

ENGINEERING.

It begins to look as though the predictions of her captain that the "Mauretania" will shortly cross the Atlantic at an average speed of 26 knots will be fulfilled. Each succeeding trip is faster than its predecessor. On her last but one crossing to the eastward, the course was covered at an average speed of 25.28 knots. On her last trip, she left New York March 17th and reached Queenstown on March 22nd, covering the distance in 4 days, 18 hours, and 35 minutes at an average speed of 25.61 knots.

The tower for the navy wireless station, which is to be erected in Washington, will be of concrete. At the base it will be 50 feet in diameter, and 8 feet at the top. The total height will be 650 feet. There will be a staircase within the hollow shaft, but no elevator. The antennæ will diverge from the top of the tower, and will meet the surface of the ground on a circle, which will measure 200 feet across.

The great cost of underground railways is shown in a comparison of the total cost of all the tube railway systems of London with the total cost of the railway system of Ireland. The latter includes 3,363 miles of road and its total cost was \$222,500,000. The railway tubes of London, which aggregate 81½ miles, have cost about \$137,500,000.

The Ohio Electric Railway of Cincinnati, Ohio, has equipped for its Columbus and Dayton division a number of flat cars with removable sides, on which it is transporting large loads of hay and grain. To prevent fire accidents to the cargo, an asbestos fiber shield, 4 by 10 inches in size, is placed under the trolley pole connection to catch any falling sparks.

The Manchester ship canal, which failed to pay its way in the earlier years of its operation, is to-day carrying a big tonnage and providing a profitable investment. During the past year about \$150,000 was added to the total cost, which at present amounts to over \$83,000,000. The canal, which accommodates seagoing steamers of considerable size, has made of the great city of Manchester a maritime port.

Prof. Albert Frank of the Hanover Technical School, has been investigating the resistance of smooth surfaces when they are moving through the air with the surface parallel to the direction of motion. The result as given in the Zeitschrift of the Society of German Engineers shows that at the same speed, the resistance of 236 square feet of side surface is equal to the resistance of one square foot of front surface placed perpendicularly to the direction of motion.

As to the result of a competition instituted by the Zeppelin Airship Company, for designs for a new airship shed at Friedrichshafen, the plans of consulting engineer E. Meier of Berlin were recommended for purchase. The building is to have an interior length in the clear of 525 feet, a width of 141 feet, and a height of 65 feet 7 inches. There will be no inside columns, and a hinged gallery is provided along each side of the inside walls, capable of being lowered at will to any desired position. The building will be of iron construction. Of the 74 sets of plans submitted, 43 were for an iron building, 28 for armored concrete construction, and 3 for a wooden shed.

The present British smokeless powder, known as cordite M. D., is in many respects a marked improvement over the original cordite of 1890, which contained 58 parts of nitroglycerine, 37 parts of guncotton, and 5 parts of crude vaseline. The cordite M. D. of 1901, as now used, contains 30 parts of nitroglycerine, 65 parts of guncotton, and 5 parts of mineral jelly. Cutting down the percentage of nitroglycerine has considerably reduced the erosion of the guns. With a density of loading in each case of 0.2, the heat of explosion at constant volume, water gaseous, is for cordite 1,156 calories per gramme, and for cordite M. D. 965. The total gases, water gaseous at 0 degrees, are for cordite 871 cubic centimeters per gramme, and for cordite M. D. 920. The temperature of explosion for cordite is 2,663 deg. Cent., and 2,374 deg. Cent. for cordite M. D.

That part of the report of the Block Signal and Train Control Board of the Interstate Commerce Commission which covers the observations of the committee sent to Europe last year to examine signaling practice in England and on the Continent, states that the committee found the block-signal operators abroad to be more carefully trained than they are in this country. This is due largely to the fact that the signalmen take up their occupation as a life calling, whereas in the United States most of the employees enter such service with the intention of taking something better whenever it offers. At present the English railroads are giving much attention to the development of a system of signals in the cab, preferring this to the use of automatic, train-stopping devices. The engineers are generally found to be reliable in their observance of signals; but the prevalence of fogs has led to the installation in the cab of signals which will indicate to the engineer at all times the position of the approaching fixed track signal.

