

PANAMA CANAL EXPENDITURES.

The classified expenditure on the Panama Canal up to May 1st, 1909, is as follows:—

Civil administration	\$ 2,806,491
Sanitation	8,468,515
Construction and engineering	45,195,326
Municipal improvements	6,428,439
Plant account	38,759,489

Total \$101,658,260

This is actual construction expenditures and does not include the price paid for the French franchise or to Columbia—\$50,000,000 in all.

QUEBEC STREET RAILWAY.

The Montreal directors of the Quebec Street, Light and Power Company recently returned from an official inspection of that system.

Mr. J. N. Greenshields, K.C., a director of the company, in discussing the matter, said that he was convinced from what he saw that the Quebec Street Railway will prove to be a little later on one of the most profitable traction corporations in the country.

"We inspected the city lines and offices, and we went over the line to Ste. Anne de Beaupre. Of course, nothing definite has been decided as yet, but I may say that the whole system will be greatly improved, such as new extensions, double tracks, larger cars, and faster time, and also by arranging for less change of cars from lower to upper town. A trip to the exhibition grounds was made across the St. Charles River. We found this line in fair condition, but by building a new bridge across the river the cars will be enabled to serve a larger area, and thereby afford access to a new section of the district which is rapidly filling up with the working classes. An inspection was also made of the St. Foy and St. Louis lines. The idea, I should think, would be to run a loop line out by St. Foy and back by St. Louis. It is also intended to double the elevator capacity at Montmorency Falls to the Kent House as the increase of traffic demands it."

FIREPROOF CONSTRUCTION IN REINFORCED CONCRETE.

There appears to be a general lack of knowledge of the recent rapid development of the important features which enter into fireproof construction whereby its cost has been materially reduced. It now costs only about 10 per cent. more to build a structure in which the fire hazard is practically negligible than one of the slow-burning type. Although the cost of thoroughly fireproof construction as provided by reinforced concrete is naturally somewhat greater than that of ordinary construction, its durability and its exemption from fire risk greatly reduce the net annual charges.

The advantages of reinforced concrete as a fireproof material are well set forth in a paper recently presented before the National Fire Protection Association by Mr. Leonard C. Wason, president of the Aberthaw Construction Co., of Boston, from which we quote in part:—

"Numerous fire tests have been made to determine both the resistance of concrete to actual test, and also the depth to which the reinforcement must be embedded to prevent its being damaged. The maximum depth of pitting observed by the writer in actual fire tests where a temperature of 1,700 degrees F. or more has been maintained for a period of five hours has been in either walls or ceilings, one inch to one and one-half inches. Also, by the examination of actual conflagrations, such as that at Baltimore and elsewhere, it has been apparent that the pre-arranged fire tests are more severe in the results shown by the structure than actual conflagrations. Therefore, if we can protect the materials

against damage in a pre-arranged test, they will stand any actual service. The consensus of opinion of engineers is that there should be at least one inch of concrete between the nearest point of a bar to the ceiling in panels, at least two inches below the steel in beams and girders, and also two inches of concrete outside the vertical bars in columns. In designing columns it is common to figure only that area of column inside the vertical bars when hooped as carrying the load, or, if hoops are omitted and but light reinforcement is used to prevent bending stresses, to add an extra inch beyond that needed to carry the load all around the outside, which might be burned away without endangering the load-carrying capacity of the balance of the column within. If this is burned off it can be plastered back, giving the column the same fire-resisting qualities as before.

"The other types of fireproof construction which are coming into competition with reinforced concrete are structural steel encased in concrete, and this, when thoroughly encased from a fireproof standpoint, is similar to an all-concrete building. Structural steel frame encased in terra cotta, and to a small extent plaster of paris and brick have been used in fireproofing steel, but not to a sufficient extent to be worthy of much comment. Thoroughly well-laid brick work is a good protection to columns, but when cast as arches between beams it leaves the bottom flange exposed, which is a serious defect. Actual conflagrations have conclusively shown that terra cotta is not so perfect a fire protection as concrete. This is largely, in the writer's opinion, due to the fact that its coefficient of expansion is high, so that it expands to such an extent that when confined between the beams it is crushed, the lower member falling, and thus weakening the floor. It is also more susceptible to a combination of fire and water, being to some extent brittle, and cracking when a cold stream strikes a hot surface.

"Before concrete will disintegrate when exposed to fire the large amount of moisture chemically combined in the setting of the cement being 20 to 25 per cent. of its weight, has to be driven off by heat, and then the vapor thus driven off has to be evaporated from the pores of the concrete before it becomes sufficiently hot to crumble. The slowness of evaporating this vapor is probably the cause of concrete resisting extremely high temperatures for the brief period of a few hours, while a much lower temperature, if long continued, would ultimately disintegrate it. Cement will resist 500 degrees F. for an indefinite period, while a continuous temperature of over 700 degrees F. is disastrous. The cement coating of the stones of the concrete will resist the attack of fire so long that it is of less consequence whether the stone can be damaged by the fire or not. Thus, pure limestone is a most excellent aggregate, and will not decompose until after the cement has, and after the cement has gone it is immaterial what aggregate is used, as the work has then failed anyway.

"Regarding the cost of this type of construction as compared with others, the large use has proved conclusively that it will compete, because the item of cost is considered paramount in ninety-nine out of every hundred structures. For large buildings the structural frame is almost always cheaper than the steel. Thin curtain walls cannot be built as cheaply on account of form work, which is constant for a thin wall as well as for a thick one, but if the wall must be sixteen inches or more in thickness concrete is cheaper than brick."

LEVEL CROSSINGS.

The Canadian Railway Commission has directed all railway companies to furnish by September 1st a return showing all crossings at which accidents have occurred since January 1st, 1900. In the case of every crossing where more than one has occurred there must be statements of the protection existing. The statement, which is to be full and explicit, must be certified to by a responsible officer of the company.