

## ENGINEERING.

It is to be hoped that Congress will grant the appropriation asked by Oscar S. Straus, Secretary of Commerce and Labor, for lighting the new Ambrose Channel entrance to New York Harbor. It would be possible to do this so thoroughly that steamships could enter the harbor with perfect safety between dark and dawn. The plan proposed contemplates the laying of acetylene gaslight buoys at frequent intervals, and it is estimated that the work could be efficiently done for an expenditure of \$80,000.

The annual report of the New York State Water Supply Commission proposes an amendment to the constitution to permit the State to build enormous reservoirs for storage and flood prevention on the upper Hudson, the Genesee, and the Racquette rivers. The commission declares that, with the complete storage of all available water supply, an eventual development of not less than 1,500,000 horse-power is assured to the State. It is confidently believed that the reservoirs would be built by the property owners benefited, who would pay a fair rental to the State for all time if they were assured of a permanent source of power.

In a recent lecture before the Royal Institution, John Oliver Arnold, professor of metallurgy at the Sheffield University, made light of Carnegie's recent prediction of an early decadence of the British steel industry. He stated that, among other developments, a new steel had been produced in Sheffield that was so far superior to existing steel, that the best high-priced steel at present in use would soon be quite out of date. Within a year the market would probably be supplied with steel whose cutting power was about four times as great as any now known, tests having shown that the new steel was capable of cutting for a whole day without regrinding.

Once more, after an interval of six years, the English railroads have achieved the remarkable record of carrying on their operations for a whole twelve-month without the loss of a single life. The last period in which this was achieved was the year 1901. In 1902, 6 lives were lost; in 1903, 25; in 1904, 6; in 1905, 39; in 1906, 58; and in 1907, 18. As a matter of fact, there has been no loss of life for fifteen months past. The relatively large number of fatalities in 1906 was mainly the result of three disasters, which were found, upon investigation, to be due entirely to the failure of the human element, all the mechanical arrangements on train and track being found perfect.

The fifth tunnel to be driven below the Hudson River between Jersey City and Manhattan was completed on January 27th of this year, the final blast which established connection between the two sections being set off during the afternoon of that day. This is the east-bound of the twin tubes which are being built between Jersey City and the Hudson Terminal at Cortlandt and Church Streets, Manhattan. If the expectations of the company are fulfilled, the west-bound tube will be opened in about three months' time, and the completed tunnel will be at the service of the public early next July. The western terminal of these two tubes is located eighty feet below the present terminal station of the Pennsylvania Railroad Company in Jersey City, and the distance between terminals is about 6,000 feet.

The report of the Public Service Commission on the subject of fender and wheel-guard tests, held last autumn at Schenectady and Pittsburg, showed that nearly 200 applications were received from inventors and manufacturers, and that 92 devices were submitted. Altogether, 1801 tests were made of 38 fenders of the projecting type, and 29 wheel guards. It is estimated that the cost of equipping all the surface cars of New York with the best type of life-saving devices will not exceed \$300,000. Although this is a large sum, the report points out that the companies operating such cars in New York city incurred expenditures for injuries, damages, and legal expenses, during the year 1906-7, of more than \$3,500,000. Much of this might have been saved by the introduction of proper fenders and wheel guards.

London for two centuries past has been the leading port of the world. The tonnage entered in 1907 was 11,160,367, and the tonnage cleared amounted to 8,598,979, making a total trade of 19,759,346 tons. The trade for the port of Liverpool for the same year reached a total of 16,665,398 tons. The value of the trade at the port of London for 1907 was \$2,430,000,000; the total for New York city for the same year being \$1,709,164,423. For many years London has spent comparatively little money upon the improvement of its port facilities, although Liverpool has spent \$25,000,000, Plymouth \$12,500,000, and Southampton \$10,000,000. Hamburg, moreover, has laid out \$75,000,000 in recent years, and Antwerp contemplates an expenditure of \$35,000,000 on new docks and facilities. At last, however, Parliament has passed the port of London bill, which has set up a new Port Authority consisting of twenty-eight members; and it is likely that vast improvements, which have long been contemplated, will now be undertaken.

