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Design and Construction of Reinforced Concrete Viaducts on North Toronto Subdivision, Canadian Pacific Railway.

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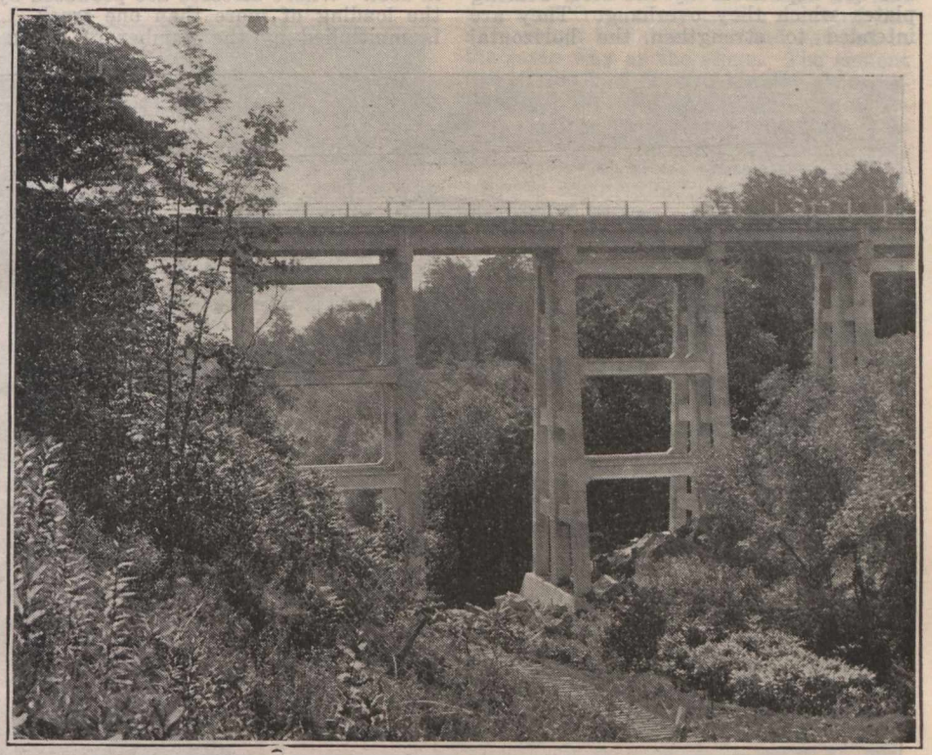
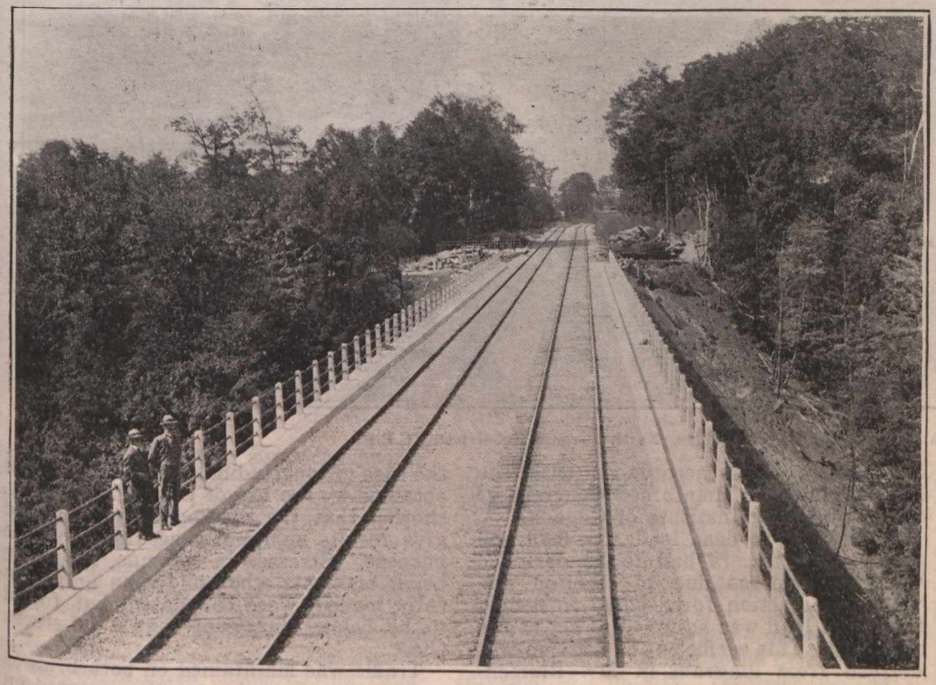
General Description and Design.—The greatly increasing freight traffic and a still greater prospective increase in passenger traffic, due to the agreement between the C.P.R. and the Canadian Northern Ry., whereby the latter acquired running rights over the C.P.R. from Leaside Jct. to North Toronto station, necessitated the double tracking of the line between these two stations. While this line is only about two miles long, several reinforced concrete culverts required extensions, and two important bridges, one at mileage 0.9 from Leaside Jct. and the other at mileage 1.8 therefrom, had to be rebuilt. The existing single track steel viaducts at these two points not being adequate for the present heavy rolling stock, and still less for future requirements, had to be rebuilt, so that these bridges would not limit the use of heavier motive power on this important link. Bridge 1.8, being located at the limit of the North Toronto yard, required an extra track for switching, so as not to interfere too much with the main line traffic.

Estimates for both bridges were made for building them in either steel or reinforced concrete. The higher cost of steel viaducts, and the uncertainty of the delivery of structural steel, were the deciding factors in the choice of reinforced concrete trestles as built and here described.

While no designs were prepared for concrete arches at these points, the possibility of building them was considered. The limited right of way at the bridge sites, however, and the necessity of building temporary trestles within these limits, made the maintenance of traffic in building arch structures a most difficult problem. The designs adopted, where all slabs were pre-moulded, and the bulk of the concrete could be cast in forms on the ground, promised a much speedier and safer construction, and permitted the carrying of traffic within our right of way without difficulty. These considerations justified the dropping of further studies of reinforced concrete arches, and the adoption of designs of which the principal dimensions are shown in fig. 1.



Bridge over Toronto Belt Line Ry. Ravine, North Toronto Subdivision, C.P.R.



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Continuous piers have been used instead of individual pedestals, as is customary for steel viaducts. These, together with the very stiff caps, made each bent as one unit. The columns are thoroughly bonded to the piers, by the recesses and the rods in tops of same, which correspond to the reinforcing rods in the columns.

In designing the columns, rectangular and octagonal sections were considered. The rectangular section was adopted, as the most suitable to resist the great bending moment that the columns would be subject to. The columns are reinforced with longitudinal rods anchored into the concrete by ⅜ in. diameter bands. On account of the unusual size of these columns, these bands were made in sections, so that intermediate bars would be thoroughly anchored into the body of the columns. These bands were not considered to act as hooping, owing to their rectangular shape. The tower bracing consists of struts, reinforced to resist the bending moments due to their own weight, and the various horizontal forces acting on the tower. In order to improve the appearance, and reduce the weight, the vertical forces of the longitudinal struts were given a 3 in. recess. The longitudinal and transverse struts are arranged alternately. At all intermediate