

## ENGINEERING.

Plans for another subway in Brooklyn are being considered by the Public Service Commission. If adopted, this will be an extension of the Brooklyn part of the bridge loop through the Eastern Parkway and Brownsville sections.

The efforts of the Chilian engineer, Señor Unduraga, for a canal project which had as its object the construction of a rival system to the Panama Canal, have been abandoned. The canal was to extend from the Gulf of Darien along the Altrato River and its branches across Colombia to the Pacific. German and British capitalists have expressed their willingness to build a canal which cannot be closed in case of war; the Colombian government, however, would not agree to give a concession, owing to the fear of possible reprisals on the part of the United States.

The new steamers "Olympic" and "Titanic" will be equipped with glass screens on the promenade decks, so that an unobstructed view seaward can be obtained by the passengers in all weathers. Passengers suffer much discomfort by the heavy canvas screens which are strung into place when rain or spray drives on board. The new glass screens will not interfere with the view of the boisterous sea, and will also do away with the stuffy feeling engendered by the canvas. The "Rotterdam" is thus equipped, and the novelty has met with much favor. The windows are of heavy plate glass, carefully balanced, and slide up or down in the steel fittings which complete the seaward side.

The War Department of the United States has been strongly fortifying the islands at the mouth of Manila Bay. On El Fraile Island a fixed battleship of concrete having two steel turrets has been erected, in each of which turrets are mounted two 14-inch guns, which can be trained in any direction by the gun crew inside. The guns are operated by the general fire-control station on Corregidor Island, where the principal fortifications of the mouth of the bay are located. These fortifications are practically complete, and include six 12-inch, one 10-inch, four 6-inch, and four 3-inch guns. There are also twelve 12-inch mortars and sufficient equipment for mining the two channels to Manila Bay. The artificial ship referred to will be about 100 feet wide and 1,200 feet long.

One hundred and fifty locomotives of the Lehigh Valley Railroad are being equipped with a new fuel-saving device. On all locomotives the air-brake pumps are operated by steam, and it has been the practice to conduct the exhaust steam from the pumps to the smokebox, to which the stack is attached, and then to release it, causing a draft. Considerable work is done by the brake pumps when the locomotive is at a standstill, thus causing a needless loss of fuel. By the new arrangement, the exhaust steam is carried outside instead of inside the smokestack. Tests made by the above-named railroad show that the company is saving about 1,000 pounds of coal per locomotive on the descent of the grade from Glen Summit to Penn Haven Junction, Penn., a distance of twenty-six miles.

Heavy explosions in the sewers of a portion of New York city containing many garages, states a contemporary, again draw attention to the danger of allowing petrol to enter sewers. Some of these explosions were so violent as to resemble the explosion of a small boiler. Manhole covers were blown into the air, windows in the neighborhood were shattered, and a number of persons injured. The sewers of the city discharge into tide water, and at high tide the sewage in them backs up in some cases. It is probable that petrol floated on the surface of the sewage when the latter was backed up by high tide, and its vapor was ignited by a spark that might have been due to several causes. While such explosions will not follow every discharge of petrol into sewers, their occasional occurrence and the possibility of much serious injury from them, states our contemporary, are a justification for rigid rules efficiently enforced to prevent the practice.

A new device for the prevention of train collisions was recently tested on the Erie tracks between Newark and Nutley, N. J. The device is an electric one, and is intended to obviate head-on collisions. When the fast-approaching trains equipped with the new device get within half a mile of each other, the air brakes are set automatically, not with the usual suddenness in an emergency, but with a gradually increasing force, the same as a skillful engineer would employ in bringing his train to a halt at a station. The trains stopped far enough away from each other to avoid mishap, and all this happened without either engineer moving a hand toward the throttle lever or air brake, the device working automatically. The invention is operated by a third rail, the shoe from the locomotive touching the rail, and receiving power through it both for the operation of the emergency brake and also for a telephone. The principle is similar to that of the block-signal system, the track being divided into zones. The brakes can be applied sharply or their operation may be graduated, so that trains may be slowly brought to a standstill.