## ELECTRICITY.

Owing to the success of its system of training for railroad employees the National Railway Training Association of Kansas City, Mo., has enlarged its field, and now gives a correspondence course in the duties of electric railway employees.

Because the American-Canadian Company, of Rio de Janeiro, operating the city railway system, changed its fares and routes, a mob burned twelve of its cars on January 11th. The police were helpless. The company left the adjustment of affairs in the hands of the mayor, and quiet was restored.

Prof. C. F. Burgess in a paper read before the Western Society of Engineers supports the theory that practically all kinds of corrosion of iron and steel, including that in steam boilers, may be accounted for by electrolysis. He says that difference of temperature, difference of chemical composition, or simply difference of treatment in manufacture between different parts of a structure, causes sufficient difference of potential to set up galvanic action.

A new flexible non-metallic conduit, known as "wire duct," has been invented, for which there should be a very wide field, if all the claims made for it can be substantiated in practice. Its fiber inner tube is attached to the middle tube by means of a helical bond, which entirely prevents its being pulled out on wires being threaded through it; and the whole, while entirely non-conducting, has great flexibility and strength to resist both tensile strain and abrasion.

An interesting exhibit at the recent Automobile Show, which may have escaped the notice of the more superficial sightseer on account of its situation in the basement, was that of the electric automobiles of the General Vehicle Company of New York. The five commercial vehicles exhibited include everything from a light delivery runabout of 350 pounds load capacity, a range of 50 miles, and a maximum speed of 14 miles an hour, to a 3½-ton truck of 35 miles range and a speed of 7 miles an hour. These machines represent a considerable advance, both in simplicity of operation and in range of travel on a single charge.

The remarkable growth of the steam turbine is well illustrated by an interesting article in the January Electrical Magazine describing the immense works of the Parsons Steam Turbine and Electrical Company at Heaton and Wallsend near Newcastle-on-Tyne, this mushroom growth among the century-old industries surrounding it occupying 16 acres. The simultaneous improvement in efficiency and increase in size of units is diagrammatically shown in a striking manner, from the first 10-horse-power turbine of twenty years ago, consuming 50 pounds of steam per kilowatt hour, to the 6,000-horse-power units of to-day, using only 14 pounds per kilowatt.

The rapidly increasing use of electric power is remarkably illustrated by the report of the U. S. Bureau of Census upon street and other electric railroads, recently issued for 1907. It shows 4,714 establishments, as compared with 3,620 at the end of 1902, an increase of 30 per cent., of which 1,252 are municipal, the latter having increased by 53.6 per cent. The total mileage of main line is 25,547, compared with 16,651 in 1902, an increase of 53.4 per cent.; and the passengers carried total 9,533,080,766, an increase of 63.3 per cent. The fact that the total output of stations, four and three-quarter billion kilowatt hours, has increased by the much larger percentage of 110.3, would indicate an increasing sale of power for commercial and domestic purposes other than traction, while the total income of all plants having been more than doubled for an increase in plant cost of less than 100 per cent, is a tribute to the efficiency of both plant and management, as well as to the flourishing state of the industry.

The fact that the above-mentioned report shows the electrical energy generated by water power to have increased by 207.3 per cent, while the steam and gas engines, including turbines, used in the same industry, have increased only 92.8 per cent in total power, gives color to the statements made by President Roosevelt in vetoing a bill to authorize the construction of a dam across the James River in Missouri for the purpose of electric power. The President states that 19 per cent of the total natural water power now in use is controlled by thirteen large corporations, of which the General Electric and Westinghouse companies are the chief, and that further evidence in the possession of the Bureau of Corporations affords reasonable ground for supposing that these thirteen concerns directly or indirectly control developed water power or advantageous power sites aggregating 33 per cent of the total now in use. This state of things will, unless controlled, lead to a repetition in the hydro-electric power industry of the history of the oil industry in this country, and with results far more oppressive and disastrous to the people. The General Electric Company has, however, issued an emphatic disclaimer of any knowledge of or interest in a water power trust, and states that it controls no water power except that supplying its manufactory at Schenectady.

