wall, it is the practice of engineers to make the width of the base of a retaining wall 0.35 to 0.45 of the height, and in some cases where there is an additional load due to surcharge of earth, street or railway traffic, walls have been built with bases as wide as 0.5 of their height.

In the case under consideration the foundation was of stiff grayish-brown clay or hard pan, with some boulders and small stones mixed among it and which could be well drained, so was considered sufficiently good support. The embankment which the wall was to retain would be made of train fill material hauled on cars from the ballast pit and dumped from a temporary trestle. As will be seen by reference to Fig. 1, the upper portion of the wall would extend to the elevation of base of rail and would be subjected to the live load on the track in addition to the embankment. From this point to the lower end of the wall the embankment lies at natural slope to elevation of grade. It was, therefore, assumed that the whole wall had a surcharged load and that a gravity wall should have a thickness at its base of 0.45 feet of its height. A wall 1.5 feet thick on top and increasing one foot in thickness for each 2.25 feet in height will give the required base. It became evident for several reasons that a reinforced concrete wall would be better suited to the conditions than a gravity wall:

(1) The unit pressure on the foundation at the toe of the wall would be reduced by the use of a wider base, which could be easily accomplished in the reinforced wall, which was actually made 18.0 feet wide for the highest part of the wall, while that for the gravity wall is 13.63 feet.

(2) The vibration due to the traffic on the C.P.R. track, which lies within eight or ten feet of the wall, would be better resisted by a reinforced structure than by one of plain concrete.

(3) The cost of the structure could be reduced.

Reinforced concrete retaining walls divide themselves into two types, viz., "inverted T" and "counterfort wall." The inverted T type has the advantage of being of much simpler shape and so requiring less form work than the other. Under ordinary conditions of foundation, cost of materials and labor, it is found to be economical up to a height of about 20 feet. The counterfort wall type was chosen on account of the closeness to the C.P.R. tracks, where traffic must not be interrupted. This fact made it necessary to have as much of the base as possible back of the face of the wall. Fig. 2 shows an elevation and sections of the north wall as designed and constructed. The horizontal earth pressure against the face of the wall between the counterforts is transmitted to them by the thin wall slab. Each counterfort was designed to resist the entire over-turning moment and bending moment produced by the resultant horizontal pressure of the earth. The portion of the base back of the wall was designed as a slab, carrying the weight of the earth above it and supported by the counterforts, and the portion in front as a cantilever fixed at the face of the wall and reinforced to resist the reaction of the ground. The tendency to slide is overcome by the sides of the excavation, which were cut to neat size of the base and the concrete poured up against the natural ground without any form. Additional safeguard against sliding was provided by making a projection on the bottom of the base at the back two feet wide and one and one-half feet deep. In this case no two counterforts were the same height in the same wall, which necessitated a separate design for each one. To prevent making the form work too expensive the space between the walls was increased from seven or eight feet (as is usually the case) to ten feet, with a corresponding increase in thickness of walls. The counterforts are 1.5 feet thick throughout. The same slope was used on the back of each one, so that the forms could be used on a counterfort of the same height, or on a shorter one by simply cutting it off at the bottom on the second wall. The wall is one foot thick on top with a coping two inches

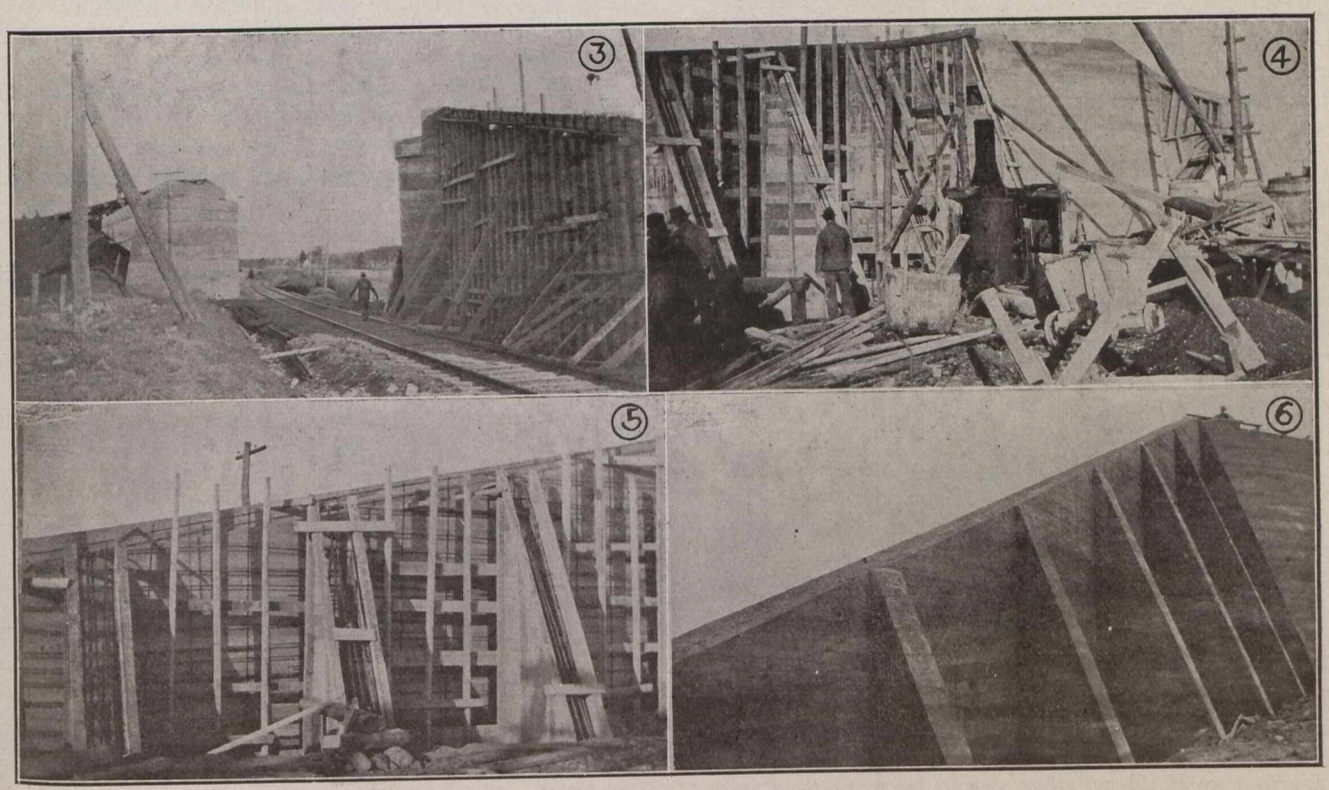

Fig. 3.—Abutments in place on either side of the C.P.R. line. Figs. 4 and 5.—Formwork and reinforcing of wall ready for concrete. Fig. 6.—Completed wall from counterfort side.