

interstices were filled with cement mortar. The operation of constructing this invert was interfered with once during construction by a severe storm. No lasting damage was occasioned by this flooding, as the sediment deposited was removed and the work proceeded with after a comparatively short delay.

After the invert was completed as above described, the bulkhead was removed and the water allowed to discharge freely through the channel thus formed. The top concrete

for railway purposes, it was considered necessary to design the slab to carry Cooper's E-50 railway loading. The soil on which the extension rested was considered to have a bearing value of 2 tons per sq. ft. Under these circumstances, no prepared foundations were considered necessary.

No particular constructional difficulties were encountered in this portion of the work. In a subsequent portion of this same extension which had to be carried through recently-filled ground, a foundation for the sewer was prepared as shown in Fig. 3. It consisted of three rows of round bearing piles spaced at 5 ft. centres under the two outer walls and at 2 ft. 6 ins. centres under the centre wall.

These piles are capped with 6 x 6 ins. caps; and upon the latter a 3-in. plank flooring is laid to receive the concrete. The cross section of the outlet takes the same form as in the first part of the extension, but the sectional area is increased to provide for the increased flow resulting from the tapping of the Bathurst outlet.

The Spadina Ave. outlet extension into the Spadina Ave. slip, and is time. The present outlet is a 5 x 7 ft. semi-circular section, discharging into the Spadina Ave. slip, and is being continued to the harborhead wall in the form of a 6 x 8 ft. rectangular section. Difficulties in regard to the design of this extension arose from the fact that the bearing

value of the material in the bottom of the slip was not sufficient to support the proposed structure, and the elevation of the rock was so close to the surface and the material so soft that conditions did not permit of driving bearing piles.

The foundation finally decided upon was a stone filled timber crib placed in position and the bottom timbers scribed to fit the contour of the rock (see Fig. 4). This crib was built in sections 12 ft. wide and 50 ft. long, the depth varying from 5 to 9 ft. On commencing work, an earth embankment was first built from the end of the Sand & Supply, Ltd., pier to the end of the Weddell pier. The slip was then unwatered to such an elevation that when the cribs were sunk, the top of the timber was just above the water level.

slab, or cover, was then placed without interruption. This slab was designed to carry a uniform load of 1,500 lbs. per sq. ft.

In addition to the section thus described, there was built an independent outlet 4 ft. 6 ins. square. As it was possible during construction to divert the flow which this outlet was being built to take, there was no necessity of adopting the method of construction used for the larger section. The two outlets were required to be kept separate and distinct throughout their entire length, as they are discharging under different hydraulic heads.

The second extension which it may be of interest to describe is that of the Old Garrison Creek and Bathurst St. sewers, which are now combined. Here again, as in the case of the Keele St. extension, the conditions under which the sewer was to be constructed and operated, together with the nature of the subsoil and the loading to which the top slab would in future be subjected, governed the design. But as this extension was not required to take the flow during construction, a more standard design was used.

It was deemed advisable to build the section shown in Fig. 2. The division into a twin section reduced the thickness of the top slab and made it possible to keep well within the limits available for elevation of invert so that the excavation might be reduced to a minimum and at the same time a reasonable depth of filling over the sewer might be maintained.

The soil through which part of this extension was made was stiff clay. Four by twelve-inch timber sheet-piling was first driven. The excavation was then made by clam-shell bucket, and as it progressed, the sheeting was braced with three by ten-inch walings and eight by eight-inch struts, the latter being so placed as not to interfere with the form work for the concrete.

