

additional ballast. These were used instead of blocks of granite, which were to be used in erecting the shaft of the pier, on account of their greater specific gravity, reducing the top heaviness of the caisson. Even at that, it was necessary to pile up car wheels to a height of over twelve feet and to indicate how little excess weight there was, may be mentioned the fact that it was necessary to reduce the air pressure eight to ten pounds, even after the cutting edge was cleared, before the caisson would sink. Skin friction was found to run somewhat over 500 lbs. per square foot, the nature of the strata being largely fine sand.

As a precaution against overturning, two 1 1/8-inch wire cables were used as a strap around the caisson to the old pier.

It is in order to state that the air work was only carried on at low-tide periods. Air was turned on while the tide had still 6 ft. to fall and the men were called out on the arrival of the bore, permitting six hours work each tide.

This decision as to low-tide work was due to the narrowness of the caisson compared to its height, No. 1 caisson being only 18 ft. wide and the height from the natural ground surface of the river bottom to high water was 50 ft.—the distance from ledge rock as found at No. 1 to high water was 77 ft. Car-wheel ballast to withstand the air pressure for working at any stage of the tide would have reached well above high-tide mark and made the caisson very top heavy and in great danger of overturning in the heavy broad-side current which prevailed at No. 1.

No difficulty was experienced in quickly blowing the water out of the air chamber with air pressure, until a heavy strata of clay was reached, which effectively sealed it, after which it was necessary to use the blow pipes to remove the water.

One of the many difficulties encountered and which caused serious delay, was the entrance of quick-sand into the air chamber on spring tides. This sand carried up on the flood tide, filtered through as much as 20 ft. of cover before getting under the cutting edge and would often fill the air chamber to within 18 inches of the roof. No means was ever found of wholly getting rid of this trouble—it would gradually disappear after the high spring tides were over, but since these high tides reappear at both full and new moon periods, it can readily be understood what a discouraging feature it was.

The average rate per day of sinking No. 1 and No. 2 caissons was 6 and 4.7 inches respectively. A progress diagram is shown in Plate 5 as well as the material passed through.

The slow progress made in sinking No. 2 was accounted for by the fact that the material was boulders of all sizes embedded in sand and clay. It was necessary to shoot these boulders constantly to clear them from beneath the cutting edge and to cut them down small enough to pass through the locks.

No serious difficulties were encountered in sealing the air chambers.

There were no fatalities in this caisson work and, in fact, throughout the entire work—a rather remarkable showing on a dangerous river. There were several cases of "bends" in which it was necessary to resort to the hospital lock.

The air supply was ample for the work, although on a few occasions both machines were operating at capacity.

After the sealing up of the caisson on solid rock, the car-wheel ballast was removed, the top of the concrete

cleaned off, levelled up to an uniform bearing at elevation 39.25 and the granite shaft started. Pumping operations were, of course, necessary each tide, since the granite footing course was two feet nine inches below dead low tide, and progress was slow. Only a small section could be attempted each tide on account of the short time available and the enormous amount of cleaning. Plate 6 shows a plan of the granite pier. Granite was laid in each section and hearted up with 1:3:6 concrete. There was 315 cubic yards of granite facing and 300 cubic yards of concrete hearting to each shaft. For protecting the green concrete against scour, wooden shutters were used in sections, secured with rods down the side of the granite shaft to the timber caisson. The heavy current was very severe on these shutters, frequently up-ending them and breaking them in pieces wherever the slightest opening appeared, allowing the tide to get under them. This scheme, however, was the most successful for preventing scour of any used.

The above piers were built for the New Brunswick Government, Mr. A. R. Wetmore, provincial engineer, Mr. R. A. Malloy, assistant engineer on the work.

The contractors were Engineers & Contractors, Limited; Mr. E. R. Reid, president, and the writer chief engineer.

### SPECIAL MEETING OF ENGINEERS' CLUB, TORONTO, TO CONSIDER NEW QUARTERS.

A special meeting of the Engineers' Club, Toronto, was held last Thursday, March 1st. This meeting was called to consider the question of new club quarters.

At the time the president, Mr. E. L. Cousins, called the meeting to order there was not a vacant seat in the lecture room. After some preliminary remarks in which the president referred to the history of the club, he called upon Mr. C. H. Heys, chairman of the house committee, to give the members some facts as to the estimated receipts and expenditures which might reasonably be expected in the event of a change of quarters being made.

Following Mr. C. H. Heys, Mr. M. P. White, on behalf of the new quarters committee, outlined the steps that had been taken by that committee in its effort to arrive at some definite proposal. Two were laid before the meeting, one providing for the remodelling of the present quarters by which the floor space would be practically doubled. The other proposal was for the club to occupy the 5th, 6th and 7th floors of the World Building on Richmond Street West. This would give the club a floor area of 15,000 square feet. The discussion was quite general, the consensus of opinion being that the World Building plan was the more desirable. When the vote was taken it was found it was practically unanimous in favor of moving to the World Building, there being only one dissenting vote. At the same time, it was felt that out of courtesy to the members of the club who were not present, a letter ballot should be taken before any definite move was made. The directorate was therefore authorized to send out a letter giving as much information as was thought necessary regarding the two proposals and thus secure an intelligent expression of opinion of all resident and non-resident members. This will be done within the next few days.

The number of companies incorporated under the Companies Act in Canada during the fiscal year ended March 31st, 1916, was 534, with a total capitalization of \$157,342,800.