, its weight complete with pumps, magneto, and carbureter being 97½ pounds. As it is claimed to be capable of developing as much as 30 horse-power, its weight without water and radiator is about 3¼ pounds per horse-power. The radiator weighs 40 pounds, and less than 10 pounds of water is carried, so that the total weight of the power plant is under 150 pounds. It was tested by a 10-hour run driving the propeller.

A 6½-foot diameter, 5-foot pitch wood propeller is mounted upon the engine crankshaft. This propeller develops a thrust of 225 pounds when the aeroplane is held stationary, although 150 pounds is all that is needed to fly it. The blades are but five inches wide. The motor is mounted upon the rear part of the main planes, half way between them, the propeller being at the rear. The aviator sits on a seat at the front edge of the lower plane and about a foot above it, this seat and a foot rest being located upon a pair of inclined braces extending upward from the front wheel to the two special uprights at the rear, which support the motor bed in conjunction with the inclined braces. Two other pairs of braces extend upward respectively from this wheel to the front edge of the upper plane and to the parallel downwardly-inclined poles extending forward from the front edge of this plane to support the horizontal rudder. The tail is carried by two pairs of parallel rods extending downward and upward from the rear edges of the upper and lower planes and meeting some 12 feet behind them. A square automobile-type radiator is placed in front of the motor; the cylindrical gasoline tank is located above it just under the upper plane, and the oil reservoir below.

The control of the new aeroplane is practically as simple as that of an automobile. All the aviator has to do is to pull or push on the steering wheel, which is placed vertically in front of him, in order to steer up or down, while turning the wheel and inclining the body slightly steers the machine to the right or left. The vertical rudder is in reality unnecessary for steering, as this can be accomplished simply by inclining the body and thus setting the balancing planes. These are connected by wires with a frame of steel tubing shaped like a bicycle handle bar and fitting around the shoulders of the aviator, so that when he sways slightly to one side or the other one wing tip is inclined upward and the other downward slightly. The aeroplane, in a run of 75 feet, will attain sufficient speed—about 25 miles an hour—to rise. It flies at more than 40 miles an hour. A plunger brake is fitted to the front wheel tire, to aid in quickly stopping it when it alights.

Several successful trial flights were made at Hammondsport, N. Y., by Mr. Curtiss on June 4th, 5th, and 6th. The longest of these was about 3 miles in the shape of a figure 8. He has shipped the machine to the grounds of the Aeronautic Society at Morris Park race track, New York, and after making some further practice flights, he will attempt to set up a record for the Scientific American trophy at the society's first 1909 flight exhibition, which will be held either the 19th or 26th instant. A new monoplane and several new gliders will also be tried upon this occasion. There will be a wind wagon race, and contests for models, kites, and gliders. The society's new dirigible balloon will also be flown.

LOS ANGELES 200-MILE CONDUIT WATER SUPPLY.

(*Concluded from page 460.*)

division, as it is called, is uninhabited, and it was necessary to transport much

of the machinery and all of the food supplies as well as the building material from the desert and mountains in wagons, necessitating the construction of an extensive mileage of roadway.

The tunnels which have been required on the route are notable for their extent. The Coast Range of mountains is pierced by a tunnel, nearly 11 feet in diameter, which is nearly 27,000 feet in length—one of the longest in America. In this tunnel and its approaches, covering a distance of 11 miles, there is a fall from 2,922 feet altitude to 1,520 feet. The head of water thus obtained will be utilized in an electric power plant of 93,000 horsepower at what is known as Elizabeth Lake. This will be by far the largest power plant in connection with the project. Another tunnel is 7,800 feet in length. The conduit does not extend into the city of Los Angeles; but its water is distributed to a series of reservoirs in San Fernando Valley. These reservoirs have a capacity of about 35,000 acre feet, a supply sufficient to serve the needs of the city for a period of several months even in the dry season.

The development of the water power and its use are notable features of the project which is being carried out. As already stated, several stations are being constructed upon the route at suitable sites. Machinery in some of them has been installed for operating the machinery of the cement mill which has been erected for supplying this material to the project; for the operation of several tramroads for carrying material; and also for dredging a lake which is located on the line, the dredge being constructed especially for this purpose, and operated entirely by electric power. The current is also to be utilized in serving a series of large electric pumps, as the supply of water is ample not only for the city, but for irrigation on an extensive scale. It is calculated that at least 20,000 acres of what is at present unproductive land in this section of California will be reclaimed for the planting of fruit, vegetables, and grain. It might be added that the transmission system from the generating stations to the points of distribution will be about 120 miles in length. In fact, the line is one of the longest in the world, and the current of 75,000 volts is the highest ever attempted over such a length of cable. The concrete-incased pressure main which leads the water to the main power house—a gradually tapering pipe, so as to accelerate the force of the water at the turbines—is the first of the kind ever put in use. Furthermore, the conduit which carries the water to this pressure main is the longest tunnel system in use for this purpose.

