

## ENGINEERING.

On February 1st the percentage of completion of the six "Dreadnoughts" now building for our navy was as follows: "South Carolina," 78.90; "Michigan," 89.70; "Delaware," 64.10; "North Dakota," 70.60; "Florida," 3.30; and "Utah," 3.10.

According to the last report on the coast defenses of the United States, there are now mounted 376 12-inch mortars and 105 12-inch, 126 10-inch, and 94 8-inch breech-loading guns. There are also 406 rapid-fire guns in position. In addition to these, seven 10-inch, five 8-inch, and 111 smaller rapid-fire guns are ready for armament.

The steamer "Mauretania" is reducing the time of the transatlantic passage on each succeeding trip. On March 2nd she established a new record for the east-bound passage of 4 days, 20 hours, and 2 minutes. The best day's run was 607 miles, and the average speed for the whole passage was 25.28 knots. The best previous record for the east-bound passage, made by the same ship, was 4 days, 20 hours and 27 minutes.

A resolution has been adopted by the Senate for the construction of a memorial highway to be called "The Lincoln Road," which is to extend from Washington, D. C., to the battlefield of Gettysburg, and \$50,000 is to be appropriated to defray the expenses of making a survey, plans for construction, and estimates of cost, by the engineers of the United States army. The Lincoln Way is to form one of certain "suitable memorials to commemorate the public services and character of Abraham Lincoln."

The Secretary of the Navy recently reported to the Senate that to keep a first-class battleship in good condition and do the necessary repairs for one year costs \$109,856. This estimate represents the average of the cost for repairs of seventeen battleships during the year 1908. It does not, however, include the heavier repairs when a ship is out of commission for remodeling or reconstruction. The coal for the battleships for one year, including transportation and storage charges, cost \$5,544,945.

According to Lloyds Register returns for the quarter ended December 31, 1908, the amount of shipbuilding tonnage under construction by the principal nations was as follows: Great Britain, 765,000 tons; Germany, 164,000; Japan, 73,000; United States, 63,000; Italy, 41,000; Holland, 40,000; and France, 39,000. The aggregate of all the countries omitted from this list reaches 66,000 tons, which, according to the Shipping World, is about one-third the work under construction in Belfast alone.

Much of the good work being done by us in the Philippines is little known to the people of the United States. The recently completed scheme for supplying Manila with water is a case in point. The supply is taken from a watershed 140 square miles in extent, being drawn from the Mariquina River, at a point 20 miles northeast of Manila. The works include a 42-inch steel pipe, 10½ miles in length, a concrete tunnel 4½ miles in length, and a reservoir of 50,000,000 gallons capacity. The capacity of the system is 22,500,000 gallons per day, equivalent to 100 gallons daily for each person in Manila.

Realizing that Congress is not disposed, at least for the present, to assist the development of the aeroplane, several leading men of this city have incorporated a company for the purpose of building machines and lending to the new industry that financial backing to which the success of the Wright brothers in France is so largely indebted. The originator of the enterprise is the president of the Aero Club of America, and with him are associated several wealthy members of the Aero and Automobile clubs. This is a step in the right direction; and the aeronautical world in this country will welcome the venture as one which meets the most pressing need of the aeronautical situation, as it exists in the United States to-day.

Excellent progress is being made in the erection of the steelwork of the new Manhattan Bridge across the East River, New York. The four wire cables, 21¼ inches in diameter, are strung. The cast-steel saddles for the support of the suspender cables, and the cables themselves, are in place; and the work of building out the floor system has commenced. Practically all of the steel for the latter is now on hand in the local storage yard. It is expected that this, the largest and heaviest suspension bridge ever built, will be open for foot-passenger and vehicular traffic by the close of the present year. This will be accommodated by one 35-foot roadway and two 11-foot sidewalks. On the same level, that is to say on the lower deck, provision is made also for four surface trolley tracks. On the upper deck there will be four rapid-transit tracks. Unfortunately, in the case of this, as of other bridges across the East River, the structure, after its completion, will probably have to wait many months, and possibly years, before any rapid-transit connections are made by the transportation companies on either side of the river.

