ENGINEERING.

New South Wales has reason to be proud of the fact that during the past seven years out of a total number of passengers carried on her railways of 258,620,836, only one has been killed in a railway accident.

Bronze medals are to be presented by the President to employees of the Isthmian Canal Commission who have served two years or more on the Isthmus. The medals are to be cast from metal collected from old French excavators, locomotives, and cars found on the works by the United States government when they took possession of the canal.

Great as is our coal production, it continues to show a large annual increase, the total amount of anthracite and bituminous coal mined in 1907 amounting to over 480,360,000 short tons. To transport this product in trains made up of thirty cars of 50 tons capacity, would call for 320,300 trains, whose combined length would extend two and two-third times around the world at the equator.

The pay-as.you-enter cars possess other advantages besides that of securing fares which are ordinarily lost to the company. It is reported that the introduction of this type on the Chicago City Railway has reduced the number of fatal accidents by over sixteen per cent. It has also reduced the number of less serious accidents due to getting on and off the car.

With a view to preventing the driving of automobiles at high speed across the tracks at grade crossings, the Long Island Railroad Company have arranged with the Long Island Automobile Club to have hummocks formed in the road on each side of certain grade crossings where reckless driving has been most common. There are altogether 429 grade crossings on the Long Island system, and the number of fatalities has grown to an alarming extent.

The old Sandy Hook Lightship which for more than fifty years has marked the entrance to the channel leading to New York harbor, will end its useful service on December 1, this year, when its place will be taken by a new lightship which will be known officially as 87 Ambrose Channel 87. The Lighthouse Bureau in Washington has decided that the importance of the new deep waterway into New York harbor is such that the ship marking its entrance should also bear its name.

There will be some sentimental regret expressed over the decision of the Navy Department to change the color of our future warships from white to a dull gray. The first battleship is to be so painted will be the "Maine," which has just returned from her cruise around the world. Slate gray, the universal war color, is adopted because of its comparative invisibility. The custom of painting warships white is costly, because the frequent coaling of the ships quickly mars their appearance and necessitates frequent repainting.

Some four years ago, when the construction of the Hudson River tubes was begun, the Erie Railroad Company employed a board of experts to report on the advisability of electrifying the suburban lines of the company. They estimated that the whole suburban system could be electrified and operated at a profit at a cost of $14,000,000. The scheme is now likely to be carried through by the aid of the powerful financial interests which have recently come to the assistance of the road. The completion of this scheme will bring a long-sought and greatly-needed relief to commuters who use this system.

We are informed by the Pennsylvania Railroad Company that an examination of their records for the past three years shows that the best performance made by a regular train between Jersey City and Chicago was that of the eighteen-hour special, which, on November 3, 1905, left on time, arrived at Harrisburg 1 hour and 36 minutes late, being delayed by a freight train, and arrived at Chicago only 3 minutes late, having made up 1 hour and 33 minutes on its regular schedule of eighteen hours. The entire run of 912 miles was made at slightly over 55 miles per hour; but most of the time was made up between Harrisburg and Chicago, a distance of 724 miles. The total time of the run was 16 hours and 24 minutes.

Although the various projects for the construction of a railroad bridge across the Hudson River have been abandoned, it is not improbable that a highway bridge for automobile, trolley car, and general vehicular traffic will be built at a site located near the upper end of Manhattan Island, where it will be possible to find a location at which the piers of the structure can be brought much nearer together than is possible lower down the river. If the main span could be shortened and the terminals be located where the cost of real estate is not prohibitive, the successful financing of such a structure should present no insuperable difficulties. A joint Bridge Commission, representing the States of New York and New Jersey, which has the matter in hand, has tentatively proposed the location of the crossing at 117th Street in the Harlem district.

ELECTRICITY.

The rack and pinion railway of the Interlaken-Lauterbrunnen-Wengern Alp-Grindelwald is being converted to electric traction. A direct-current overhead trolley system will be used. This change to electricity is made possible by the abundant water supply from the glacial areas.