Construction was commenced on the eastern section, as it was realized that the tunneling and closed conduits would require so much more time than the open canal. The section in the Jawbone district has been by far the most difficult to complete, for the rock work here comprised nearly nine miles and included no less than twenty tunnels. These tunnels are connected by short redwood flumes, but to all intents and purposes they constitute one continuous underground conduit.

A reference to the headworks and the tunnel system makes clear the entire scheme. A dam, thrown across the canyon at the intake, backs the water up for over a mile, forming a large reservoir, from which the water flows into the tunnels in sufficient quantity to fill them to their required depth of 6 feet 6 inches. From this point the river, in the 12 miles to the power house, drops by a succession of falls and steep grades almost a thousand feet; but the tunnel grade has a fall of only 8 feet to the mile, the total fall to the forebay being only 68 feet. Thus, instead of the waters following their natural course far down in the gorge to the floor level of the power house, they are run through the gravity conduit high above the bed of the river, emerging from

(*Continued on page 471*).

Harrow, L. F. Wheeless	924,517
Hat body and making the same, Wollner & Eiseman	924,408
Hat container, lady's, F. Young	923,924
Hats, means for facilitating the circulation of air under, L. Morigi	923,986
Hay rake and cocker, W. C. Trussell	924,297
Hay rake and loader, C. Bornboldt	924,035
Headache, appliance for relief of, J. M. Blashfield	924,596
Headlight operating means, E. C. King	924,557
Heater, F. Buehring	924,315
Heating air or other gases, apparatus for, W. R. Wood	924,409
Heating and mixing plant, F. O. Blake	924,132
Heating furnace, continnons, H. E. Smythe	924,009
Heating medium for scientific and similar apparatus, means for automatically regulating the supply of, G. S. Edelen	923,957
Heating system, duplex, E. H. Gold	923,968
Hinge, C. F. Anderson	924,412
Hinge, gate or door, C. W. Cook	924,430
Hinge, spring, E. Bommer	924,422
Hoe and weeder, garden, J. S. Worcester	924,124
Hoisting and conveying apparatus, W. M. Shaw	923,899
Hoisting or carrying mechanism for barns, M. S. Yoder	923,923
Horseshoe, M. T. Keenan	924,241
Horseshoe calk plate, O. F. Peterson	924,580
Horseshoe calk, removable, D. A. Shaffer	924,586
Hose coupling, R. S. MacEwan	924,166
Hosiery, manufacture of fashioned, A. Gee	924,605
Hub, vehicle, W. R. Wilson	923,919
Huller. See Pea huller.	
Hunting knife, D. H. Holman	924,070
Hydrant, hose, C. C. Corlew	924,041
Hydrocarbon burner, Stamps & Singer	924,012
Hydrocarbon motor, F. L. Nichols	924,100
Hydropneumatic wheel, Oudinot & Putois	923,881
Ignition regulator, automatic, E. D. Waldron	924,119
Implement handle, auxiliary, C. P. Paulsen	923,994
Internal combustion engine, W. E. Struss	924,116
Internal combustion engine, R. A. Reynolds	924,382
Invalid lifter, swing, and wheel chair combined, C. F. Moore	924,177
Iron heater, F. L. Miller	923,983
Jacquard mechanism, J. A. Groebli	924,454
Jar cover, Strachan & Campbell	924,401
Joint. See Floor covering joint.	
Joint coupling, universal, F. Panse	924,187
Joint device, expansion, F. Seiffert	924,279
Keyhole guard, R. J. Copeland	924,321
Knit fabric having elastic seivages, H. C. Shaw	924,385
Knockdown box, A. M. Wight	923,920
Label affixing device, bottle, S. B. Goff	924,343
Labeling machine, can, J. Barrow	924,129
Ladder, extensible, A. F. Cralle	923,815
Lamp, M. I. Coben	924,600
Lamp and lantern, H. E. Harbaugh	923,970
Lamp bracket, vehicle, Eblen & Kirkendall	924,045
Lamp bulb guard, G. L. Brisbin	924,312
Lamp, inverted incandescent gas, J. W. Hosler	923,972
Lamp oscillator, G. Printup	923,996
Latch bolt dogging mechanism, A. Arens	924,528
Lavatory, W. Bunting, Jr	924,598
Lawn sprinkler, B. F. Wooding	924,519
Leer charging apparatus, Hubbell & Morris	924,356
Level, automatic, J. J. Garrett	924,340
Life-saving device, F. C. Bargar	923,801
