ENGINEERING.

The North British Locomotive Company has recently completed and tested the first steam turbine locomotive, and it is said to be entirely successful.

The great shops of the Pennsylvania Railroad Company at Altoona, employing 12,000 men, are now working full time. This is the first time since the financial depression of 1907 that all departments of the great shops have been operated.

A non-shrinking alloy can be produced by melting together 50 pounds of tin and 50 pounds of zinc. This gives a hard alloy if a good grade of zinc is used. Two pounds of bismuth will render it very fluid and enable it to be poured at a lower temperature.

Work is being pushed on the Cape Cod Canal. A big granite breakwater is being constructed in Cape Cod Bay to protect the end of the canal and furnish anchorage for shipping. At the other end, in Buzzard's Bay, work is also proceeding at a fair rate.

A new trolley car is being experimented with in New York city. The new car is operated by gasoline, and is also supplied with an electric equipment. In the event of a blockade or accident on the road, the new cars can be switched over to another track and be run by gasoline. Riding in the car is very much like riding in an automobile, there being an entire absence of the jerk which is so disagreeable in electric cars. The radiator is on the roof.

A twenty-four-hour test of the "North Dakota" at a 12-knot speed was finished November 7th. The consumption of coal and water was well below the guaranteed mean amount. The consumption tests of this battleship are therefore in keeping with the remarkable speed shown in her special mile trials. It has been found that her turbine engines have developed a greater top speed and generated power for a low speed at less expense for coal and oil supplies than did the reciprocating engines of the "Delaware."

The Board of Estimate of the City of New York has approved the action of the Public Service Commission in awarding contracts for the construction of the Fourth Avenue subway in Brooklyn, and work on this very much needed improvement will proceed at once. The contracts were sent to the Board of Estimate over a year and a half ago, and have been held up ever since. As the building of subways under the best conditions cannot keep pace with the increase in population, it is to be hoped that there will be no such senseless delays in authorizing future subways.

An exhibition was recently made of Mr. Louis Brennan's monoroil car which, it will be recalled, is held in upright position by means of gyroscopes. Since the first announcement of his invention, Mr. Brennan has been at work developing the car to practical dimensions and the present model is large enough to contain forty passengers. The car was operated both on a straight and a circular track, and maintained its equilibrium perfectly. So sensitive was it to the shifting of the center of gravity, that when the passengers all crowded over to one side, the car immediately righted itself and maintained its horizontal position. Mr. Brennan overcomes the precession by means of frictional devices acting on the gyroscope wheels.

The Baldwin Locomotive Works has just completed for the Atchison, Topeka & Santa Fé Railway the most powerful passenger locomotive now in use. Apart from its tender this locomotive weighs 376,450 pounds, and is 65 feet long. The tender carries 12,000 gallons of water and 4,000 gallons of oil, which will be used as fuel. The length of the locomotive and tender is 105 feet. The tractive power of the locomotive is 53,000 pounds. There are five pairs of driving wheels, 73 inches in diameter, working in sets of two, the locomotive being of the Mallet articulated type. The locomotive is the first for passenger service to be built of this type, and is the first to combine feed-water heater, superheater, and reheater in one machine. Its firebox is built on an entirely new plan which eliminates staybolts.

The October Engineering Review gives an admirable illustrated account of the progress of work on the Los Angeles aqueduct, now about half completed. It is probably little realized, away from southern California, that this is by far the largest hydraulic engineering work now in progress, with the exception of the Panama Canal. It speaks well for the courage of the people of Los Angeles, and their faith in the future of their city and district, that they should meet by this immense undertaking the serious problem of a waning water supply coupled with a growing population. The aqueduct will be 230 miles long, and will be capable of conveying 280 million gallons of water per day from the Sierra Nevada across the Mojave Desert to San Fernando Valley, providing sufficient water for power purposes and irrigation of the district, as well as for the city supply. Practically the entire work, including tunnels, steel siphons, and concrete-lined and covered canal, is being done by the city under the direction of its own engineers.

