(*Paper No. 2092.*)

“Erection of a Howe Truss Bridge over the first crossing of the Columbia River, British Columbia, on the Canadian Pacific Railway.”

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A DESCRIPTION of rapid track-laying on the Canadian Pacific Railway having appeared in the Minutes of Proceedings,¹ it may be interesting to put also on record the manner and time in which the above bridge was erected.

How the ice on the Kicking Horse and Columbia Rivers would break up in the spring of 1885 being only a matter of conjecture, it was considered necessary to press the construction of the Columbia Bridge, in order to avoid accidents which might occur to the temporary structure for carrying the line over when the ice broke up.

This temporary structure consisted of pile bents, in places carrying 20-feet and 25-feet trestles. The height from rail-level to low-water was 45 feet. The bays were not all of the same length, there being longer ones where the east abutment, pier, and west abutment for the permanent bridge were to be built. In the lesser heights there were four piles to a bent, and in the greater ones six. There were two pile-drivers, each worked by two pairs of horses. All the trestle-work was of green timber, 12 inches square in section, obtained by the axe on the spot. The stringers that carried the ties and rails were all 12 inches by 15 inches; for spans of 15 feet there being five stringers, and for spans of 20 feet six stringers. At the highest places the trestles were stiffened by horizontal cross-braces just above the water-line.

The pier crib was originally designed to support masonry to be carried on piles inside the crib, but as driving these piles would have caused delay, as well as because the piles would not drive

¹ Minutes of Proceedings Inst. C.E. vol. lxxi. p. 383.

well, they were left out, and the crib filled up with stone. Eventually piles were driven outside the pier to hold the rip-rap outside together, and to strengthen the bottom. The foundation was hard gravel, fairly smooth on the surface. The pier was close built, and only settled 0·9 foot after it had taken the weight of the trusses, for which an allowance of 0·7 foot had been made.

The trusses were of the Howe pattern, with wrought-iron tension-rods and cast-iron angle-blocks. The timber was all procured in the vicinity of the bridge, at a saw-mill erected by a contractor; it was cut, sawn, framed, and erected without any delay, Douglas fir and white pine being used for the more important parts, and spruce for those of less importance.

As an insurance against floating ice, pile clusters were driven at various points, from which it was proposed to range out booms to guide the ice and driftwood coming down the river through the bridge; but these booms were not necessary, the bridge having been completed before the ice broke up; and besides, the ice disappeared quietly and silently, melting away by degrees, the water not rising, and not a single piece of ice was seen floating down the Kicking Horse or Columbia Rivers.

The trestlework was originally designed to act as a falsework for the trusses, but as it had not been erected exactly as designed, it was decided to bolt on to the trestle-work false cross-walings to take the bottom chords, on top of which an independent false-work was erected to take the top chords in the ordinary way.

The trusses were calculated to carry a load of two 74-ton Mogul locomotives, followed by 2,000 lbs. of freight per lineal foot, the factor of safety being 8, and they are reckoned to last seven years. The deflection of the west span, with a load of one 34-ton locomotive and eight cars heavily loaded with stone, was 1·2 inch, with a permanent set of 0·2 inch; and the east span gave a similar result.

The time taken to frame and erect the crib, frame and erect the trusses, drive the piles, take down the temporary work, and stack any good material alongside the line on shore, and putting stone inside and outside the crib, was from the 7th of February to the 14th of March, 1885; the actual time for erecting the trusses, including taking up, stacking and re-laying track, was sixteen days. In criticising the time, it should be remembered that picked men were not invariably employed.

COST OF LABOUR.

		\$	Cents.
295	men days framing and erecting crib to pier at	2 75	811 25
500	" " framing trusses "	2 75	1,375 00
650	" " erecting " "	2 75	1,787 50
80	" " erecting approaches to trusses "	2 75	220 00
35	" " taking down temporary work "	2 75	96 25
36	" " lifting and stacking old material "	2 75	99 00
4	team " " " " " " " " " " " "	6 00	24 00
162	men " {stone filling to crib and rip rap } outside }	2 25	364 50
73	cars stone, \$1.25 per cub. yd., 730 cub. yds.	12 53	915 00
12	team days pile work } 1,428 lineal feet . {	6 00	72 00
96	men " " " " " " " " " " " "	2 50	240 00
Total			6,004 50

The Paper is accompanied by two sheets of drawings, from which Plate 8 has been prepared.

* * Mr. Stoess writes, under date the 30th of August, that "It is expected to connect the track by the end of October. The 'grading'—i.e. earthwork, tunnelling and rockwork—is practically completed to the second crossing of the Columbia river, a further distance of 45 miles, notwithstanding that the location has been changed since January, when the ground was covered with snow to a depth of 7 feet, and the grading was only commenced at the end of March."—SEC. INST. C.E.

CANADIAN PACIFIC RAILWAY
BRIDGE OVER 1ST CROSSING OF COLUMBIA RIVER B.C.

TRESTLE BENT.

Scale, 10 Feet = 1 Inch.

Feet 10 9 8 7 6 5 4 3 2 1 0 10 20 Feet

TEMPORARY STRUCTURE.

Scale, 100 Feet = 1 Inch.

Feet 100 50 0 50 100 200 Feet

PERMANENT ABUTMENT.

Scale, 10 Feet = 1 Inch

Feet 10 9 8 7 6 5 4 3 2 1 0 10 20 Feet