Light fixture shade, P. J. Handel	924,457
Line casting machine, J. R. Rogers	924,000, 924,001
Line casting machine, L. L. Kennedy	924,243
Line holder, C. W. Wilson	924,026
Liquid heating and cooling apparatus, A. Jensen	924,233
Liquid purifying apparatus, F. P. Smith	924,285
Liquid separator, automatic, O. Zerkowitz	924,524
Liquids and gases chemically active upon each other, apparatus for simultaneously treating, J. Steynis	924,592
Lithographic presses, blanket for, F. A. Tessmer	924,016
Loader, R. A. Ogle	924,184
Lock, R. Feola	924,331
Lock and latch, combination, W. T. Blount, Jr.	924,421
Locking device, drawer and tray, W. H. P. Feely	924,225
Loom, W. R. Burrows	924,142
Loom, W. J. Garlick	924,339
Loom side protector, Goulet & Lamarre	924,451
Loom thin-place preventer, J. T. Rutledge	924,190
Lubricating washer, C. E. Palmer	924,265
Lubricator, J. Sherry	924,588
Mail bag catching and delivering mechanism, W. C. Miller	923,872
Mail box, H. P. Davis	923,818
Mail carrying apparatus, L. W. Westcott	924,206
Mail delivering and receiving apparatus, W. Kreanner	923,977
Mail delivering and receiving apparatus, W. O. Massie	924,085
Mail receptacle, J. W. Cutler	923,816
Match box, P. J. Wurzburger	924,522
Match box and cigar cutter, combined, W. H. Webster	924,022
Match safe, S. Whitcomb	924,407
Measuring and weighing machine, B. P. Mulloy	924,570
Measuring apparatus, torsion, W. H. Kenerson	924,242
Mechanical movement, W. S. Taylor, Jr	924,509
Medicine cabinet, J. W. Hunt	924,468
Merry-go-round, B. F. Fitch	924,155
Metal cutting apparatus, N. H. Davis	923,954
Metals by the wet method, electric dissociation of, A. Levy	923,864
Meter statement delivery apparatus, R. W. Gallagher	924,158
Micrometer, A. Nielsen	932,880
Milking machine, L. Holt	924,229
Mill and method for rolling tubes, M. F. Capron	923,944
Mining timber, reinforced concrete, J. A. Elliott	924,153
Mold, L. D. Irish	924,553
Molding apparatus, Danver & Lose	924,436
Molding machine, R. C. Meyers	924,366
Mortising tool or chisel, O. L. Smith	924,199
Motion, mechanism for converting reciprocating into rotary, O. Schoell	924,003
Motor control, electric, D. C. Jackson	923,973
Motors, apparatus for injecting fuel into internal combustion, F. Durr	924,044
Mower cutter, lawn, A. B. Case	924,318
Mud guard, B. L. Jones	923,849
Muffin pan, H. R. Wolfer	924,209
Music leaf turner, J. F. Dickson	924,042
Musical instrument, brass, J. Low	924,250
Nail setter, C. A. Gehne	924,054
Needle shower, I. G. Dimond	924,602
Nest trap, G. H. Gaw	923,829
Nut lock, T. M. Mills	924,259
Nut lock, B. Humphrey	924,467
Oar, H. Chaussinand	923,945
Oil burner, H. H. Ashlock	924,216
Oil burner, self-cleaning, P. K. Morcom	924,566
Oil cup, W. L. Morris	924,487
Oiling device, belt, C. Benson	924,417
Ore jigger, W. M. Williams	923,917
Ore separator, C. M. Mullen	923,988
Ores, reducing, F. M. Becket	924,130
Overalls, J. Stecker	924,013
Oxygen from air, separating, G. M. A. Claude	924,428
Package, T. D. Richardson	924,275
Package tie, D. Comfort	924,146
Package tie, J. Bennor	924,594
Packing, C. C. Puffer	923,890
Packing, lubricating, Stewart & Carr	923,908
Pad. See Collar pad.	
Paper bottle closures, making, C. F. Jenkins	924,555
Paper box blank cutting machine, F. Girond	924,607
Paper boxes and similar articles, closure for, P. B. Myers	924,094
Paper machine, H. J. Meader	923,870
Paper, etc., machine for mounting sheets of, E. Jagenberg	924,163
Papering apparatus, O. O. Carey	924,317
Papering machine, D. Krapf	924,361
Pea huller and separating machine, M. T. Freeman	924,447
Pencil case and other cylinder, A. Walker	924,406
Phonograph record cabinet, W. C. Nickerson	924,493
Phonograph stop, F. H. Andrews	924,527
Photographic apparatus, H. Hubscher	924,465
Piano action, L. N. Soper	924,394
Piano fall board, J. R. A. Lang	924,247
Piling, interlocking sheet metal, S. T. Fiero	924,442

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than ten lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated.

MUNN & CO.

BUSINESS OPPORTUNITIES.