## ELECTRICAL.

Electrical exhibitions seem to be growing in favor with manufacturers, and also receive hearty support from the general public. Only the other day Boston had its first electrical show, and now we learn that San Francisco is to have one from January 29th to February 5th, and Philadelphia during the week beginning February 14th, 1910.

A firm in Germany that is building a storage battery locomotive has adopted the Edison storage battery because of its efficiency and lightness. A small locomotive about 25 feet in length has been built. It is equipped with two series motors of 35 horse-power each, which are geared to the axles. The locomotive weighs 19½ tons, including the battery, which weighs 5.9 tons. At a recent test the locomotive traveled 130 miles on a single charge, drawing a car weighing 33 tons.

The city of Ashtabula, Ohio, is being fitted with a new telephone equipment, which is called "automanual," for the reason that it is largely automatic, though it requires some manual control. The telephone operator is provided with three sets of keys, one of which is operated to connect her receiver with the calling line, and as soon as she receives the number she presses keys corresponding to this number, and then operates a starting key, which automatically connects the calling line with the desired subscriber. This done, the two circuits are disconnected from all other lines and from the operator, so that the conversation cannot be overheard or interrupted by anyone.

The German Agricultural Department has been developing the peat lands between Aurich and Wilhelmshaven. A canal has been dredged through them, with small branch canals to drain out the bog. It was found necessary to operate the machinery used for this purpose with electricity, because the vibration of steam engines caused earth slips. Accordingly, an electric power station was established. The quantity of peat obtained from these lands was so large that it was difficult to find a market for it all without doing injury to the smaller peat-bog owners. Consequently, the peat was used in the power station for fuel, and the power output was increased so as to supply distant centers as well as the immediate neighborhood with current.

Steam turbines are not the best prime movers for driving propeller shafts, because they are not sufficiently flexible and their greatest efficiency is obtained only when they are operating at speeds that are too high for the propellers. For this reason efforts have been made to introduce an efficient transmission gear between the turbine and the propeller shaft. At a recent meeting of the Society of Naval Architects and Marine Engineers, held in this city, a paper was read by Mr. W. L. R. Emmet on this subject, proposing the use of a combination electric drive. While the general idea is not new, Mr. Emmet presents some novel details. Twin screws would be used, each driven by an electric motor and a low-pressure turbine, the motor being energized by a generator connected to a high-pressure turbine. The low-pressure turbine would deliver three-fifths of the power when traveling at full speed, and at low speed would carry no load whatever. A proposition has been made to the government to equip one of the new battleships with this system.

A number of questions on electrolysis were submitted by the chairman of the Electrolysis Committee in Chicago to the United States Bureau of Manufactures for investigation by American consuls in ten of the largest European cities. The questions were as follows: 1. The use of the track rails for the electric return circuit of street railway lines. 2. The permissible drop in potential over the return circuits of street railway lines. 3. The maximum difference in potential between track rails used as return circuits and gas pipes, water pipes, or other metallic structures contiguous to the track. 4. Regulations or practices with reference to electrically connecting track rails to gas mains, water pipes, or other metallic sub-structures. A summary of the answers of the consuls in the cities referred to has just been published in the Daily Consular and Trade Reports. In all of the cities rails are used for the return circuit. The permissible drop in potential over street railway return circuits in London is 7 volts maximum; in Paris, 1 volt per kilometer, 5 volts maximum; in Vienna, 5 to 7 volts; St. Petersburg and Moscow, 1.5 volts in the city and 3 volts in the suburbs; Glasgow and Liverpool, 7 volts, and Christiania, 10 volts. The potential difference between track rails and contiguous pipes for London was pipes +1.4 volts and pipes -4.2 volts; Paris, average of 1 volt; Vienna maximum observed, 1 volt; Glasgow observed less than 1 volt; Liverpool maximum, 4.5 volts; Christiania maximum, about 5 volts. In London and Glasgow electrical connections between negative returns and contiguous pipes are permitted. The cities of Berlin and Brussels make no specific regulations regarding any of the last three questions.