## SCIENCE.

Prof. George E. Hale, of the solar observatory of Mount Wilson, California, has been appointed a delegate to represent the National Academy of Sciences at the Darwin celebration at Cambridge, from June 22d to 24th, 1909. He will also lecture at Columbia University in April on cosmic evolution, in commemoration of the Darwin centenary.

The reversal by the referee board of consulting scientists of the findings of Dr. Harvey Wiley, and its statement that benzoate of soda, when used as a preservative for foodstuffs, is not a poison, has been made the subject of considerable criticism in the Senate. It is pointed out that while the investigation carried on by the referee board lasted four months only, Dr. Wiley's experiments consumed nine months. In justice to Dr. Wiley it must be stated that he has never claimed quick action for preservatives, but that their danger lay in the ultimate effect which they produced from constant use.

The production of petroleum in the United States in 1908, according to a preliminary estimate made by David T. Day, of the United States Geological Survey, amounted to between 175 and 180 million barrels, an increase of between 5 and 9 per cent as compared with the production of 166 million barrels in 1907. The total value of the product showed an even greater proportionate gain, for the price of oil increased in California and remained steady in other fields except the Gulf. The increases are attributed to steady growth in Illinois and California, though neither field showed phenomenal development.

According to Prof. Percival Lowell, at certain seasons of the Martian year white spots permanent in place and persistent in character show themselves upon the ground of the planet. Though not restricted to any one zone, they are remarkably attached to localities, and recur year after year in the same places. A natural supposition is that they are snow-fields or glaciers collected on high mountain summits. Such explanation of them might indeed be plausible, but for one objection: that there are no mountains on Mars. Of this fact we have assurance by the absence of any evidence of peaks at the times when of all others they could not fail to betray themselves did they exist, to wit: when they are passing the sunrise or sunset edge of the illuminated disk. By this means we are able not only to gage their possible existence but to ascertain their height, and in consequence we are assured that no elevation worthy the name of mountain exists there. Furthermore, since the air thins out relatively much more slowly on Mars in consequence of the planet's lesser gravity, a much greater elevation would be necessary to accomplish the same climatic result.

M. Ogawa, of the University of Tokio, has discovered a new element in the minerals thorine, reinite and molybdenite. The name nipporium and the symbol Np have been given to the new element. Its combining equivalent is about 50 and its atomic weight is some multiple of that number, probably 100, which would give it a place between molybdenum and ruthenium in the periodic series. It appears to form two oxides, of which the lower possesses basic properties and is very difficult to separate from alumina, and the higher is an acid-forming oxide, analogous to molybdenum trioxide, and readily reducible to the lower oxide by the action of zinc and hydrochloric acid. Nipporium occurs in thorine in the form of small yellow or red crystals, hard enough to scratch glass, having a density of 4.5 and composed of a double silicate of nipporium and zirconium. These crystals constitute one per cent of the weight of thorine.

Ocean currents can be traced by throwing into the sea, at various points, sealed bottles containing records of the date and place at which they were abandoned. When these bottles are found on the coasts or picked up by ships, they furnish data for the calculation of their probable course and the time occupied in accomplishing the journey. The Hydrographic Bureau of the United States, for the purpose of obtaining a great many such indications from which a general scheme of ocean currents may be deduced, supplies ship captains with bottles containing blank forms on which the date and latitude and longitude of the place are inscribed when they are thrown overboard. The captain of the ship "Emma Laurans" has published in The Yacht a note on the wanderings of one of these bottles which, thrown overboard by him on March 24, 1906, at 51 deg. S. lat. and 48 deg. 40 min. W. long., was picked up more than thirty months afterward on September 2, 1908, near Robe, in southern Australia, in about 37 deg. S. lat. and 140 deg. E. long., having traveled 14 degrees in latitude and nearly 189 degrees in longitude. It would be very interesting to know the precise route followed by the bottle, but the precise route is never given by these experiments, as they are conducted at present. If all captains who find these floating bottles would set them adrift again after recording the place and date, more could be learned of their wanderings and, consequently, of the course of ocean currents.