MY BOOK, "Building a Business," tells how mail order agency business can be started with capital of $50 to $100, and make several thousand dollars annually. It's free. Robert Hicks. St. Louis, Mo.

Inquiry No. 8868.—Wanted to buy nickeloid for buttons.

INVENTOR WANTS HELP.—Automatic oyster opener. 2 doz. a minute. B., 14 Lake St., San Francisco.

Inquiry No. 8904.—Wanted to buy new or second hand machinery for making "bow type," mouse and rat trap springs and wire parts, single machine or full outfit.

PATENTS FOR SALE.

FOR SALE.—Patent No. 912,708. Hand massage machine. Only one of the kind in the world. Will sell you all rights, including tools for making same, and turn over orders for 15,000 machines. Money wanted to invest in another line at once. A snap and will be sold in a few days. Address Box 816, Kalamazoo, Mich.

Inquiry No. 8908.—For a dealer in tapes and cords for Venetian blinds.

FOR SALE.—Patent No. 787,968.—Typebar for first-class visible typewriter that is cheap to manufacture. Carries its own guide, furnishing perfect and permanent alignment under heavy manifolding. Address John Winsor, 146 Mott Street, Corry, Pa.

Inquiry No. 8918.—For manufacturers of "Wydt's Electro-Catalytic Sparking Plug."

FOR SALE.—Patent No. 905,322, outright or royalty. Shirt form and fastener. The best advertising specialty ever invented. Patentee has no funds to promote it. Address Jenkins, P. O. Box 237, Springfield, Ill.

Inquiry No. 8921.—For the manufacturers of gilt paper.

FOR SALE.—U. S. Patents Nos. 737,965 and 816,938; Canada, 107,767. Program attachment for clocks for use in schools, hotels, railroad offices, etc. For particulars address the inventor, A. L. Ronell, Fort Dodge, Iowa.

Inquiry No. 8922.—Wanted the address of Worthington Boiler Co.

FOR SALE.—Patent window lock, patented September 15, 1908. Nothing like it on the market. For full information and particulars address L. G. Miller, 499 East 162d Street, New York City.

Inquiry No. 8928.—For the manufacturers of a steam rotary excavator as described in the Scientific American of December 12, 1908, page 547.

FOR SALE.

FOR SALE.—Specialty for manufacturers. Dental floss holder, patented May, 1909. For further particulars apply direct to inventor, T. A. Tubbs, Seattle, Wash., care H. S. Emerson Company.

Inquiry No. 8931.—For parties who manufacture the Western Stump Borer for boring stumps.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., List Department, Box 773, New York.

Inquiry No. 8936.—Wanted machinery used to spin or wrap paper pencils in the manner that paper pencils are made.

A LIST OF 1,500 mining and consulting engineers on cards. A very valuable list for circularizing, etc. Price $15.00. Address Munn & Co., List Department, Box 773, New York.

Inquiry No. 8941.—For manufacturers of machinery for making fly screens.

Inquiry No. 8957.—Wanted manufacturers of angle bars either malleable steel or sheared.

Inquiry No. 8960.—For the address of the Windsor Mfg. Co., manufacturers of waterproof collars and cuffs.

Inquiry No. 8966.—Wanted the address of the Cohendet Motor Co.

Inquiry No. 8969.—Wanted machines that make accordion dress plaiting (steam).

Inquiry No. 8972.—Wanted to buy complete outfit for making meat hooks.

Inquiry No. 8974.—For address of firms interested in fishing reels.

Inquiry No. 8975.—Wanted the address of the builders of moving stair cases.

Inquiry No. 8977.—For manufacturers of machinery for manufacturing denatured alcohol.

Inquiry No. 8978.—Wanted the address of manufacturers of dry pans or crushers to grind sand for plastering and cement works.

Inquiry No. 8980.—For the address of manufacturers of mortars and pestles that are used by druggists.

Inquiry No. 8982.—Wanted a machine or process for slitting or laminating the edges of heavy cardboard, impregnating the slit or laminated edge with a waterproof material and compressing the edge after treatment. The object of the process is to produce an edge that shall be waterproof and which shall not fray or split when in use.

Inquiry No. 8984.—Wanted the address of the manufacturers of Cypress wash tubs.

Inquiry No. 8986.—Wanted to buy crown and flint glasses for telescope objectives.

Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle, Woods & Sons, and the Weber power meters.

Inquiry No. 8988.—Wanted to buy a large building or abandoned manufacturing plant having a large water power in a populous town.

Inquiry No. 8989.—Wanted a machine for making cocoa fiber mats.

Inquiry No. 8990.—For information regarding shoes not made of leather but similar to the same and are as durable.

Inquiry No. 8991.—Wanted to communicate with manufacturers of large straw hats for every-day wear.

Inquiry No. 8992.—Wanted to buy cheap glass eyes suitable for images of animals, etc.