## SCIENCE.

Prof. Hergesell of the Strasburg University is bound for St. Thomas, West Indies, to make atmospheric observations on the Atlantic as part of an international study undertaken by the great meteorological observatories of the world.

A German chemist has found 135 grains of free organic bases, estimated as nicotine, and 10 grains of combined organic bases, estimated as nicotine, in the smoke from 300 cigars. Hence, of the entire quantity of organic bases which is contained in tobacco smoke, 93 per cent are present in the free state.

French colonial authorities have inaugurated a serious attempt to introduce in the French market the zebu of Madagascar as a substitute for beef. The first batch of a dozen carcasses sold in the Paris stalls brought the prices of the highest grades of cattle. Herds of zebus, otherwise known as Indian oxen, which have been threatened with extermination, are now being rapidly restored, and probably 4,500,000 head roam the plateaus of Madagascar. The meat of the zebu is said to be savory and nutritious, and is equal to beef.

Some fabrics can easily be made waterproof by soaking them in a solution of celluloid in acetone, ether, amyl acetate, or other volatile solvent. The evaporation of the solvent leaves the fabric coated with a thin film of celluloid which is firmly united with the fiber. The thickness of the film can be increased by repeating the operation or by using a stronger solution. Fabrics thus treated are absolutely waterproof and can be washed without absorbing water. Linen which is first starched and then treated by this process can be washed with soap and water without removing the starch.

Plans for a national Audubon university on the University Settlement plan, to be endowed with \$1,000,000, have been announced in this city. Based on the known annual crop loss of \$1,000,000,000, due to the spreading pests that the insect-eating birds destroy, the calculations of the National Association of Audubon Societies, which is back of this project, show that the teaching of bird value from such an institution must result in wiping out at least one per cent of the huge national penalty for popular lack of knowledge on this subject. For every hundred thousand dollars put into this work of economic education a million is sure to be saved to the agricultural interests of the whole people. Successful agriculture means general prosperity, and thus every merchant, manufacturer, and business man of any sort is vitally interested and should bear his part in the plan to educate the public in the great economic principles of bird conservation.

The manioc root contains from two to three hundredths of one per cent of hydrocyanic or prussic acid, which is so poisonous that even this small proportion may produce serious results if it is not thoroughly removed by washing, in the preparation of tapioca, semolina, and other food products which are obtained from the manioc. The presence of prussic acid in these products has been detected by analysis. The same statement is true of the coarser products employed in brewing, distilling, and cattle feeding, some of which have been found to contain a quantity of hydrocyanic acid equivalent to a dose of more than half a grain Troy in the daily ration of an animal. Thorough cooking volatilizes the hydrocyanic acid already present and destroys the diastases which convert certain saccharine ingredients into cyanogen compounds, as has been proved in the case of Javanese and Burmese beans, which also contain hydrocyanic acid, but manioc products are often fed raw. They should always be thoroughly cooked, and should be analyzed if the slightest ill effect follows their use.

Mr. C. P. Butler, astronomer at the Observatory of Solar Physics, has just presented to the Royal Photographic Society of London some very curious photographs of the spectra of Jupiter, Saturn, Uranus, and Neptune, taken by the American astronomer Percival Lowell at the Flagstaff Observatory. There are, in fact, in these spectra, absorption bands which coincide with the rays of chlorophyll, which is, as everyone knows, the green coloring matter of vegetable cells. Thus, one would be led to believe, from these results, that these planets might be covered with some sort of vegetation colored with chlorophyll. Remark worthy of attention: The lines corresponding with the absorption bands of chlorophyll are more intense as the planet is farther from the sun, so that it is on Neptune that plants would be met with in greatest numbers and would be most vividly colored with green. But again, it would have to be admitted that these planets were all covered with luxuriant vegetation at the moment when the photographs were taken, which seems all the more improbable, because everything leads us to believe that Jupiter and Saturn are worlds far from being completed. However, these results are very interesting, although contradicting the opinions generally received, and they deserve to be noted while awaiting another explanation.