ELECTRICITY.

A cable line is to be laid between New York and Newfoundland by the Commercial Cable Co. and will there connect with a cable to Europe. The new section will be 1,700 miles long. It will furnish a more direct means of communication with Europe than we have now, and will reduce the time of transmission.

All-steel street cars are being made for the United Railway Company of St. Louis. The reason for using steel in place of wood is not owing to the danger of fire or destruction in collision, but because the cars can be made lighter in this way, and will cost less for upkeep. It is estimated that from \$50 to \$60 a year can be saved in the operating cost of each car owing to its lighter weight.

A new type of high-tension switch has been designed by a German company in which each switch is mounted on a carriage so that it may be removed whenever desired for inspection or repairs. The connections are made by means of plug contacts. In practice an extra switch carriage is provided which may replace the one that is being repaired, or inspected, so that interruption of the service is reduced to a minimum.

An instrument is being used in one of the South African mines which automatically keeps a record of the cage or skip journeys as well as the signals given in the shaft and in the engine room. A band of paper ruled off into time spaces is marked by a small disk provided with a needle at one side. While the skip or cage is in motion, the disk travels over the cylinder making its record. When the signal bell is sounded the needle is caused to perforate the paper once for each ring of the bell.

A French inventor has devised a means of simultaneously cleaning and electroplating an object. He uses an anode of the metal that is to be electro-deposited on the object while the object itself serves as the cathode. The liquid used is an alkaline substance with a small amount of alkaline cyanide. When the current passes through this liquid it cleans the cathode and attacking the anode produces the desired electrolyte and thereupon the metal is deposited upon the cathode.

An automatic telephone exchange system is in use in Vienna, and has been tested for a number of years. As a result of these tests the head of the Austrian telegraphs, Mr. Charles Barth de Wehrenalp, declares that the automatic system can be made to seriously compete with the manual system. He states that in New York it takes on the average sixteen seconds from the time the subscriber removes his telephone receiver to the time the ringing signal is set; whereas in the automatic system for 100,000 subscribers this work is done in but ten seconds. Three seconds after the subscriber hangs up the receiver the line is clear. Owing to this saving in time a larger number of messages can be delivered through the automatic exchange than through the manual exchange.

As a rule in the electrical equipment of a vessel a low voltage is preferred, this being due to the action of salt air on the switches and plugs, which produces considerable leakage. Furthermore, the lamps used on a higher voltage than 110 must be provided with delicate filaments which cannot withstand the jarring and vibration of the vessel. Another reason is that there is a greater danger of fire at sea, because, owing to ignorance, fewer precautions are taken by those responsible for the electrical equipment. These reasons are outlined in a paper recently presented before a section of the British Institution of Electrical Engineers. The paper further contains the statement that a 2 x 110-volt three-wire system is soon to be adopted in the British navy, and that one large battleship is already wired in this way.

As an echo to the sleet storm which interrupted communication with Washington on inauguration day, comes the following suggestion from one of the readers of the SCIENTIFIC AMERICAN. Nearly all sleet storms and so-called "blizzards" of the East are accompanied with easterly winds. Why would it not be a good plan to place all the telegraph and telephone lines which border our railroads, on the westerly side of the track. Then, in case of a storm severe enough to blow the wires down the railroad, at least, would not suffer from the tangled mass of wires and poles. To be sure, all railroads do not run north and south, and those that do run in this general direction have many curves which lead them in easterly or westerly directions. But the telegraph lines could cross the track wherever it was found necessary, and then in case of a storm the only interruption which could occur would be at these crossings, whereas the stretches of track running approximately north and south would be free from interruption. If necessary a double line of telegraph poles could be used on the westerly side of the track to carry the number of wires required. In case of a sleet storm telegraph and telephone communication would still be liable to interruption, but there would be no interference with postal communications and railroad travel.

SCIENCE.

