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THE TAY BRIDGE.



short history of this remarkable structure, which was partially destroyed on the last Sunday night of 1879, may form an interesting sequel to Major-General Kilner's letter, in our March number, on the subject of its destruction.

The bridge was constructed by the North British Railway Company with the object of shortening the route between London, Edinburgh, and Aberdeen. The following description is taken from articles by Mr. Grothé, C.E., who superintended the works as representative of the

contractors :

Mr. Thomas Bouch, years ago, proposed the bold plan of bridging them both—the Forth at Queensferry—and the Tay about a mile above Dundee. While the desirability of such a scheme was generally recognised, the most sanguine hardly believed that it would ever be realised; but they overlooked the fact that while our wants increased, engineering science had not remained stationary, and that by modern improvements in machinery and appliances, facts could now be accomplished which, even twenty years ago, would have been classed amongst impossibilities. Mr. Bouch's earnestness, and great reputation as an engineer, at last gained the victory over the doubt of those who had to support him, and, in 1869, the company applied for and obtained the Act of Parliament which authorised them to build the Tay Bridge, and raise the necessary capital on shares—the North British Railway Company guaranteeing an interest of $5\frac{1}{2}$ per cent. from the time the bridge was expected to be finished, viz., three years after it should be commenced. On May 8, 1871, the next important step was taken, viz., that of entering into an agreement with an experienced contractor for the execution of the work. Mr. Charles de Bergue, from London and Manchester, the accepted contractor, had acquired great fame in the

erection of large bridges in nearly all parts of the world, but almost immediately after the signing of the agreement he became seriously ill, so that he could not take an active part in the execution. At his death, in 1873, complications arose which had a retarding influence on the progress of the work, and the contract was annulled by mutual consent of the parties, and transferred to Messrs. Hopkins, Gilkes & Co., Limited, of Middlesborough.

At the site of the bridge, the Firth of Tay is about two miles broad. On the south side trap rocks rise abruptly to a height of about 50 feet out of the water; on the Dundee side they have a more gentle slope. In both cases they very soon disappear towards the centre of the river, and are only found at depths which put it out of the question to use them as a foundation for the various piers. Their place on the river bottom is partly taken by clay and boulders, partly by sand; and under the latter, in depths of about 18 feet, a stratum of gravel is found, which is quite capable of sustaining the weight which is to be put upon it. There are in all eighty-five piers, supporting spans of varying lengths, and differing according to the weight of the latter. Those piers which stand on the solid rock are entirely constructed of brickwork set in Portland cement. Portland cement plays a most conspicuous part in the construction of the piers, the first fourteen from the south side being entirely built with it up to the very top, and all the others up to 5 feet above high water where the ironwork begins. The piers which are not founded upon rock require, of course, an extended base to carry the great weight with safety. The former consist of two cylinders of 9 feet 6 inches diameter, while those standing on gravel, and supporting spans of the same length, have the diameter of these two cylinders enlarged to 15 feet, and their top weight is greatly reduced by substituting for the heavy brickwork above high water, cast-iron columns, fixed together by horizontal and diagonal transverse bracing. Thirteen of the spans over that part of the river which is generally used for navigation are 245 feet long, and the piers are so high that at the highest water there are 88 feet of clear waterway left—more than sufficient for the class of vessels plying from Dundee to places above the bridge. The girders composing these spans are placed so wide apart that the trains can pass between them, the roadway being fixed at the bottom of the girders. In the other parts of