

and the supposed reasons for the sinking are given, with the means which were adopted for replacing those stones which had been displaced, and it is stated that no sinking has since occurred.

The paper is illustrated by eighteen remarkably well executed drawings (Nos. 3426 to 3443) by Mr. Butterton.

Captain W.
S. Moorsom.

Captain Moorsom said that there were a few interesting particulars relative to the bridge, beyond those which were given in the paper. Mr. Murchison * showed, in his work on the Geology of the Silurian districts, that the deposits of gravel of the Lickey range of the hills nearer to Birmingham, and that of the Avon near Pershore, were, geologically speaking, identical; but Captain Moorsom found that, as regarded the engineer's operations, they differed in character.

The gravel in the neighbourhood of Birmingham was remarkable for the rounded character of the stones composing it, whereas that which was found in the neighbourhood of this bridge consisted almost entirely of angular stones, which were used without any admixture of sand, for making concrete, which was found to become most compact when the stones were perfectly clean; but the Birmingham gravel required a certain proportion of sand with it, to make compact concrete.

In excavating for the foundations of the abutments several bones of deer and a human skull were found, at depths from 10 to 14 feet below the level of the bottom of the river.

The circumstances attaching to the partial failure of the small southern abutment arch were peculiar. It had been supposed to arise from the expansion of the iron-work taking place all in one direction, but after watching the arch for six months, he thought such an opinion was to a great extent unfounded; and he conceived it to have arisen partly from the abutment wall having slightly sunk at the back, owing to the great quantity of rain which fell at that period, affecting the spongy soil upon which it was built.

For seven months the valley of the Avon, at the spot in question, was (with a very few days' intermission) under water, immediately after the walls had been built, and before the bridge was nearly completed. An amount of sinkage which was scarcely perceptible in the back of the foundation of the wall, would have the effect of displacing the stones of the arch to the extent of some inches, and it was to this cause that he attributed the separation of the arch stones. As soon as the settlement appeared to have ceased, the defective

* Silurian System, vol. i., p. 524.

stones were taken out and replaced, without interrupting the passage of the trains.

The north-eastern wing wall also failed from the same cause, viz., the spongy nature of the soil when it was thoroughly saturated with water; and if this had been foreseen, prevention would have been easy, by placing a firmer and more extended base of concrete under the footings of the wall.

He thought that the method of forming the piers, was as good and as cheap, as any known mode that could have been adopted; but if he had to build another bridge of the same dimensions, and under similar circumstances, he would not use cast-iron, but would construct it of timber, not on account of any engineering difficulty, but simply because a timber structure would be very much cheaper, and equally serviceable for the purposes of the railway, taking into account comparative durability as well as present cost.

No. 646. "Description of a wrought-iron Lattice Bridge, lately erected on the line of the Dublin and Drogheda Railway." By G. W. Hemans, Grad. Inst. C. E.

This kind of bridge is stated to have been first used in America, where timber being so abundant, the lattice sides are formed of that material, and consist simply of planks three inches thick, crossed so as to form deep beams, and secured with oak trenails at all the inter-sections. Iron
Lattice
Bridges.

The bridge described in this communication, is situated about three miles from Dublin, over an excavation of 36 feet in depth; its span is 84 feet in the clear, and the two lattice beams are set on edge parallel to each other, resting at either end on plain stone abutments built in the slope. These beams are 10 feet in depth, and are formed by a series of flat bars of wrought-iron, $2\frac{1}{2}$ inches wide, and $\frac{3}{8}$ inch thick, crossing each other at an angle of 45° . At a height of 5 feet 6 inches above the bottom edge, transverse bearers are placed, formed of $\frac{1}{4}$ inch angle-iron, 6 inches deep, and set 2 feet apart, similar to the cross ties now used for the decks of iron steam-vessels, and upon these the planking for the roadway is fastened.

The account of the mode of construction, and of the raising and fixing the lattice-beams, by Messrs. Perry of Dublin, the contractors, is given in detail.

The author states that some deflection or sagging of the lattices was expected, and was provided for, by constructing each of them with a camber or gradual curve from the ends, amounting to 12 inches in