The Illinois Central Railroad has recently announced that its terminal in Chicago is to be electrified. This is considered an important victory for the public in their agitation against the smoke nuisance. It is estimated that the cost of electrification without power generation will amount to nearly $4,000,000.

Nearly 300 miles of line for power transmission purposes is to be put up by the Ontario Hydro-Electric Power Commission in order to supply various towns and cities in Ontario with electricity generated at Niagara Falls. About a million pounds of aluminium wire will be used. The line will consist of three cables supported on towers spaced 550 feet apart.

Application for permission to acquire the Tyin and Matre watercourses in western Norway for the development of 60,000 to 70,000 horse-power has recently been made by a German company. The power will be employed for the production of chemicals, for the reduction of iron ore and for other industries. At the expiration of seventy-five years both plants will revert to the government.

Two storage-battery railway cars are now in use on the Prussian state railways. These are the first of 57 such cars which will soon be in service. The cars can run 60 miles without recharging. They are arranged in pairs, each member of a pair being furnished with an 80-horse-power motor and a battery of 84 cells, which is carried in front of the motorman's compartment.

Emigration to the cities and the cost of maintaining draft animals during idle times are two potent factors which have contributed to the use of power machinery in agricultural operations in Germany. German farmers have found it economical to introduce many electrically-driven machines, such as plows, mowers, harvesters, threshing machines, beet-pullers, weeders, etc. In the dairy, as well, the electric motor is used to drive the machines.

An electrically-propelled ferryboat has recently been put in service on the Rhine. This vessel is provided with twin screws which are driven by a pair of 50-horse-power interpole series motors. The electrical energy is supplied by a storage battery of 160 cells. In addition to the two driving motors there is a pair of motors used for operating the gang planks and another motor for operating a pump. At each side of the river facilities are provided for charging the battery.

Lifting magnets are being used quite extensively in some of the large machine-tool plants of the middle West. These magnets are not only employed for handling iron and steel castings, but also for cleaning up the small particles of metal from the floor or even from the yard around the plant. They are suspended from locomotive cranes and moved about the yard close to the ground. The amount of steel and iron they collect is astonishing. Often pieces that have mysteriously disappeared are resurrected by the magnet, sometimes showing that they were purposely buried to hide mistakes of the employees.

The first of the four locomotives which are to haul trains through the Cataract Tunnel of the Great Northern Railroad is now being severely tested. The locomotive is of the double-truck type. Each truck is fitted with two motors which are of the three-phase induction type. The locomotive has an over-all length of 45 feet, with a rigid wheel base of 11 feet, and its total weight is 230,000 pounds. It is equipped with four trolleys, two of which are used in each direction, the rails serving as the third conductor. The current will be supplied at 6,000 volts and will be transformed in the locomotive to 500 volts. The Cataract Tunnel is nearly three miles long and has a uniform grade of about 1.7 per cent. The locomotive is designed to give a speed of about 15 miles per hour up grade.

For the past year one of the large German steel works has been using the electric furnace on a large scale for producing cast steel for automobile and other machine parts. The reason for the change from the crucible furnace to electricity is the fact that the cost of fusion could be materially reduced without lowering the quality of the steel. The Stassano system of electric furnaces is used and the furnaces are charged with from 400 pounds to 10 tons of metal. The carbon electrodes terminate slightly above the surface of the metal, and a concave dome reflects the heat that radiates upward. Mixing is effected by mounting the furnace on a slightly inclined axis, when the rotation of the furnace causes the lower part of the molten mass to rise to the top, thoroughly mixing the material. Fusion requires 3½ hours, and an hour and a half more is necessary for the removal of phosphorus and sulphur.

SCIENCE.