Inquiry No. 8993.—Wanted to buy producer gas plants.

Inquiry No. 8994.—For manufacturers of an apparatus to produce very high temperatures.

Inquiry No. 8995.—Wanted to buy round and oval glass paper weights, such as are used for mounting photographs.

Pilings, device to protect, A. B. Cook 923,813
Pipe connector, automatic, J. L. Mohun, 924,485, 924,486
Pipe coupling, T. W. Moll 924,262
Pipe coupling, V. H. Kriegshaber 924,558
Pipe fitting, G. Clark 924,039
Pipe reamer, W. F. Porter 924,378
Piston for ammonia compressors, P. Neff, et al 924,098
Pitcher, D. Ball 923,931
Planer, metal, H. Baerbalck 923,930
Planter and fertilizer distributer, combined, H. Tatum 923,909
Planter, cotton, C. A. Thurmond 924,204
Plate lifter, I. E. Spry 923,906
Pliers, J. Irwin 924,357
Plow, G. G. Floyd 923,964
Plow, A. L. Covey 924,222
Plow, Parks & Coughlin 924,371
Plow, A. C. Rosencranz 924,583
Pocket holder for pens, pencils, or like articles, J. H. Cowan 923,948
Pocket, safety, C. D. Trussell 924,017
Pocket, safety, Pugatsky & Mannes 924,380
Poke, animal, M. E. & L. C. Baker 924,219
Polishing implement, H. J. Miller 923,871
Polishing wheel, H. E. Moineau 924,565
Post-card stand, M. E. Bishop 924,031
Potato seed cutter, J. Snyder 924,393
Press attachment, drop, A. O. Slentz 923,904
Press for the manufacture of tubes, rods, and the like from blanks, A. Schwieger. 924,005
Pressure button, V. Marendowski 924,254
Printing frame, C. Dow 924,327
Printing machine, J. A. Boyce 924,310
Printing press, G. Hartman 923,836
Propeller shafts, etc., transmission gear for, P. Daimler 924,323
Pump for automobiles, power air, W. J. Spencer 924,115
Pump governor, automatic steam, C. P. McMullen 924,097
Pump, steam, T. R. Brown 924,140
Pump, vacuum, J. T. Wilkin 924,024
Punch, check, G. Sittmann 924,112
Putty knife, automatic, J. H. Johnson 924,469
Rack, F. P. Shek 924,386
Rail connection, W. A. Hendricks 923,888
Rail sand, track, J. Taylor 924,202
Rail straightening device, J. Warehock 924,514
Railway, automobile scenic, A. G. Neville 924,182
Railway gate, R. Spurlock 924,290
Railway rail joint, P. McGinley 923,876
Railway signal, electric, W. A. D. Short 923,901
Railway signal operating device, A. S. Hickley 924,227
Railway switch, G. J. Abry 923,926
Railway switch, W. A. Guynn 924,455
Railway switch operating mechanism, J. P. Blackwood ..... 923,802 to 923,804
Railway tie, E. S. & C. G. Michael 924,563
Railway tie, A. Morrison 924,568
Railway tie and fastener, H. A. Bamberger 924,414
Railway tie and rail fastener, L. E. Barton, Sr. 924,415
Railway tie puller, J. R. Smith 924,391
Railway track sweeper, S. Speer 924,114
Railway traction, G. Giorgi 924,056
Ratchet mechanism, W. A. Peck 924,372
Ratchet wrench, S. A. Brockway 923,942
Receptacle, O. J. Weeks 924,205
Receptacle closure, Ryburg & Bryan 923,895
Reflectograph, M. Monaco 924,089
Refrigerating cars, means for, L. M. Lyon 924,620
Relay, E. McClintock 923,874
Resin-like product, new, C. Gentsch 924,449
Retort, L. Augustin 924,305
Revolver frame clamp, J. H. Wesson 923,915
Ring or loop, R. J. Nicholson 924,492
Riveting machine, W. H. Kennedy 923,852
Road surface preparation or composition, W. A. & S. C. Meadows 924,086
Roadways, manufacture of bituminous, C. Richardson 923,891
Robe holder, lap, C. B. Phillips 924,188
Rock drill, H. J. Hibschle 924,350
Rod. See Curtain rod.
Roller, B. D. Turner 924,402