ELECTRICITY.

The city of Baltimore is evidently favorable to municipal ownership. The problem of lighting the streets is being investigated. In September, 1910, the contract for lighting the city expires, and hopes are entertained that a municipal plant will by that time be ready to furnish power for the street lamps.

Following a test of gas-electric motor cars between Manassas and Strasburg, Virginia, the Southern Railway Company has bought two of these cars from the General Electric Company. Each car is equipped with a pair of 100-horse-power motors operated on a voltage of 600. The current is generated by an 8-cylinder gas engine. The cars are 55 feet long and will seat 52 passengers.

The Third Avenue Railroad Company of this city is experimenting with gasoline-electric power on its 125th Street crosstown line. The requirements call for a car which can run up a five per cent grade and which can maintain a schedule of eight miles per hour with ten stops per mile. So far the results have been very satisfactory; the car has successfully run up an eight per cent grade and is keeping its schedule.

The new Blackstone Hotel in Chicago is provided with an unusually complete electrical equipment. In the kitchen particularly extensive use is made of electrical labor-saving devices. There are electric dish elevators, dish washers, vegetable parers, dough mixers, silver-polishing machines, etc. The laundry of the hotel is also completely equipped with electrically-driven laundry machinery of every description.

Before the advent of the metallic-filament street lamp, gas lamps were largely used in English cities to illuminate the side streets, as the requirements did not justify the use of flaming arc lamps. Now the gas lamps are giving way to the metal-filament lamps, which afford a considerable saving. Nearly two thousand side street lamps at Marylebone have been changed from gas to electricity, with the result that $7,500 has been saved.

The Railroad Commission of Indiana has been ordered to investigate the various types of headlights for locomotives, and when the best one has been discovered, to require the use of this headlight on every railroad in the State. The tests have recently been undertaken near Avon, Ind., to determine the relative efficiency of oil and electric headlights. The effect of opposing headlights, the distances at which obstructions on the track could be detected, and the effect of observing signals were investigated, but as yet no conclusions have been reached.

A new form of electro-magnetic clutch has recently been devised, in which a stationary electro-magnet is used to draw the clutch members together into frictional engagement. The magnet coil is placed between flanges formed on the two members of the clutch, and when it is energized it attracts the clutch members with sufficient force to permit one to drive the other. When the current is cut off, a spring serves to separate the clutch members. The advantage of this system lies in the fact that the magnet does not come in contact with the parts it actuates.

The Electric Railway Journal calls attention to the many problems which arose in modernizing the traction system of Bombay. As the average daily income of the inhabitants is but 25 cents, five-cent fares are out of the question. The fare is two cents for a seven-mile ride, while the average fare is one anna, or one and one-third cents. In order to withstand the ravages of insects, special varieties of wood had to be used in the cars and track system. Even the overhead system had to be modified so as to permit of the passage of the tall shrines used by the natives in their religious pageants.

Practically all the coal consumed in Brazil is imported. As a consequence the cost of fuel is very high and this has done a great deal to prevent the growth of manufacturing industries. However, advantage is now being taken of the water power of the country. A recent consular report points out the development of hydro-electric power systems around Rio de Janeiro, showing that many manufacturing concerns are changing from steam to electricity and it is hoped that the industrial development will be largely increased because of the greater advantages and the economy of using electric power.

The new articulated electric locomotives of the Pennsylvania Railroad for service in the New York and Long Island section virtually are two separate locomotives coupled together. The motive power comprises a pair of 2,000-horse-power direct-current interpole motors, which are crank-connected to the driving wheels. The locomotives are required to start a 550-ton train on a two per cent grade, and must have a tractive effort of 60,000 pounds. Although a speed of sixty miles per hour was called for in the specifications, the locomotive now under test has made seventy-two miles per hour. The weight of the locomotive is 332,100 pounds.