## ELECTRICITY.

A novel form of current collector is to be used on the cars of the South London Railway, which is now being electrified. Bow collectors will be fixed on the roof of each car, and will be provided with aluminium contact strips. In each strip there will be a groove filled with lubricating material. This will tend to reduce wear on the trolley wire, and when the aluminium strip wears out, it can readily be renewed.

An enormous hydro-electric undertaking is being considered in France. The plan is to dam the Rhone below the rapids, some 13 miles from the Swiss frontier, and utilize the water in a fall of 230 feet. The entire upper valley of the Rhone would thus be formed into a long, narrow lake. The plant would generate 240,000 kilowatts, half of which would be transmitted to Paris, about 280 miles distant, at a tension of 120,000 volts. It is estimated that this work would cost about \$16,000,000, and could be completed in seven years' time.

In order to increase the efficiency of mercury vapor lamps, quartz tubes are used in place of glass tubes. A very interesting method of making these tubes has just been patented. A carbon mold is imbedded in granulated quartz, and then heated by passing a current therethrough until the quartz is fused about it. The tube is now cooled, and by means of an electric arc the carbon is burned off, leaving a quartz shell. At each end of the shell potassium is combined with the quartz to form gas, into which platinum terminal wires may be sealed.

An interesting form of dry battery has recently been invented, which is inactive unless exposed to a beam of light. The cell consists of a glass tube in which a platinum strip forms one electrode, and an amalgam of potassium and sodium the other. The air is exhausted from the tube, leaving a high vacuum. When the amalgam is exposed to a strong light, a current flows from the platinum to the amalgam through the vacuum tube. The internal resistance of this cell, which is known as a "photo-electric cell," is about 75,000 ohms.

The towns of Emden, Wilhelmshaven, and Leer are soon to be furnished with electricity from a power plant near Aurich; in which peat alone will be consumed. At present a small power station has been erected in which a 200-horse-power engine is supplied with steam from two boilers. One of these boilers is fired with air-dried compressed peat, and undried peat is used with the other. It is hoped that the experiment with undried peat may prove successful. The station, when it is completed, will contain three 1,800-horse-power steam turbines.

The present methods of wiring a building were criticised in a paper recently read before the Glasgow section of the British Institute of Electrical Engineering. The introduction of metal filament lamps leads to the expectation that lower voltages will be used for the wiring of buildings, thus making possible a cheaper system of installing the circuits. It was suggested that a metal-covered cable should be invented which shall be soft enough to be rolled up into coils for delivery and to be unwound and straightened for use in the building. The metal covering could be used as the neutral wire, or in isolated work as the return line.

The city of Budapest has a news telephone service with which news items, music, etc., are transmitted to the various subscribers. At about nine o'clock in the morning a buzzer is sounded for about fifteen seconds, after which the correct time is announced. Then the subscriber is told the programme of the day, which is carried out on a time schedule. First there are stock quotations and news items; then the parliamentary news, closing prices of stocks, the weather forecast, etc. Toward evening the subscriber can listen to music at the cafés or gardens, and in the evening to the Royal Opera or one of the theaters. The service costs \$7.31 per year.

About seventeen years ago the Wizard of Menlo Park startled the world by carrying on telegraphic communication between a moving train and stations along the railroad without any wire connection therewith. The system employed was to mount a board covered with tinfoil edgewise on the car roof. The tinfoil formed part of a local telegraph circuit, which inductively affected the telegraph wires that paralleled the track, and in this way the messages were made to "leap" from the train to the telegraph lines. The recent experiments on the Lake Shore Railroad, where messages were exchanged between an operator on a fast-moving train and operators in Toledo, Elkhart, and Chicago, were of a different character; that is, the Hertzian waves were used, which transmitted the messages directly to the receiving stations, and not to the telegraph wires along the track. The value of such communication between trains and railway stations was illustrated at the very outset of the experiments. On one of the trains a truck broke at some distance from Chicago, and by means of wireless telegraphy a repair train was called from Elkhart.