Roller, A. Stouffer 924,506
Rolling machine, metal form, W. D. Eynon. 924,329
Roof, T. Kress 924,244
Roof covering, metal, F. A. Clark 924,144
Rotary engine, C. Miller 924,173
Rotary engine, T. Jorgensen 924,556
Rotary shears, Liebig & Ludewig 924,251
Rubber or caoutchouc, preparation or regeneration of, F. W. Passmore 924,101
Sad iron, gas heated, C. F. Capell 924,037
Sand band, H. G. Peters 923,995
Sander head, G. A. Lippincott 923,865
Sash fastener, F. R. Kratzenberg 924,474
Saw filing device, R. E. Blankenburg 924,134
Saw guide, adjustable band, F. T. McDonough 924,622
Scene and curtain trimming and hosting apparatus, Harding & Spilman 924,349
School register, Sunday, C. Bernst 923,937
Scraper, foot, T. C. Prouty 923,997
Screw, O. Rehse 924,273
Screw press mechanisms, quick return for, A. W. Williams 924,122
Scrubbing machine, A. F. Fischer 924,443
Seal, car, H. I. Lahr 923,861
Seat frame, E. G. Budd 923,809
Seeder, J. Hitchings 924,228
Semaphore controller, McAndrews & Bleibtrey 924,489
Separating process, electrostatic, Blake & Morscher 924,032
Separation of solids from liquids, H. T. Durant 924,043
Separator, R. W. Jessup 924,358
Separator feed governor, centrifugal, J. J. Berrigan 924,308
Sewing machine, J. E. Miller 924,175
Sewing machine, Johnston & Powell 924,236
Sewing machine attachment, M. J. Eidam 923,824
Sewing machine, book, C. J. Rich 924,274
Sewing machine guide attachment, R. Frank 924,157
Sewing machine, shoe, J. H. & J. B. Ursbruck 924,019
Sewing machine spool holder, F. C. Luethy. 923,867
Shade adjuster, window, Fries & Hover 924,448
Shade and curtain pole hanger, J. A. McCaskey 923,989
Shade and socket holder, Minor & Heck, 924,260, 924,261
Shade, window, C. M. Martin 924,255
Shafts and the like, sinking, D. E. Moran 923,984
Shelf or stretcher fastener for knockdown tables, etc., W. J. Maddox 924,084
Shock absorber, Muehlhausen & Thomsen 924,179
Shocking apparatus, M. Kelly 924,079
Shoe, laced, M. Kroell 923,860
Shoulder brace and garment supporter, combined, I. M. Bond 924,034
Shuttle, J. H. Morin 924,567
Sieve hanger, A. P. Troxell 924,296
Sign, R. P. Schriver 924,585
Sign apparatus, motor operated, C. Belile 924,416
Signal, D. B. Utt 924,403
Signal controlling device, electromagnetic, E. B. Craft 923,949
Signaling system, wireless, G. Marconi, 924,168, 924,560
Siphon, E. Neugebauer 923,879
Skid and truck, combination, E. W. Skipworth 924,282
Skirt marker, R. Sideman 923,902
Skirt supporter and waist holder, J. Sprague 924,011
Slack adjuster, automatic, C. O. Anderson 923,927
Small-arm breech mechanism, K. J. Ebert 924,224
Smoker's pipe, P. Talarico 924,508
Snap switch, rotary, G. W. Goodridge 924,609
Soap receptacle, liquid, E. E. Ellmann, 924,046, 924,047
Solder-edged caps, forming, C. W. Graham. 924,452
Soldering machine, C. W. Graham 924,453
Soldering stick, L. R. Benson 923,934
Soldering tool, E. L. Seaman 924,110
Sound reproducing machine, L. T. Haile 924,456
Speed controller, automatic, C. E. Palmer 924,266
Spinning machine traveler, ring, D'Aoust & Deck 924,325
Spittoon, fountain, A. C. Clark 923,946
Spraying apparatus, A. Sala 924,501
Spring fastener, K. & M. Gerisch 924,341
Spring wheel, R. H. Burgess 924,036
Stack former, C. A. Hitchcock 923,844
Stacker, hay, J. H. Cope 924,534
Steam jetting device, E. A. Wildt 924,121
Stoker for locomotive boilers, mechanical, J. H. Lowe 924,364