A bulletin issued by Harvard College Observatory says that Prof. E. B. Frost, director of the Yerkes Observatory, calls attention to the recent increase of brightness of Morehouse's comet. He writes on October 29: "The comet on that date was visible to the naked eye, and three or four degrees of tail could readily be seen in a small field glass. Three spectrum plates were obtained at Yerkes. Two of these had exposures of one hour. No continuous spectrum was perceptible on the date mentioned. Hence the important inference is reached that the comet's light was very largely intrinsic. Seven bands were very conspicuous as knots on the plate."

The ancient Greeks recommended the use of sterilized water. In the first century of our era Rufus of Ephesus wrote: "The water of all ponds and rivers is bad, except that of the Nile. Stagnant water and the waters of streams which traverse unhealthy lands or pass near public baths are unwholesome. The best water is that which has been boiled, in vessels of earthenware, allowed to cool, and heated again before drinking." For armies in the field the following method of purification is recommended: "A series of pits extending from the highest to the lowest point of the camp, should be dug and lined with the soft unctuous clay of which pottery is made. The water is caused to flow successively through these pits, which retain all the impurities." It is remarkable that neither of these methods was deemed necessary in the case of the water of the Nile which, although the microscope shows it to be safe, is apparently the worst of all and looks like very muddy Sauterne.

At the last meeting of the scientific commission of the Aero Club of France, M. Decuzis presented a report of an ascension made on July 3, 1908, in which the great altitude of 17,500 feet was attained. At the highest point the temperature was 53½ deg. F. and the hygrometer indicated a relative humidity of 27 per cent. Dr. Crouzon gave an account of the physiological observations made by him and Dr. Soubies in the course of the trip. One of the passengers was attacked by "balloon sickness" at an elevation of 13,300 feet, but was readily relieved by the administration of pure oxygen furnished by the Guglielminetti apparatus. No regular effect of altitude upon arterial pressure was observed, but a marked progressive diminution of muscular strength with increasing altitude was recorded. Cutaneous sensibility, measured with the Weber compass, diminished slightly and a similar effect upon the acuteness of hearing was detected with the Bonnier diapason. These experiments will be repeated and extended in other ascensions to great altitudes which will soon be made by the commission.

David Starr Jordan, president of Stanford University, spoke before the Trans-Mississippi Congress on "International Fisheries Commission." Dr. Jordan described the Commission as an interesting effort "to settle at once a number of problems in international law, in constitutional law, in conflict of laws, in equity and at the same time in biology." No statute for the preservation and propagation of fish can be effective, he said, unless the nature of the individual species, its food, its distribution, and its habits, is primarily and persistently kept in view. He reviewed the efforts to regulate the American and Canadian fisheries, and said it had been agreed to submit a code to both nations in January, 1909. The artificial propagation of fish, the development of the fish hatchery, said Prof. Jordan, was the real solution of the problem. It was an art rather than a process and, like all arts, it must rest on science. He described various species of fish and sounded a note of alarm concerning the salmon fisheries of the Columbia River.

Several French sugar manufacturers have been making experiments in regard to the possible addition of sugar to bread, with the object of creating a new market for French sugar which, since the Brussels convention, cannot be sold profitably in foreign markets. Dupont observes that the total consumption of sugar would be very largely increased by its addition to bread in so small a proportion as five parts to the hundred. It is a curious fact that the flavor of bread containing 5 per cent of sugar cannot be distinguished from that of ordinary bread. Bread does not taste sweet unless it contains at least 10 or 15 per cent of sugar. The sweet taste is agreeable to some consumers, but not to all, and difficulties are encountered in making and baking bread which contains so large a percentage of sugar. Hence it is not advisable to add more than 5 or 10 per cent of sugar. At the last congress of chemists, excellent bread made according to Dupont's formula was exhibited, and bread containing sugar has been experimentally used, with success, in the army. Sugar possesses a high food value and is perfectly assimilated, and an increase in the consumption of sugar would be of great benefit to the farmers of northern France. In 1907 the consumption of sugar in France amounted to 581,000 tons, or about 33 pounds per capita.