Owing to the fact that this extension passed through property any part of which might at some time be required

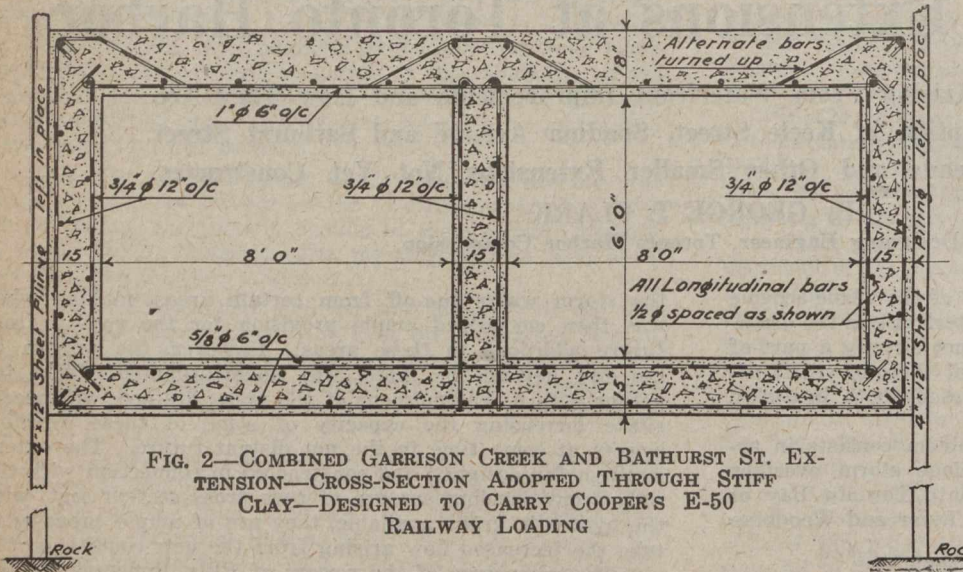


FIG. 2—COMBINED GARRISON CREEK AND BATHURST ST. EXTENSION—CROSS-SECTION ADOPTED THROUGH STIFF CLAY—DESIGNED TO CARRY COOPER'S E-50 RAILWAY LOADING

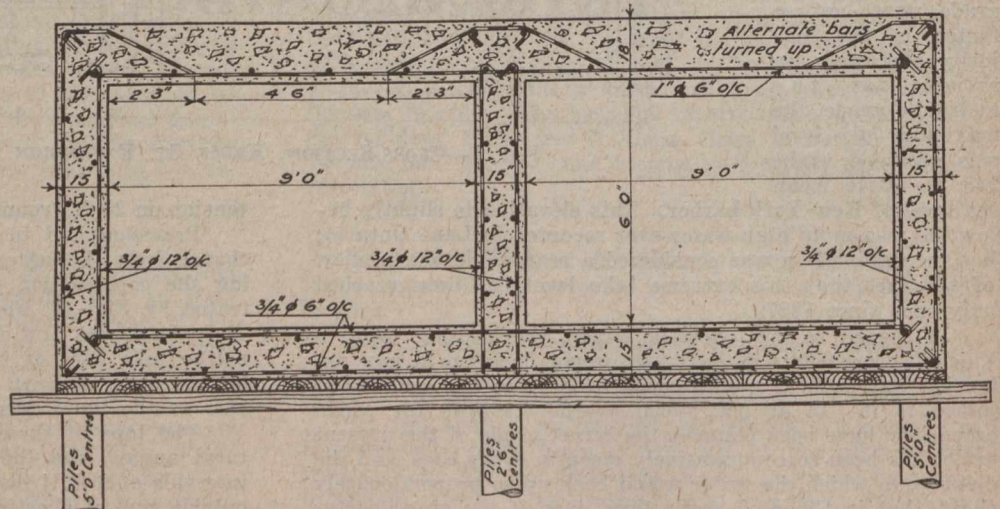


FIG. 3—SECTION ADOPTED FOR BATHURST ST. EXTENSION THROUGH FILL

After the crib had been sunk to position and allowed to settle thoroughly, a 3-in. plank flooring was laid on the crib, and any slight variations in the elevations of the top of the flooring were adjusted in the thickness of the bottom slab of the sewer section. The forms were then placed on the top of the flooring and the concrete poured in the dry.

For the present, the outlet will be constructed only up to the end of the Weddell pier. The remainder of the ex-