

ENGINEERING.

Armored concrete continues to enlarge the field of its application, and he would be the bold prophet who ventured to state the limits of its usefulness. We understand that the experimental concrete telegraph poles erected by the Pennsylvania Railroad have proved so successful that the company has decided to extend their use gradually over its western lines.

We understand that M. Turpin, the inventor of melinite, the first of the high-explosive shell fillers, has invented a new powder which he has offered to the French government. The new explosive is more stable than that now used by the government, and the inventor claims that the number of accidents will be greatly reduced by its introduction into the army and navy.

Following the lead of Brazil, the Argentine Republic is undertaking an ambitious programme of naval reconstruction. The principal feature is the construction of two battleships of the "Dreadnought" type, six destroyers, and a considerable number of torpedo boats. According to advices the battleships are to be of 20,000 tons trial displacement; and it is expressly provided that there shall be a secondary battery of sufficient size and power for torpedo defense.

A special train on the New York Central system recently made a run from New York to Chicago which is worthy of being placed on record. Leaving New York at midnight, eastern time, or eleven o'clock central time, Buffalo was reached at 6:39 in the morning, Cleveland at 9:27, Toledo at 11:23, Elkhart at 1:23, and Chicago at 3.07, the total distance of 965 miles being covered in 967 minutes. The train consisted of three empty cars and one private car, and six changes of engines were made on the trip.

The Long Island Railroad Company has asked for bids on 120 steel passenger motor cars, which will cost together about \$2,000,000. They are intended for service through the Pennsylvania tunnels leading beneath the East River into the New York city terminal. It has been definitely decided that steel cars only are to be operated in the tunnel system, and the Long Island Railroad, by this order, is bringing its equipment up to the required standard.

The decision of the United States Geological Survey to establish rescue stations in the leading coal fields of this country is prompted by humanitarian considerations which will meet with universal approval. The stations will be located in centers where the most fatal accidents have occurred; complete plant for the rescue of miners will be provided; and a board of experts will instruct both the officials and the miners in its use. The instruction corps will consist of thoroughly competent mining engineers, who will hold themselves at all times ready for emergency work.

With a view to avoiding the passage around the dangerous Cape Cod coast, a provision was inserted in the River and Harbor bill recently passed, under which the government engineers are empowered to make a preliminary survey of what is known as the "inside" route. The line of the proposed canal extends from Narragansett Bay, by way of Taunton River to Taunton. It follows a tributary of this river to the divide, and reaches Boston by way of Weymouth, Fore River. The length of the canal, from the 25 feet depth of water in Taunton River to the same depth in Boston harbor, is about 41 miles. The estimated cost is \$12,000,000.

The work of reconstructing the late Admiral Sampson's flagship, the armored cruiser "New York," is about completed. The ship now carries new and modern armored turrets, fighting tower, and gunfire directing and control systems. The new turrets are of the same design as those being installed on the new "Dreadnoughts." They have automatic shutters in the ammunition hoists; and everything relating to the handling of the ammunition and the firing of the guns is thoroughly up-to-date. The "New York" now carries four of the new 50-caliber 8-inch rifles in her two turrets; and a broadside battery of 5-inch guns will probably replace the old and comparatively feeble 4-inch guns. The latest water-tube type of boilers is to be installed. Altogether the ship will be modernized.

The first official statement of plans for the great bridge across Hell Gate, New York, which will serve to connect the system of the New Haven Railroad Company with that of the Pennsylvania Railroad Company on Long Island, was recently given out. The bridge, including its steel approaches, will be about a mile and a half in length, with a central span above Hell Gate 1,000 feet in length, having 135 feet headway above the water. It will be a braced arched structure, the total height of the arch above the suspended roadway being 140 feet. The crown of the arch will be 277 feet above the water. The structure will provide four railroad tracks, capable of carrying the heaviest load of locomotives and freight trains upon all four tracks at the same time. This will be the heaviest span, per foot of its length, of any of the existing long-span bridges of the world.

