

ENGINEERING.

The important work of deepening the channel to the city of Baltimore has been so far completed, that there is a depth from the city to the sea, if we except the crossing of York's Spit at the mouth of Chesapeake Bay, of 35 feet, and a channel width of 600 feet. Opposite Fort McHenry the channel is to be widened out to provide an anchorage for ocean-going vessels.

The increasing precipitation of the rainy season is having its usual effect of reducing the amount of excavation on the Panama Canal. The rainfall in April was 4.36 inches; in May it was 9.82 inches, and the excavation fell from 3,454,649 cubic yards in the former to 2,896,095 cubic yards in the latter month. There is an increase, however, in the total amount of concrete laid, which was 11,586 cubic yards in May as against 7,978 cubic yards in April.

The average speed for the transatlantic passage is now within 0.12 knot of the 26-knot mark. On June 21st, the "Mauretania" on her passage to the eastward passed Brow Head at 8 A. M., having made the passage from the Ambrose lightship, Sandy Hook, in 4 days, 17 hours, and 21 minutes. The successive day's runs were 588, 606, 609, 606, and 524 miles. The total distance is 2,937 knots, and it was covered at an average hourly speed of 25.88 knots.

The new United States ships of the "Dreadnought" type, among other novelties of construction will embody three electric passenger elevators. They will have a lift of a little over twenty feet, and they will be used mainly by the watch officers whose duty takes them from fireroom to fireroom. The elevators are rendered necessary by the fact that there are no doors between firerooms on the new ships. The first elevator to be used in the United States navy was installed on the hospital ship "Solace" during the Spanish war.

The worldwide falling off in business in 1908 made itself felt in the traffic through the Suez Canal. During 1908 there passed through the canal 3,795 vessels of 13,633,283 tons net, a decrease of 472 vessels and 1,095,151 tons as compared with 1907. There was an increase in the size of the individual type of vessels, and the average time of passage, seventeen hours and twenty-four minutes, was the best that had been made in any year since the canal was opened.

It is understood that a majority both of the Canadian and American Commissioners of the International Waterways Commission will recommend that a dam be built on the Niagara River, opposite Buffalo and Fort Erie, for the purpose of raising the level of Lake Erie. In the autumn of every year there is a fall of about two feet in the level of the lake. This reduction of available navigation depth seriously affects the shipping interests; and with the increase in the size of vessels it is becoming a menace to navigation. The estimated cost of the dam is about \$5,000,000.

The growth in size of steamships and in the cost of labor and the materials of their construction has caused a great increase in the total cost of transatlantic steamships during the past decade. Thus the "Kaiser Wilhelm der Grosse," 1897, cost a little over \$2,500,000; the "Oceanic," 1899, \$3,000,000; the "Deutschland," 1900, \$3,250,000; and the "Kaiser Wilhelm II," 1903, \$4,000,000; while the estimated cost of the "Mauretania" is \$6,750,000. The most fruitful cause of the increase in cost has been the effort in each ship to outdistance her predecessor in speed. This has led to an increase in the engine power from 30,000 in the "Kaiser Wilhelm der Grosse" to 70,000 in the "Mauretania."

An engineer who has recently made a tour of the waterways of the Middle West, to gather data relative to proposed waterway improvements, informs us that he was astonished to find what a large amount of freighting is done by individual storekeepers and smaller merchants in launches propelled by internal-combustion motors. The country storekeeper, living on the banks of rivers and canals, has found that he can ship his own freight from the wholesale dealer and distribute it to his retail customers by motor boat, at a cost far below that of any other available means of conveyance. There is in this fact a suggestion of future usefulness for abandoned canals in which the draft is limited.

Frequenters of the classic Battery Park at the southern end of Manhattan Island were forcibly reminded of the palmy days of "America" cup racing, when they saw a gang of Park Department riggers hoisting into position a new flagpole, which turned out to be nothing more nor less than the mast of the old cup defender "Constitution." The lower mast is built of steel and is, of course, hollow. Telescoping into this is the wooden topmast. The foot of the mast is bolted to a mass of concrete, and the truck of the topmast from which the flag flies is about 165 feet above the sea wall. In the rigging of the mast Herreshoff tried a new system of double crosstrees. Breakages of the mast were frequent, and he subsequently, in the "Reliance," returned to the old system of single crosstrees.

