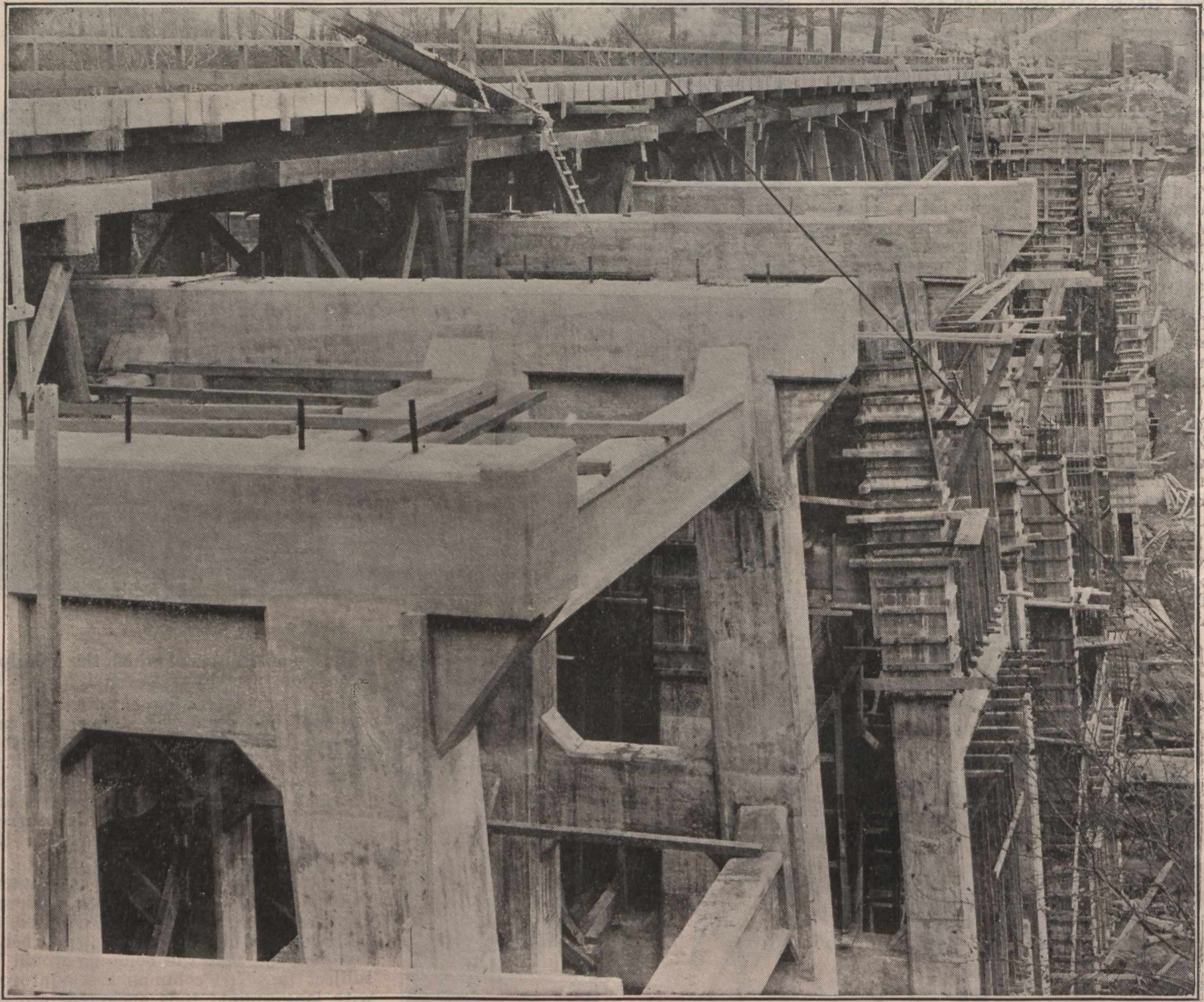
points, bending moments, due to transverse forces, will then be practically zero, where the moments caused by the longitudinal forces are maximum. Sliding surfaces for the main slabs are provided by ½ in. steel bearing plates on caps of the bents; the plates are held in position by 1½ in. dowels. As these plates are continuous over the caps of the bents, they strengthen the caps against stresses produced by longitudinal forces on the bridge.

Each track is supported by two premoulded simple T beams. The end brackets on these slabs do not bear on the caps, but are kept clear by the steel bearing plates which they overhang. They are intended to strengthen the horizontal

The sidewalks are composed of premoulded T shaped slabs, supported on brackets projecting out from the main slabs. The flanges of the sidewalk slabs fit into a horizontal groove in the coping blocks, which are heavy enough to counteract any tendency of the T beams to overturn. One-inch dowels hold these slabs in position on the brackets. The hand-railing consists of premoulded concrete posts, and three rows of 2 in. pipe.

The bridges are designed to carry Cooper's E-50 loading, with an impact allowance of .90 — 300/300 L.L., where L.L. = live load and L. = loaded distance in feet. Where stresses are produced by the loading of more than one track, L. is multiplied by the number of tracks.

Bending moments in columns, due to dead load of struts, were included in calculations. While this is usually neglected in steel structures, it became necessary here, owing to the great weight of the struts. These latter moments, and also the moments due to traction, were calculated by the elastic theory—the equations being solved by the area moment method. Fig. 2 indicates how these equations were developed. The application of this theory, however, for the calculation of moments, due to transverse forces, became extremely involved, owing to the shape of the bents. For this reason, points of inflection were assumed as shown in fig. 1. Comparison between results obtained by similar assumptions, in



Construction of Reservoir Ravine Bridge, North Toronto Subdivision, C.P.R.

flanges and improve the appearance of the structure. The top surfaces of the slabs have a smooth finish, and are sloped towards drain pipes, placed along coping blocks and between the tracks.

The ballast is held in position by the coping blocks, which were premoulded in sections and anchored to the slabs by 1 in. dowels. After the erection of the slabs and coping blocks, the surfaces in contact with the ballast were waterproofed with a membrane type of waterproofing. This was laid continuously from abutment to abutment, the gaps between slabs being reinforced by additional layers of felt and mastic.

The design is in accordance with the Specification for Reinforced Concrete of the Engineering Institute of Canada.

In addition to dead load, live load and impact, the towers had to be designed to resist stresses due to traction and wind. A traction force equal to 9% of the wheel load was assumed to act at the rail level. This coefficient of traction was derived from diagram in Mr. Blumenthal's paper on Traction Stresses (Can. Soc.C.E. Transactions, Vol. 24, Part 2). A wind load of 30 lb. a sq. ft. on exposed surfaces of train and slabs, and a similar load on 1½ times the vertical projection of towers was assumed.

the case of longitudinal forces, with those obtained by the use of the elastic theory, showed that the method adopted would give results sufficiently accurate for the purpose. Stresses in columns, including being moments when one span only was fully loaded, were calculated, but found to be below maximum shown on stress sheet.

Traffic was maintained on both bridges on temporary wooden trestles, erected on the north side of the old main line track. This was contemplated from the very first for bridge 1.8, as the spans of the existing bridge were so arranged, that to build a concrete trestle and keep clear of existing