SCIENCE.

Lieut. E. H. Shackleton, who returned from an Antarctic expedition early this year, after reaching a point within 111 miles of the pole, has been knighted by the King of England.

Arrangements will shortly be made by the Austrian government for the public sale of radium for medical and experimental purposes. The total quantity of radium which has been thus far recovered for scientific use throughout the world is estimated not to exceed a quarter of a pound.

The Harvard Observatory announces that a photograph of the spectrum of Morehouse's comet, taken on November 17th, 1908, with an eight-inch telescope, shows six broad, bright bands. These bands appear to coincide with the hydrogen lines zeta, epsilon, delta, gamma, beta, and the strong, bright band at wave length 464 to 473, characteristic of spectra of the fifth type.

Tantalum is a "rare metal" of slight importance, the only practical use to which it is now known to be put being in making filaments for incandescent electric lamps. The efficiency of the tantalum lamp is greater than that of the carbon lamp, but somewhat less than that of the lamp with tungsten filament. As more than 20,000 filaments of 20 candle-power can be made from a pound of tantalum, the market is not large. It is at present probably supplied by rich manganotantalates from western Australia. No tantalum minerals are known to have been produced in the United States in 1908, according to F. L. Hess, whose report on various rare metals forms an advance chapter of "Mineral resources of the United States, calendar year 1908," published by the Geological Survey. The tantalum used in the manufacture of lamps in this country is made in Germany and imported at a cost of $300 or more a pound.

A great daylight meteor of October 6th was observed by many persons in various parts of England. The particulars to hand are not very definite, and it is scarcely possible to compute the real path of the object. From a comparison of about fifteen descriptions, W. F. Denning states in Nature that there seems little doubt that the meteor moved in a direction from south to north over Reading, Thame, and on to a termination near Market Harborough. The radiant point was in Leo, and it is hoped that more observations of an exact character will be supplied. The sky was clear over a large extent of England, and hundreds of persons saw the meteor, though only a small proportion of that number have reported their observations. The great daylight meteor of 1900, January 9th, was directed from Aquila, that of 1894, February 8th, emanated from Hercules. It is seldom that meteors appearing at such times can be suitably observed, as the sky does not afford any reference objects such as is furnished by the stars at night.

Before timber is subjected to preservative treatment it is customary to remove the bark. Unless this is done very thoroughly, however, patches of the inner bark will remain on the wood. Until recently, it does not seem to have been realized that this bark presented a very effectual hindrance to the penetration of creosote. The same thing was discovered by the management of one of the large creosoting companies in the South, and steps were immediately taken to see that every particle of bark was removed from piling and other timbers. While it is probable that the bark of all species is not as resistant as that of pine, it is not known how the different species rank in this respect. In the creosote treatment of timbers it is rarely that the entire stick is penetrated by the preservative. The value of the treatment consists largely in the creating of an exterior antiseptic zone around the untreated interior portion. If this outer zone be broken, the value of the treatment is to a large extent lost.

Recent investigations by the United States Geological Survey have shown that oxygen, so essential to all life, forms in coal an impurity that is almost as injurious as the ash content. Oxygen and ash are of very nearly equal negative value, ash being probably a little more injurious in most coals. The calorific value of coals in general is indicated by the balance between the total carbon on the one hand and the sum of the two great impurities, oxygen and ash, on the other. The practical application of these statements appears in considering the effect of the exposure of coal to the weather. The weathering of the lower grades, especially lignites, bituminous coals, and peats, is marked by the accession of oxygen, which is taken into combination. This increase of the oxygen content permits a calorific deficiency, which, on account of the high anticalorific value of oxygen, is often serious. It is possible that in many cases considerable increase of oxygen and consequent loss of efficiency are suffered by the lower-class fuels between removal from the bed and consumption; and it is probable that in the sub-bituminous coals, and more especially in the lignites, oxygenation begins immediately after the coal is blasted from the face in the mine.