ELECTRICITY.

A novel grounding device is now in the market, which is made up of a number of double convex disks secured to a central rod of a conductive material. The disks are non-metallic, but are formed of absorbent material which retains moisture. The advantage of this grounding device is that it is not affected by acids or alkalis, so that it provides a permanent ground connection of high capacity. When the device is placed in the ground a pailful of strong brine is poured over it, and as the earth is filled in over the disks, more salt water is added, so as to increase the conductivity of the surrounding earth.

The recent agitation in the Southern States in favor of electric headlights on locomotives has led to the design of several very efficient turbo-generator sets of such design that they can be placed directly on the locomotive boiler and be driven by steam taken from the boiler. A very compact outfit of this type was exhibited at the recent Master Car Builders' and Master Mechanics' conventions in Atlantic City. The turbine is of the impulse type, consisting of a single wheel, provided with re-entrant paths for the steam, which receives nearly its total expansion at the nozzles. One model shown was directly connected to the headlight. It supplied a current of 25 amperes at a tension of 30 volts.

A miner standing at the bottom of a shaft 2,500 feet below the surface of the ground in the Clear Creek district, Idaho, can carry on a telephonic conversation with Chicago, says the Electrical Review and Western Electrician. However, only a miner can telephone in such surroundings, owing to the noise of the drills and other machinery in operation all about. The telephone instruments used in the mine are of special construction to protect them from dampness. There is a regular telephone system connecting over one hundred miles in the Idaho Springs district, all of which mines are tapped by an underground railway through which the telephone wires run.

The first electric locomotive for the Detroit River tunnel has been completed. This locomotive has a weight of 199,000 pounds. It is of the articulated type. It is provided with four motors, each adapted to develop a tractive effort of 9,000 pounds at 12 miles per hour. The maximum speed of the locomotive is 35 miles per hour. It is provided with the multiple-unit type of control, the motors being so arranged that they may be operated four in series, four in parallel, or two in series and two in parallel. The system of control makes it possible to start a train so gradually that the motion is almost imperceptible. This locomotive is one of six which have been ordered for the tunnel, and is designed for use in hauling both passenger and freight trains.

As a substitute for large condensers using paper, glass, or mica for the dielectric, an electrolytic condenser has been devised, which consists of aluminium electrodes immersed preferably in ammonium borate. Magnesium or tantalum electrodes can be used, but aluminium is preferred because it is cheaper. The current acting upon the metal causes it to be coated with a thin layer of oxide, but this oxide is very porous, and in the pores a gas is formed which serves as a dielectric between the metal and the electrolyte. The resistance of this gaseous dielectric increases with the tension up to a certain critical point. Experiments have been made with various electrolytes, and it was found that the critical tension with sulphate of soda was 40 volts, permanganate of potassium 112 volts, bichromate of potassium 122 volts, silicate of soda 415 volts, citrate of ammonia 470 volts, borate of soda 480 volts, and citric acid 535 volts. The best effect was that of ammonium borate with a critical tension of 403 volts. There was quite a loss of current with tensions above 90 volts.

One of the principal problems considered by the International Meteorological Conference in London last week was the question of wireless marine weather reports. Prof. Willis L. Moore, representing the United States, urged the necessity of adopting regulations that will compel a ship beyond a certain tonnage to carry wireless instruments and operators and to take at noon Greenwich time a daily observation of the weather. Observations received by a ship would be transmitted to other vessels so that by means of such relays the weather conditions over the entire ocean would in a few minutes reach the central meteorological offices in the United States, England, France, Germany, and other interested nations. Forecasts could then be made and distributed to the vessels by wireless telegraphy. It is believed that a universal system such as this would be a great factor in saving life and property both on land and at sea. The conference has adopted an international weather signal code. Heretofore American vessels have used flags by day and lights by night to convey storm warnings while other nations have used balls and cones. Now any one will be able to read the weather signals, no matter what his nationality may be.