the tunnels in the forebay, 87 feet above the power house, to which they pass through the immense pressure main to the impulse wheels of the generators. Carrying their full load, the tunnels have a capacity of 410 second feet, or 20,500 miner's inches. The conduits leading from the forebay to the power house are steel tubes, which taper from a maximum interior diameter of 90 inches to a minimum interior diameter of 28 inches. The thickness of the shell of the piping is 3/16 of an inch where it has a solid rock backing; but where it leaves this formation, and has only the steel to depend upon for withstanding the pressure of the water, the interior diameter is decreased to 72 inches, and the thickness of the pipe is increased to 1⅜ inches. Over one million pounds of steel were used in its construction.

The pressure main was built in 10-foot sections, which were hoisted over an aerial tramway to the top of the hill, and from there conveyed to an inclined shaft, where they were lowered into place. As each length was riveted, the work taking from ten to twelve hours, the iron workers left and their places were taken by the concrete molders, who formed the concrete casing around the pipe.

The head of water of 877 feet gives a pressure at the impulse wheel of 380 pounds to the square inch. The power is generated in four units, each unit operated by two overhanging impulse wheels carrying eighteen brass buckets. Each impulse wheel is set in a separate masonry compartment which opens directly into the tailrace, where the water is measured before it is returned to its natural channel.

An idea of the immense quantity of material needed for the project is given, when it is stated that the cement alone required amounted to 1,300,000 barrels. Fortunately, large deposits of sand and limestone were found in the Owens River district, and the builders were enabled to manufacture concrete along the route, the largest cement mill having a capacity of 1,000 barrels daily. The volume of water carried by this route will average a flow of over 400 cubic feet a second. The source of the supply, however, the Owens River, is one of the principal water courses in eastern California, and measurements by instrument, which were taken for a considerable period before the work on the conduit commenced, proved that the volume of water it carries is sufficient for the purpose even in the dry season of each year.

The chief engineers of this notable project, and the man to whom the bold scheme for directing the Owens River across the State is due, is Mr. William Mulholland of Los Angeles, who spent several years in looking over the proposition and preparing plans. He is assisted in the construction by Mr. J. B. Lippincott, formerly in the United States Irrigation Service.

It is interesting to remark that the motion of the solar system plays an important part in the shifting panorama of the heavens. Not only do the stars move onward, but the sun, moving also, carries us continually northward, so that our point of view is ceaselessly changing, and looking out from the flying earth, we are like people on a ship which is passing by a squadron of other ships. Their evolutions cause them to appear in constantly changing relations to one another, and at the same time our own motion, shifting the line of sight, produces other changes of view, which increase the complexity of the apparent movements. In short, we are reminded of the remarkable resemblance of the universe to the modern conception of an atom, in which the restless corpuscles are speeding in all directions, so that an infinitesimal being, inhabiting one of those corpuscles, would see the other corpuscles shaping themselves into constellations that would be as unenduring as are the figures that the poetic imagination traces among the stars.