ELECTRICITY.

A company has been incorporated in Canada to develop the water power of the Conchos River in Chihuahua, Northern Mexico. It has been estimated that 25,000 horse-power can be developed, but at the start only 15,000 horse-power will be used. The current generated will be employed for light and power purposes in the surrounding towns and cities of the state, and also in neighboring mines. Many large and important mines are located within fifty miles of the plant.

It is customary to test a storage battery on open current by applying a voltmeter across the terminals of the battery. It has been pointed out that this is not a true measure of the condition of the battery when discharging at normal current. In order to make the proper test an instrument has recently been devised in which is embodied a resistor, adapted to be connected in parallel with the battery and the voltmeter. The resistor is such as to permit momentarily a normal discharge of the battery.

Some of the electric lighting companies in Germany charge their customers for a certain maximum current consumption for which the customer agrees to pay. This does away with the necessity of using current meters and simplifies the keeping of accounts. However, to protect the companies against an over-use of current an instrument is provided on each circuit which is arranged to break the circuit whenever the current consumption exceeds the amount agreed upon. The current limiter is provided with a solenoid which is set to operate at the predetermined current value and thus interrupt the flow of current. The device operates with two-pole magnets for three-wire systems, and has been made with three-pole magnets for polyphase currents.

A relay has been devised for use with the telephone receivers of wireless telegraph systems. It is customary to read wireless telegrams by means of a telephone receiver. The relay consists of a step-down transformer coil, the fine wire of which is connected with the electrolytic detector, while heavy wire is connected to the telephone receiver. The fine wire is wound to 450 ohms, while the thick wire coil is wound to 3 ohms. A carbon rod rests on the diaphragm of the telephone receiver, while the opposite end engages a carbon block, thus forming a microphone. The second telephone is placed in circuit with this microphone and a battery. The second telephone thus reproduces the "wireless" signals so loudly as to be heard throughout a large room.

An electric furnace has been put on the market for tempering and hardening tool steel, in which it is claimed that a more constant and uniform temperature is maintained than is possible with the ordinary coal and gas furnaces now used. As a bath for this furnace barium chloride and potassium chloride are recommended. These metallic salts have no effect on the composition of the steel and thus have an advantage over the lead bath or cyanide process. Furthermore, they give off no dangerous fumes. The outer wall of the furnace, even when the temperature of the bath is 1,300 deg. C., is not so hot as to be uncomfortable to the hand. Hence the cooling bath may be placed close to the furnace, reducing to a minimum the time required to transfer the material from one bath to the other.

In a paper recently presented by Prof. S. P. Thompson and Mr. E. W. Morse before the Physical Society, England, some interesting facts about the demagnetization of bar magnets were brought out. They showed that every bar magnet has a self-demagnetizing action, the value of which at the middle of the bar depends for a given intensity of magnetization on the ratio of the length of the bar to its cross section, on the permeability and on the surface distribution of the magnetism. It was found that for equal values of the dimension ratio the factor for rectangular bars having a sectional ratio of 2 to 1 was about 93 per cent of that for bars of square section, while for flat bars having a sectional ratio of 10 to 1 the factor was 75 per cent of that for bars of square section.

The value of ozone as a disinfectant is well known, and many apparatus have been designed for the production of this gas. The most familiar method of generating ozone is by means of the silent or brush discharge, and this requires a transformer using an alternating current or an interrupted direct current. A new method of making ozone has just been devised, in which a continuous current is used, and the transformer is eliminated. It consists of a tube provided with a small fan, adapted to draw the air therethrough. In the center of the tube is a Nernst rod. The rod is first heated to the proper degree by a heating coil, after which the coil is disconnected in the usual manner and the current passes directly through the rod, which is thus rendered incandescent. At the same time the fan is automatically started. Ozone is produced by the contact of the air with the incandescent Nernst rod.

SCIENCE.

