"History and Construction of Westminster Bridge, accompanied with detailed Drawings. By F. Whishaw, M. Inst. C. E."

Westminster Bridge

This account of Westminster Bridge has been extracted from the very voluminous documents in the Westminster Bridge Office, access to which was given to the author of this paper by the kindness of Mr. Swinburne, the resident engineer to the Bridge.

The first act was passed in 1736, and empowered certain Commissioners to raise moneys by lottery. Three sites were pitched upon; the Horse-ferry, over against the Palace Yard, and over against the Woolstaple, which latter was finally fixed on. The scheme was violently opposed by the City of London and the Thames watermen. The Commissioners selected a very curious and well-designed wooden superstructure, by James King, but having determined that the bridge should be of stone, they accepted a proposal from Mr. Labelye to found one pier by means of caissons, and which he had offered to build at his own expense.

This bridge, so lasting a monument to the genius of Labelye, consists of fifteen semicircular arches, decreasing regularly in span by 4 feet from the centre, which measures 76 feet, to the sixth arch on each side, which is 52 feet in span; all the arches spring from the line of low water of 1736. The whole distance between the abutments is 1068 feet, with 870 feet clear water-way, and 198 feet solid. A peculiar feature in this bridge is, that the spandils are formed of radiated purbeck blocks with occasional bond stones, and the interior filled with ballast and rubbish.

The design of Mr. Labelye was the only one for laying the foundations of the piers under water, and the application of caissons for this purpose then first took place. The construction of these caissons and method of founding the piers by means thereof are fully described and illustrated. The piles were driven by an engine invented by Mr. Valoue, a watch-maker; it was erected on a platform, fixed on the top of a barge, and worked by three horses walking round and turning an upright shaft, on which was fixed a large cog-wheel and a drum, on which the rope was wound, and passing by pulleys to the top of the guide frames was connected with a follower furnished with tongs, as in the common pile engine. The number of strokes in an hour was about 150, at an elevation of 9 feet; the weight of the ram 1700 lbs. The piles were generally cut off; the time occupied in cutting off a pile about 15 inches square and 10 feet under water being not more than a minute and a half. The construction of the abutments and of the arches is fully described, and the quantity of stone employed in the middle

76-foot arch, and the two adjoining 72-foot, is stated; the expense of these three arches was £24,074.

The centres employed were on the principle of the diagonal truss; for the five middle arches three rows of piles were driven on each side to support the centres, and for the other arches only two rows. Each centre consisted of five ribs of fir timber, resting on transverse and longitudinal oaken plates. The five centres used on the Westminster side were afterwards used for the corresponding arches on the Surrey side; the striking of the centres was first performed by means of circular wedges of a peculiar construction; this mode however, from its expense, was superseded by straight wedges.

A most interesting portion of the history is that which relates to the 15-feet sunken pier. There was no piling under the caisson bottoms, and the removal of gravel of the bed of the river very near the pier in question occasioned consequently a sinking. The progress and nature of the sinking are accurately detailed. The south point had settled 14 inches and the north point 13 inches; and the sinking still going on, it was determined to remove the superstructure above the sunken pier and damaged arches; the sinking still continued, but at last appeared to stop, and the whole amount was found to be 3 feet 4 inches at the north-west angle, and 2 feet 7 inches at the south-east angle, of the pier. Centres were erected under the two damaged arches; the adoption of which plan was recommended to the Commissioners in the following words: "If the pier should settle much more it is not in the power of any mortal agent or agents to hinder the arches from following it, as long as it is possible; and therefore, in that case, the two arches instead of parting asunder, and their materials falling into the river, and not to be taken up without a great expense of time and money, will be received and their materials supported and secured, in order to their being regularly unbuilt." The pier, however, lightened as above described, did not continue to sink, and the weight over the piers was considerably reduced by introducing segment arches over the 15-foot pier, and half arches over the adjoining piers, leaving a considerable void space beneath each.

Labelye presented to the Commissioners several reports on the open joints, on the sunken pier, on the Surrey New Road, and on the completion of the works. These are most interesting, serving, as they do, to exhibit the state of engineering at that time in the country.

A detailed account is also given of the ingenious wooden superstructure designed by Mr. James King, and of Mr. Batty Langley's design for a wooden bridge at the Horse-ferry. The author has also

collected, at immense pains, the prices of materials and of labour as paid in the erection of Westminster Bridge; he has also compiled a journal of works from the commencement of the undertaking to the time the bridge was opened. These most interesting and instructive documents are collected from the voluminous records deposited in the Bridge Office.

The paper is accompanied by an atlas of eleven drawings, shewing the site and all the details of the bridge, with fac-simile signatures of Charles Labelye the engineer, and Messrs. Jelfe and Tufnell the contractors.

May 29, 1838.

The PRESIDENT in the Chair.

James Routh and B. Townshend were elected Graduates; and F. Braithwaite, J. Milner, N. King, J. Richards, P. Henderson, were elected Associates.

Decomposition of Water.

The minutes of the conversation on the explosion of Steam Boilers were read, and Mr. Lowe stated that the ordinary process of making water gas shewed that an iron plate would readily decompose steam or water. The decomposition of water goes on extremely well until the oxidation of the tube has advanced to at least $\frac{3}{16}^{\text{ths}}$ of an inch. An iron tube begins to make gas extremely fast at first, and continues until the tube is cased with a thick crust of protoxide of iron.

Thames Tunnel.

The drawings of the Shield at the Tunnel were exhibited, and Mr. Brunel explained the construction of the Shield, and the manner in which it is advanced and worked.