Stone press, artificial, J. Draenert	924,540
Stopper puller, E. Sanborn	923,897
Storm shield, A. L. Brown	924,424
Stove, furnace, and the like, H. Gerdes	924,548
Stove, gas, M. O'Brien	924,183
Strength testing apparatus, J. L. Perkins	924,579
Strength testing machine, C. W. Putnam	924,625
Stress indicator, W. P. Chapman	924,427
Striking bag platform, portable, P. G. Armitage	923,928
Stropping device, J. Schnurr	924,278
Suction apparatus, hydraulic air and other gas, W. J. Frame	924,335
Surgical head holder, S. M. Langworthy	923,862
Swing, W. Johnson	923,974
Tack puller, insole, L. G. Freeman	923,828
Tank float, F. M. Stevens	924,398
Telautograph, G. S. Tiffany	924,512
Telegraphic receiving tape, P. B. Delany	924,538
Telegraphy, wireless, R. A. Fessenden, 923,962,	923,963
Telephone attachment, R. E. Pedigo	923,882
Telephone cables, distributing terminal for, F. J. Beaucond	923,933
Telephone exchange system, J. L. McQuarrie	923,993
Telephone ringer, J. A. Birsfield	924,030
Telephone transmitter mouthpiece, M. S. Hufschmidt	924,072
Telephone transmitters, antiseptic attachments for, E. B. Crosby	923,950
Telescopes, focusing cap for, H. C. Mustin	924,488
Tempering furnace, electric, V. Royle	924,109
Thermometer bulb protector, A. Roesch	924,276
Thermoplastic compound and making same, B. B. Goldsmith	924,057
Thermostat controller, J. McCartin	924,095
Thionous precipitation, G. C. Westby	923,916
Thread cutting tool, B. Borden	924,221
Tie, track fastener, and brace, J. J. Griffin	923,969
Tightening device, H. English	923,960
Tile greenhouse bench, B. P. Wise	923,921
Tile machine, H. H. Gibson	924,450
Tire casing, J. F. Palmer. 924,186, 924,267, 924,268,	924,571
Tire for vehicles, removable, A. M. Condit	924,429
Tire, metallic, G. E. Fortescue	924,156
Tire plug, R. Sampson	922,896
Tire, pneumatic, F. H. Perry	924,102
Tire, pneumatic, J. F. Palmer	924,572
Tobacco box and cutter, combined, H. C. Moses	924,569
Tobacco pipe, G. D. W. Schmidt	924,192
Tobacco, treating, F. S. Smith	924,284
Tongue, wagon, F. A. & N. C. Long	924,480
Tool, electropneumatic, W. Z. Ward	923,913
Tools, making hand, G. E. Wood	924,210
Train stopping device, J. E. Maloney, et al.	924,482
Transportation receptacle for dead human bodies, C. L. Barnes	924,029
Trolley hanger, W. H. Kempton	923,851
Truck, elevating, W. H. Cadwell	924,143
Truck, hand, A. W. Young	924,523
Trunk, S. W. Bonsall	923,807
Tubes, apparatus for automatically perforating, C. Thibodeau	924,203
Turbine, G. H. Cook	923,947
Turbine, W. L. R. Emmet	924,546
Turbine, elastic fluid, C. Roth	924,108
Turbine, steam, A. Bonom	924,309
Type for typewriting machines, etc., machine for making dies for the manufacture of, L. A. Diss	924,539
Type making machine, W. G. Reynolds	923,998
Type setting and line casting machine, H. Degener	924,326
Typewriter line spacing mechanism, F. H. Ward	924,021
Typewriting machine, F. X. Wagner, reissue	12,970
Typewriting machine, W. J. Roche	923,893
Typewriting machine, H. Crutchley	923,951
Typewriting machine, G. A. Seib	924,006
Typewriting machine, J. C. McLaughlin	924,096
Typewriting machine, J. Sinisi	924,198
Typewriting machine, J. F. Allard	924,525
Typewriting machine, G. H. Smith	924,590
Typewriting machine, E. E. Strong	924,593
Typewriting machine, Gibbs & Sokolov	924,606
Typewriting machine erasing device, G. K. Andrews	924,215
Umbrella, J. Beaudry	924,530
Valve, Breth & Campbell	923,808
Valve, C. Wilson	924,207
Valve apparatus for tanks, L. A. Cornelius	924,432
Valve, automatic shut off, C. D. Miller	924,257
Valve controlling device, bygrometric, W. S. Johnson	924,235
Valve device, M. Garl	924,159
Valve for water tanks, E. A. Naslund	923,878
Valve gear, M. Berg	923,935
Valve, high speed reducing, W. V. Turner	924,018
Valve locking device, E. A. Brandenburg	924,423
Valve seat refacing device, R. Netter	924,369
Valve, throttle, Kindig & Dexter	924,080
Valve, water supply, H. Gardenier	924,052
Vanner, G. B. Shinley	924,589
Vehicle wheel, Bradley & Fairchild	924,139
Vehicle wheel, J. R. Fouch	924,334
Vehicle wheel, L. A. Hill	924,614
Vehicle wheel, cushioned, W. C. McCarty	924,621
Vending machine, coin controlled, R. F. Emmerich	923,958
Vending machine, coin operated, C. M. Linde	924,252
Vending machine ejecting device, J. E. Allison	924,526
Veneer press, W. R. Snyder	924,591
Ventilator. See Window ventilator.	
Ventilator, G. G. Loebler	924,479
Vessels charged with volatile liquids or liquids under pressure, closure for, Paulard & Grillet	924,496
Wagon body lifter, W. P. Lucas	923,980
Wagon, dumping, J. D. Bunn	923,943
Washboard, D. Hughes	924,466
Washboard soap holder, R. E. Toy	923,911
Washpan, P. Schlueter	924,384
Washing machine, G. A. Post	923,888
Washing machine, J. H. Pearson	924,578
Washing machine gearing, H. W. Darrow	923,819
Water elevator, H. Z. Hoylman	924,071
Water gage, H. R. Fay	924,050
Water heater, W. A. Pratt	924,105
Water meter, P. A. McGurrin	923,992
Water motor, W. J. White	924,300
Water motor, impact, R. M. Dobble	924,150
Water supply apparatus, T. Smith	923,905
Water wheel bucket attachment, W. R. Eckart	924,544
Wave motor, C. E. Edwards	923,823
Weather strip for doors, B. E. Cox	924,434
Weed cutter, J. J. Smith	924,392
Weed destroyer and gatherer, B. Pomije	924,498
Weighing apparatus for liquids, automatic, J. P. Baldwin	924,220
Weighing machine, W. S. Scales	924,191
Welts, material for waterproof, J. R. Reynolds	924,106
Wheat, machine for separating cockle from, C. P. Ballard	923,932
Wheelbarrow, A. N. Faulkner	924,547
Whiffletree fender, E. N. Smith	924,389
Windmill, E. Hards	924,060
Window balcony, J. P. Roger	924,189
Window fixture, T. J. Corken	924,431
Window screen, W. H. Millis	924,258
Window ventilator, C. O. Meurk	924,365
Wire connector, Callahan & Eskridge	924,426
Wire stretcher, F. Davis	923,817
Woodworking machine, D. S. Courtney	924,536
Woodworking machines, rotary cutter for, C. Karpp	924,240
Work holding means, E. W. Morehouse	924,178
Wrench, W. E. Piper	923,886
Wrench, J. G. Paterson	924,269
Wrench, H. T. Bush	924,292
Wrench, L. Forsythe	924,444
Writing machine, E. B. Hess	924,460

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.