The glass works at Baccarat, France, have produced glass chimneys of remarkable properties for lamps used in coal mines containing much fire damp. Ten of these chimneys were placed in water, slowly heated to the boiling point and then plunged into water at 59 deg. F. Not one of the chimneys cracked.

It is announced in press dispatches that Sir William Ramsay in an address before the Chemical Society stated that he had succeeded in transmuting zirconium, thorium, hydro-fluorsilicic acid, and bismuth into carbon. The announcement can hardly be credited until Sir William's complete paper is published. If true, the discovery is fully as important as the conversion of radium emanation into helium.

Creighton and Mackenzie have shown that radium has an effect on the decomposition of iohydric acid. At temperatures below 24 deg. C. the quantity of iodide liberated from a solution of iohydric acid kept in the dark is increased by the presence of radium. The acid is not decomposed by sunlight nor by radium emanation in the absence of oxygen. These experiments show that radium has the remarkable property of decomposing some compounds.

The extremely complicated problem of earth tides has recently been brought into public prominence by the researches of Prof. Hecker of Potsdam. Prof. Hecker showed that it is possible to estimate how much a pendulum would be deflected by the attraction of the sun and moon if the earth were perfectly rigid. The difference between these two records is the measurement of the earth tide. The observations of Prof. Hecker go to show that there is a movement of the earth's surface to the extent of some 20 centimeters only.

Inasmuch as the supply of natural turpentine oil will soon be unable to meet the demand, chemists have long been endeavoring to produce the oil synthetically. Most artificial oils are combinations of coal tar and petroleum derivatives and do not completely answer all requirements. M. A. Poulverel, a French chemist, has recently succeeded in obtaining an oil from the residuum left in manufacturing natural turpentine oil. Poulverel's oil is said to have the same chemical properties and composition as the natural oil. The result is that the output of oil is vastly increased.

Camille Flammarion has revived his old scheme of digging a geothermic well 200 meters in diameter to ascertain the internal constitution of the earth. The imaginative Flammarion proposes to find an economic and almost inexhaustible source of heat, to verify the rate of caloric increase, to find out if the materials constituting the terrestrial globe are in a state of fusion—in a word, to do rationally and directly what has been done slightly and a little by chance up to the present time in mines. To carry out the work the standing armies of the world are to be called into requisition.

Tannisol is a methyltannin obtained by the action of formalin on tannin. The two substances are heated together on the water-bath, when effervescence occurs, and a viscous mass is formed. This is dried, powdered, and exposed to a temperature of 45 deg. to 50 deg. C., to drive off excess of formaldehyde. It forms a red-brown, odorless, and tasteless powder, insoluble in most solvents, except alcohol and dilute alkalies. It is prescribed in intestinal catarrh as an astringent antiseptic, in doses up to 8 grains for adults, or 1½ to 4 grains for children. It is also used externally as a dusting powder, either alone or combined with other powder, or in the form of a 10 per cent ointment or soap.—Nouveaux Remèdes.

Prof. Cecil Rowntree, F.R.G.S., of the Middlesex Hospital Cancer Research Laboratories, in the course of a lecture before the Royal College of Surgeons on the X-ray and cancer, stated that X-rays have two separate and distinct actions upon animal and vegetable cells. In relatively large doses they have destructive or paralyzing action upon the cells' activity, whereas in small and oft-repeated doses they bring about exactly the opposite condition and stimulate the tissues to abnormal activity and increased growth. Prof. Rowntree is of the opinion that these observations may have an important practical application in connection with the treatment of cancer.

A dinosaur has been found in Wyoming which is something more than a fossil skeleton. The very skin has been preserved, so that paleontologists are at last able to determine definitely the character of the hide that covered one of the world's greatest extinct animals. Needless to say, the American Museum of Natural History has acquired this valuable relic. The animal must have died on some dry, sandy spot, exposed to the sun, so that the carcass was mummified. Then it must have been suddenly buried by a flood of sand from a freshet, so rapidly and deeply that the skin had no chance to soften and decay, but was preserved and petrified with the bones. This occurred 3,000,000 years ago, on a moderate estimate of geologic time.