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On the Action of the Ice upon the Bridge at Rice Lake.

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The bridge of the Cobourg and Peterboro' Railway over the Rice Lake, in the county of Northumberland, is perhaps the largest Railway bridge on this continent, and one of the largest in the world,—its total length being a trifle over two miles and a half. The Railway crosses from the Cobourg shore to Tic Island by a pile bridge of 3,754 feet in length. Here it curves a little, the deflection being 2½°. From Tic Island to the north side of the main channel, a distance of 2,760 feet, there is a succession of wooden cribs 10′×20′ in size, sunk eighty feet from centres, filled with stone, and carrying a superstructure of that class of bridges known as "Burr's Truss."

In the channel, there is a pivot draw on a turntable, supported by a pier 20′×40′ in size, and giving two openings of fifty feet each. The bridge raised on an incline from each end towards the draw, and the spans immediately next it, give a clear headway of twelve feet, to afford a passage for the cabins built upon the rafts which come down the Lake.

From the end of the truss bridge to the Indian village shore, a distance of 6,728 feet, is a pile bridge, similar to the other, except that it is strengthened every five hundred feet by a crib 10′×20′ in size, loaded with stone. The cross section of Rice Lake accompanying this paper, shows these dimensions of the bridge.

The bottom of Rice Lake is black mud, in a semi-liquid state, and capable of affording no support to piles. This sometimes reaches nearly to the top of the water, and sometimes there is a depth of ten to fifteen feet of water before reaching it. It affords nutriment to the wild rice (Zizania aquatica. L.), from which the Lake takes its name, and which grows in large patches in such luxuriance that it is difficult to paddle a canoe through it. Under this black mud there is a stratum of very hard and compact sand, overlaying the clay.

The depth of water and mud averaged from the low water level, shown in the section, is about fourteen feet south of Tic Island, and sixteen feet between the Truss bridge and the Indian shore. The total rise and fall of the Lake is six and a half feet.

The piles are driven through the sand and a little into the clay, in some instances; generally, however, they are driven an average of ten feet into the sand, which was a difficult process; the pile not going more than two inches at a blow, from rams weighing 18 cwt., falling through forty feet leaders, after it had begun to penetrate this sand.

It will be observed that from Tic Island to the channel, where was evidently the ancient bed of the river, it is deeper than the rest of the Lake, being an average of twenty-eight feet from low water mark In the channel it is thirty-six feet from low water mark, and forty-two and a half feet from high water mark to the hard bottom. This depth rendered an ordinary pile bridge impracticable, and accordingly the truss bridge, resting on crib piers, as before mentioned, was designed to carry the Railway over this part of the Lake.

The mode of construction was as follows:—Four long piles were driven and capped, to bear the vertical pressure of the bridge until the cribs could sink to their bearings. They also served as guides for the cribs, which were built around them, 10′×20′ in size at top, and battening 2″ in 12″ at the ends, and 1″ in 12″ at the sides. They were made of square timber above, and round below water. They were sunk to their places through the ice in winter, and then loaded with bowlders, collected along the shores.

The construction of the pile bridge will be seen from inspection of the accompanying drawings. The piles, of which the centre pair were white oak, the outside pair and the spur piles in some cases pine or tamarac, were driven, and capped with pine caps 12×12. The spur piles were driven with a leaning machine, so that their tops stood about four feet from the others. They were then drawn up by strong tackle, and secured with 1″ round bolts. The corbels are fastened to the caps and piles by 1″ square rag bolts three and a half feet long. They are notched an inch on the caps. The stringers of pine, 12″×18″, are secured to the corbels by 1″ round screw bolts. Ties of 3″ oak plank connect the stringers together on top.

The quantities of materials in this bridge are as follows:

184,000 lineal feet of piling.
138,000 " " round timber in cribs.
644,000 feet B. M. square " "
1,932,000 " " " " in bridge.
250,000 lbs. iron in bridge.
20,000 yards stone in cribs.

The total cost of the bridge has been not far from $175,000.

It remains now to describe the effect which the ice has already had upon this structure, and to consider what are its future prospects of stability and permanency.

It was predicted by many persons, previous to commencing this undertaking, that no structure could possibly be built which could resist the power of the ice in Rice Lake,—which forms to the thickness of two and a half feet; expands with such force as to "buckle" up into high ridges, from the heat of the noonday sun; and contracting again in the cold nights, cracks and splits with a noise like that of artillery, and with a tremendous power which, as they declared, no artificial structure could resist. Moreover, they said, after the ice has "taken," the lake rises some two or three feet, and the ice, being frozen to the piles, must inevitably drag them all out.

To these evil forebodings it was replied that it was not supposed that a pile bridge could sustain the thrust of the ice for any length of time; it might be disturbed and thrown out of line and level, but notwithstanding it could serve to carry the trains across the lake until such time as it could be filled up with a solid embankment. It was not expected that it would last for ever; but if it lasted long enough to form a means of communication across the Lake until it was filled up from dirt waggons, that would be a great advantage,—sufficiently important to justify the cost of the bridge. To be sure, if the Company had plenty of time, and unlimited means, it would be better to fill the Lake up as they went along, leaving only a passage for the waters; but, in their circumstances, this was entirely impossible, for it would have required such a large immediate outlay, with so remote a prospect of remuneration, that the project would have been killed.

The bridge was accordingly built, and the result has thus far justified the anticipations of its projectors; while, on the other hand, the prognostications of those who feared danger from the ice have been partially realized. The bridge has been much twisted and shaken, but although its straightness and regularity have been destroyed, it still stands in its place, fully equal to the task of carrying unusually heavy engines over in safety.