## SCIENCE.

Luther Burbank has succeeded in organizing a company to assist in marketing his products. In this way he hopes to make his more important discoveries practically and more widely useful.

Arunds has discovered that pyrogallol acid and certain substances belonging to the class of tannins have the power to prevent the decomposition of solutions of hydrogen dioxide (peroxide of hydrogen). The addition of very small quantities of these substances completely arrests the decomposition of the solution. A three per cent solution of hydrogen dioxide to which a little tannin was added showed no sign of decomposition six months afterward.

A commercial process for the separation of hydrogen from water gas consists in passing the latter, which is essentially a mixture of hydrogen and carbon monoxide, through a cylinder filled with inert material through which trickles a solution of cuprous chloride. The carbon monoxide of the water gas is dissolved by this solution and the hydrogen alone passes on to the collecting apparatus. The dissolved carbon monoxide is subsequently extracted from the copper solution by pumping *in vacuo* and is burned under the water-gas generator, which is of special construction.

Prof. Edward C. Pickering of Harvard Observatory and the Rev. Joel H. Metcalf earnestly appeal to the astronomers of America to co-operate in taking up the work of following the movement of newly-discovered asteroids, which has been abandoned by the United States government. For two or three years much useful work was done by the observatory in following the asteroids discovered by Mr. Metcalf. Some of the asteroids will soon come to opposition. Unless the ephemerides for them are computed they cannot be found, and there is danger that they will be permanently lost.

In 1900, Prof. Lowell published his conclusion, based on observations of the occultations of the third satellite in 1894, that the atmosphere of Jupiter is of great height and produces a refraction of 8 min. Chevalier has recently noted an interesting phenomenon, which also appears to be due to refraction by Jupiter's atmosphere. In the occultation of a star by Jupiter, the star does not vanish exactly at the point on the planet's limb toward which it had apparently been moving a few seconds previously. In other words, the star appears to deviate from its course just before occultation. M. Esclangon, of the Bordeaux Observatory, thinks that this apparent deviation is caused by horizontal refraction by Jupiter's atmosphere.

The word "kerosene" seems to have been first used in United States patent No. 12,612, of March 27th, 1855, granted to Abraham Gesner, of Williamsburg, N. Y., and assigned to the North American Kerosene Gas Light Company. In the preamble to his specification Gesner states that he has "invented and discovered a new and useful manufacture or composition of matter, being a new liquid hydrocarbon which I denominate 'kerosene.'" So far as we are aware, and so far as the Patent Office examiners are aware, this is the first instance in which the word "kerosene" was suggested as a trade mark or a name for what was then generally called "rock oil."

Calcium is not a new metal, but it has hitherto been confined to the laboratory. It now appears ready to go forth, like aluminium, and assume an important place in industry. Numerous uses have already been suggested. At the time of the great rise in the price of copper it was proposed to make electric wires of calcium. Its immediate promise, however, is in metallurgy, for calcium is an excellent reducing agent. According to a paper communicated to the British Association for the Advancement of Science, calcium is very efficient in refining metals, reducing oxides and sulphides, eliminating dissolved gases, and combining with impurities to form less injurious compounds. Calcium is a silvery white metal, easily oxidizable in moist air, very malleable and a good conductor of heat. Its hardness is equal to that of aluminium.

A new explosive is made by mixing perchlorate of ammonia with an organic substance containing tannin. The perchlorate may be partly replaced by nitrate of ammonia or common saltpeter. Myrobolan and divi-divi are suitable organic ingredients. A good explosive mixture consists of 36 parts of myrobolan and 64 parts of perchlorate of ammonia. Nearly half of the perchlorate may be replaced by saltpeter. The proportions are by weight, and all the ingredients should be pulverized before being mixed. The new explosive is well adapted for use in coal mines as the temperature produced by its explosion is too low to ignite either coal dust (choke damp) or marsh gas (fire damp). It is advisable to convert the mixture into a plastic mass by the addition of fish glue, oil, or, preferably, agar-agar. The explosive is very powerful, yet it is not easily ignited by shocks and can be handled with safety.