SCIENCE.

According to a recent report of the biological survey of the Department of Agriculture, rats destroy annually \$100,000,000 worth of American grain. It is estimated that one rat will eat 60 cents' worth of grain in a year, while of oatmeal it will consume \$1.80 worth. Rat-proof construction, especially the use of concrete foundations, is urged, as well as some rational method of disposing of garbage and storing food.

Prof. John A. Brashear of Allegheny calls attention to a peculiarity of the solar eclipse of June 17th. For a few seconds it was an annular eclipse, then a total eclipse, and finally an annular eclipse again. Although we have records of annular eclipses for four hundred years, and of total eclipses for thousands of years, Prof. Brashear maintains that this is perhaps the first occurrence of the kind.

The excavation of the Menelaon, the reputed tomb of Menelaus and Helen, has brought to light some interesting Mycenaean relics, among them traces of frescoes, fragments of pottery, bronze and lead votive offerings, beads, double-headed axes, terra-cotta objects, and the like. The Menelaon itself was probably built about 5 B. C., in other words, six hundred years later than the traditional period of Menelaus.

Dr. William Tell Kudlich has brought to the notice of the Health Board of Hoboken, N. J., a plan for exterminating the mosquito, which consists in planting mosquito-ridden tracts with arzolla. The plant is a native of Africa. It in a short time covers marshy land with a layer three inches thick, thus both suffocating mosquito larvae and preventing the living insects from depositing their eggs in the water. The plant is said to have been used with some success in the German colonies of Africa.

In a process recently patented in Germany, for the regeneration of vulcanized India rubber, fragments of old rubber are mixed with from one-tenth to one-fifth their weight of anilin, and the mixture is heated until it becomes fluid. The special advantage of the process is the comparatively small quantity of solvent required. The regenerated rubber is said to be little inferior to new rubber in elasticity and other properties. It can be vulcanized in the usual way and can afterward be regenerated again by the new process.

The danger of explosion of mixtures of air and combustible dust is well known. Explosions of this character occur in flour mills and frequently in coal mines. Mixtures of air and aluminium powder are very liable to explosion. The combustion of aluminium powder produces a very high temperature. On this fact is based the process of autogenous welding of iron rails which is known as aluminothermy. Recently, in a factory near Nuremberg, where a metallic surface is given to paper by means of aluminium powder, the breaking of the globe of an inclosed arc lamp (Liliput) caused an explosion which killed two men and wounded several others.

Experiments were recently made in France on various preservatives of wood, including carbonileum Avenarius, carbonileum Lyon, gas tar, microsols, lysol, antimony, antigermine, and hydrofluoric acid. It was found that for spruce, beech, poplar, oak, and Aleppo pine, exposed to the atmosphere, the best preservatives are certainly the carbonileums, gas tar, and microsols. The other substances examined produced absolutely no effect. These same preservatives (carbonileum, gas tar, and microsols) are also most efficacious for the preservation of wood in the confined hot air of mines. Antimony and hydrofluoric acid are less effective.

Formol has been recommended as a fly poison by several writers, who have studied its action and the best method of using it. It is necessary, in order to obtain good results, that the formol shall be swallowed by the insect, hence the flies must be attracted to the poison by mixing with it an appetizing food and by spreading the mixture over a large surface. Honey has given poor results. The best mixture is that of formol with milk. The best results are obtained by using a solution containing 15 per cent of the formaline of commerce, 20 per cent of milk, and 65 per cent of water, placed in large flat vessels. Most of the dead flies fall, not within the vessels, but around them, sometimes at a great distance.

An international agreement is reported between England, France, and the United States upon a unit of candle-power of luminous intensity to be known as the international candle. No change is made in France, which adheres to the *bougie decimale*, nominally one-twentieth of the *violle* or molten platinum standard, but actually 0.104 carcel. In England, whatever small change may have been actually involved is covered by specifications of the national pentane flame standard by reference to the amount of moisture in the air of the photometer room. In America, a reduction of 1.6 per cent in the standard of candle-power maintained at the Bureau of Standards will be involved, a change capable of being observed only by trained photometrists.