Pieces of special work are made by building up standard sections with cast-iron fillers, or cast-steel bodies with special inserts such as manganese steel, or all cast manganese steel.

A very common form of special work is made from rolled steel body with some hard, tough material (like manganese steel) inserts placed at the point of maximum work. These inserts are usually keyed in place with some form of spelter which may be easily removed from the surface without disturbing the pavement.

Special pieces of solid cast steel, or rail sections held in place with solid cast-steel joints, are often built. The solid cast pieces are made of open-hearth cast steel, and of manganese steel, and for important intersections it is good practice to use solid cast-manganese steel throughout. Pieces of the cast-in type may be considered only for light traffic.

In comparing the life of special work, car traffic is usually estimated in tons per hour when referring to density, and total car tons when speaking of the life of a special. As an example, cars crossing an intersection with headway of three minutes would mean 20 cars per hour. Supposing that a loaded car weighs 25 tons, the density of traffic is $25 \times 20 = 500$ tons per hour. If cars operating 18 hours per day will pound out the points of a special in 10 years, we may say that this piece of work carried a load of $500 \times 18 \times 365 \times 10 = 32{,}850{,}000$ car tons.

The width of intersecting roadways usually governs the distance the tracks are to be placed centre to centre. Two centres are used in Edmonton, viz., a 10-ft. centre on roadways up to and including 56 ft. or where side-pole construction is used to carry overhead work, and a 12-ft. centre on roadways of 56 ft. and over or where centre pole construction is used to carry overhead work.

The intersecting tracks are joined by the largest possible curve which will give sufficient clearance at the curb intersection, and at all poles, hydrants and man-holes. The simplest form would be a curve with one radius, but with the development of faster operation, it has been found desirable to work up to the central curve with a gradually increasing curve. A similar result may be obtained by compounding the curve, starting with a longer radius and working up to the shorter radius at the central curve.

In later special work it has become a common practice to pick up the wheel on its flange and ride it over the groove of the intersecting track, letting it down on the ball of the rail a few feet from the intersection. This is accomplished by gradually reducing the flange depth until the wheel rides clear at the intersection. The effect is to greatly reduce the pounding caused by the wheel bumping across the groove of the intersecting rail, adding to the comfort of the passengers and extending the life of the rolling stock and special work.

The United States government has not yet accepted any of the offers made for the large factory erected for it at Leaside, Ont., during the last few months of the war. Among offers that are being seriously considered is one from the Willys-Overland Motor Car Co. J. G. Perrin, assistant general manager of that company, states that should their offer be accepted, the building will be taken down and re-erected in West Toronto.

According to reports in the Montreal daily newspapers, the city of Montreal has agreed to pay a salary of $10,000 per annum to each of three engineers who are to serve on a board to supervise the completion of the Montreal aqueduct. The engineers appointed to this board are R. S. Lea, Walter J. Francis and A. E. Doucet. Mr. Doucet is city engineer of Montreal; Mr. Francis and Mr. Lea are prominent consulting engineers of that city. The aqueduct is to be finished in accordance with a report recently made by Mr. Lea to the Administrative Commission. It is understood that these three engineers will devote two-thirds of their time, or 200 days a year, to this work. The cost of building the aqueduct is estimated at $1,683,000; of the new pumping plant, $850,000; and of the addition to the filtration plant, $2,000,000.

DEVELOPMENT OF WATER-POWER

By L. G. Denis

Hydro-Electric Engineer, Commission of Conservation, Ottawa

UTILIZATION of water-power in Canada is advancing even more rapidly than heretofore. During 1919, the installation of plants with a total of 64,400 h.p. was completed in various portions of the Dominion; the developments at present under construction or in process of installation aggregate over 470,000 h.p. Other projects definitely contemplated for the near future will add 750,000 h.p.

Among the more notable developments are the 300,000-h.p. Chippawa plant of the Ontario Hydro-Electric Power Commission, now under construction, to utilize the full head of Niagara power, and the impetus given by the Quebec government to the conservation of water by storage. Much activity is also to be noted in the Maritime Provinces.

This rapid progress, which represents industrial growth of the most valuable character, should be encouraged, yet most carefully guided. In the United States, electrical installations have doubled every five years while, in Canada, the present hydro-electric installation is about ten times that of 1900. The present hydraulic installation in the Dominion is nearly 2,400,000 h.p. If we assume for this country only one-half the rate of increase recorded for the United States, a total of 4,800,000 h.p. will have been developed 10 years hence, and 9,600,000 h.p. 20 years hence, if available.

The resources actually available to meet future demands are indicated in the accompanying table of the estimated developed and undeveloped water-power in Canada. An attempt has been made to separate available sites within the populated areas from those farther north.

Available Water-Powers in Canada.

Province or District.	Estimated total possible h.p.	Available in populated area, h.p.*
Maritime Provinces ..	403,000	354,300
Quebec	6,000,000†	2,600,000
Ontario	5,800,000	2,800,000
Prairie Provinces ...	3,379,000	653,860
British Columbia ...	3,000,000	990,000
Yukon and Territories	150,000	‡
Total	18,832,000	7,398,160

*Minimum all year power, with possible regulated flow where investigated. Figures for some of the rivers included may vary as additional information is secured from future detailed surveys, flow records and conservation storage investigations.

†Not including Ungava. 5,000,000 h.p. south of the 50th parallel.

‡Available possibilities not definitely known.

The 7,398,160 h.p. available for new development in the populated area is derived from an estimated total possible of 9,781,400 h.p., of which 2,383,240 h.p. has already been developed.

Under the rate of growth assumed, all the available water-powers within the populated portion would be developed in twenty years. It is self-evident, however, that, as new development becomes dependent on less accessible sites, it will proceed much more slowly.

F. M. Dawson read an interesting paper on "Some Investigations of Cement Under a Grant from the Advisory Council," at a recent meeting of the Engineering Institute's Montreal Branch. Discussing the paper, A. C. Tagge, general superintendent of the Canada Cement Co., Ltd., spoke of the interest that cement companies are taking in any development, such as super-cement, which might benefit their customers. A. D. Swan, consulting engineer, said that there is great need for improvement in cement for use in marine work. J. A. Jamieson, consulting engineer, stated that such researches such as those undertaken by Mr. Dawson are of great value to the engineering profession.