A new radio-active product of the uranium series has been discovered by Mr. Jacques Danne, of Paris. While engaged in the laboratory of Mme. Curie at the university in separating and concentrating the uranium X contained in 60 pounds of uranium nitrate, he was led to observe the new substance which appears as closely related to uranium X. He has decided to call this body radio-uranium.

The prairie dog has become such a pest in the national forests of Arizona and New Mexico, that the United States Forest Service has decided to carry out an active campaign for its extermination. Poisons are used such as strychnine, cyanide of potassium, anise oil, and molasses, the poison being smeared over wheat. The riders carry the wheat in a tin pail supported by a gunny sack slung across the shoulder. One hand is free for the reins. With the other the rider uses a teaspoon to measure out the poison.

Capt. Roald Amundsen has completed arrangements for his drifting expedition in search of the North Pole in Nansen's famous ship, the "Fram." The "Fram" is being overhauled and strengthened, and probably will be ready to leave Christiania early next year. Amundsen will accompany the steamer out of the fiord, but will return and later proceed to America, and thence to Nome, Alaska, where the "Fram," which is to go by way of Cape Horn, will pick him up. From Nome the expedition will enter the Arctic Ocean through Bering Strait.

It is estimated that a fence post, which under ordinary circumstances will last for perhaps two years, will, if given preservative treatment costing about 10 cents, last eighteen years. The service of other timbers, such as railroad ties, telephone poles, and mine props, can be doubled and often trebled by inexpensive preservative treatment. To-day, when the cost of wood is a big item to every farmer, every stockman, every railroad manager—to everyone, in fact, who must use timber where it is likely to decay—this is a fact which should be carefully considered.

A radium institute, of the kind already in process of formation in Vienna, London, and Berlin, is to be opened for work in Heidelberg in the present year. An endowment has been secured, and the Heidelberg Institute will thus be the first of its kind actually to come into existence and to commence work. It is to be known as the Radiologische Institut. The new institute is to be under the same direction as the Physikalische Institut of the University, and will thus secure full benefit from the whole existing resources of the university. The endowment will insure the furnishing of the institute with the best equipment that can be secured, while the spring sediments from the neighboring State of Kreuznach, to be worked up by the government salt department, will provide a source of radio-active material for clinical and scientific investigation.

A peculiar phenomenon attending a total eclipse of the sun is that generally known as the "Shadow Bands," first observed in 1842, and noted in most subsequent eclipses. Ordinarily the phenomenon presents itself as a series of long, dark bands, separated by white spaces, which are seen on the ground or sides of buildings just before and just after the total phase of an eclipse, these bands having a progressive, or undulatory motion. While they are generally admitted to be due to the irregular refraction of the light coming from the narrow crescent of the sun's limb, no conclusive proof has yet been offered and further observations are desirable. Prof. A. Lawrence Rotch has for many years collected such observations. He infers from all the data collected that the shadow bands are produced by the diminishing crescent of light penetrating air-strata differing in their thermal and hygrometric conditions and, consequently, in their refractive power.

Prof. W. H. Pickering recently announced that there might be a possible ultra-Neptunian planet in right ascension 7 h. 47 min., declination + 21 deg. In the December number of the Monthly Notices of the Royal Astronomical Society Prof. George Forbes from a study of the aphelion positions of a number of comets deduces the place of a possible planet for 1908 as longitude 215 deg. 31 min., latitude -33 deg. 53 min. or right ascension 13 h. 12 min., declination -45 deg. For 1914 the predicted place is longitude 217 deg. 21 min.; latitude -32 deg. 15 min., or right ascension 13 h. 24 min., declination -44 deg. The period of the hypothetical planet is given as 1,076 years and the other elements as follows:

Ω	i	e	π	Mean Distance.	Date of Perihelion Passage.
247° 34'	52° 0'	0.1665	114° 57'	105.1	A. D. 1702.

A remarkable feature of these elements is the great inclination (52 deg.) of the orbit to the plane of the ecliptic, which explains perhaps why it has not been found if it should be bright enough to be readily seen or photographed.