raw water by-pass is closed by means of the relief valve shown in Fig. 5, and the whole of the water is sent through the sand washers, thus creating in the sand washer a greater induction, which causes the drifting sand to operate at its maximum rate. The relief valve is controlled by the operator from the gallery.

Suction Well.—The only excavation work that required caisson work was the suction well, which was carried down to 25 feet below high water. An iron cutting edge was built on the site and the concrete forms erected over it. The concrete was poured in sections 7 feet high. When two sections had been poured, the caisson was sunk by taking the sand out of the interior by means of a clamshell. No trouble was experienced until within five feet of its final position, when fine running sand flowed in so fast that the material could not be removed. Operations were suspended until a pipe trench was run close enough to draw the water away and reduce the upward pressure on the caisson. A sump was sunk in the centre of the bottom of the caisson and drains of gravel were built radially into this sump, the whole being covered with light sheet iron, and then concreted into place.

Sand.—In all about 6,000 cubic yards of filter sand are required. This material is being secured at the York Sand and Gravel Co.'s pit on Kingston Road, and the separating of the materials and washing of the sand is carried out at a plant specially erected for this purpose at the pit by the verMehr and Cowlin companies. Considerable difficulty has been experienced in the preparation of this sand, due to lack of water for the purpose of washing and segregating the material. Wells and ponds in the neighborhood of the pit were relied upon for the water supply, and due to the extremely dry summer the supply has been such that the plant could be operated only part of the time.

From a storage bin holding 100 cubic yards of material, the sand and gravel is fed by a belt to a screening arrangement which eliminates all gravel that is too big. From this gravel is obtained the 800 cubic yards necessary for placing around the underdrain system. The material which passes through the main screen is conveyed by water to a series of eight screens about 1 foot in diameter, where the sand that is too coarse is eliminated and the smaller sand drops into the screening tank. From this screening tank the sand is then conveyed to a separator box where the material that is too fine is driven off by water, finally leaving the sand which is satisfactory for filtering purposes. This is conveyed into a storage bin and from there it is grabbed into railroad cars and shipped to the plant.

Plant.—The location of the work was out of the ordinary, involving not only difficulty in foundations but also considerable difficulty in transportation of supplies and men. In the summer all supplies were towed across on scows, and in winter were hauled over the ice. There were periods, however, when both methods were impossible, owing to loose or thin ice, and then long lake hauls were necessary to reach the work. On this account carpenter shops, machine shops, blacksmith shops, etc., were built at the work.

The light and power for the construction plant were both electrical, and the lines were both carried on the same poles. Toronto Hydro-Electric System power was used, with steam stand-by on account of the pumps.

Acknowledgment.—*The Canadian Engineer* is indebted for the above information to Mr. William Gore, consulting engineer, and to Mr. William Storrie, chief engineer, of the John ver Mehr Engineering Co., Toronto, which concern designed the whole plant. The construction work was carried out by Wm. Cowlin & Son (Canada), Limited, Toronto.

QUEBEC BRIDGE CENTRAL SPAN.

MR. G. H. DUGGAN, chief engineer of the St. Lawrence Bridge Co., Limited, issued the following circular last week to the engineers of Montreal and vicinity who would likely be interested in the placing of the centre span of the Quebec Bridge:—

The controlling valves in the pontoons which will float the centre span will be closed shortly after midnight on Sunday. The span will be floated about four o'clock on the morning of 11th of September, and, if weather permits, it will be moved away from its present supports as early as there is sufficient daylight to allow the work to be safely conducted. It is expected to arrive at the site of the bridge between six and seven o'clock in the morning and that the connections for hoisting it up will be made about nine a.m.

The centre span is 640 feet long, centre to centre of end pins, 88 feet wide and 110 feet high in the centre. It weighs, in its present condition, about 5,100 tons. It has been erected at Sillery Cove, about 3½ miles below the bridge, on ordinary steel false-work, a bent under each panel. This false-work was afterwards removed and the span now rests on the end pins on heavy steel towers built for the purpose at each end. The span was built in such a position and at such a height that scows could be floated under it at high tide and allowed to rest with the receding tide on foundations prepared for them at a height that would permit blocking and steel girders for distributing the load upon the scows to be placed between the span and the scows.

The scows, six in number, each 165 feet long, 32 feet wide and 11 feet 6 inches deep, are built with heavy steel frames and steel plate girder bulkheads calculated to support the large concentrated loads to which they will be subjected—the wooden planking being considered only as a skin to keep out the water and not as adding strength to the framework. The scows require about 8 feet 2 inches of draught to float the span; their bottoms are placed at elevation 83, a considerable distance above low water at spring tides and in this position the high tide rises about 2 feet above the decks, although when the span is floating the deck will be about 3 feet 4 inches above the water level. Each of the scows has six valves in the bottom which can be operated from the deck and these valves are now open so that the tide may flow in and out, keeping the level of the water inside the scows the same as on the outside, thus preventing any tendency to float except from the buoyancy of the wood in the timber skin so long as the valves are open.

If conditions are suitable, the span will be moved out from its anchorage at Sillery Cove when the tide is strong flood. Anchors have been arranged and it will be swung out clear of Sillery Point by means of these anchors and two small tugs of light draught until it is perpendicular to the shore or practically parallel to the position it will occupy in the bridge. As soon as it is swung into deep water, two of the largest tugs available will be attached to the centre of the span, one up-stream and one down-stream, to act as floating anchors for checking the span and holding it when so desired. In addition to these tugs, there will be four powerful tugs attached to the

(Continued on page 219.)