

INSTITUTION
OF
CIVIL ENGINEERS.

SESSION, 1844.

January 9.

The **PRESIDENT** in the Chair.

No. 591. "Description of cast and wrought iron, trussed-girder Bridges on the line of the Bishop Auckland and Weardale Railway." By John Storey.

Trussed
Girder
Bridges.

The author states, that his attention has been long directed to the expensive construction of the brick and stone bridges, usually erected over and on the line of railways, and the apparent want of durability in the timber bridges, which have in some instances been substituted; as well as to the cast iron bridges, which have generally been constructed in situations where the height between the top of the rails and the level of the roads which they span, was so limited, as not to admit of a stone or a brick arch. In the latter cases, cast iron girders have been employed, but their great weight has rendered them expensive, and has obliged the abutment piers for supporting them to be very substantial.

In order to obviate these objections, the author has introduced combinations of cast and wrought iron in forms, which he contends, may be advantageously adopted for occupation bridges, or even for carrying the railway, and that they may be constructed at a less cost than stone, brick, or even timber bridges.

These bridges consist of longitudinal and segmental girders of cast iron, abutting against each other at the ends, secured together by bolts and nuts through the flanches, and resting on masonry abutments: a system of wrought iron tie-trussing is then applied, and struts are placed at certain distances where they are requisite. As

many of these principal trusses are used as the strength of the bridge demands, and they are connected by transverse braces and distance pieces of cast iron, thus preventing undue outward pressure; sockets are cast upon the girders, to receive the timber joists, and the platform is covered with Dantzic deal planking spiked to the joists. The wrought iron struts at the top, clasp the girders to which they are also firmly bolted, and their lower extremities pass through the truss, so that on the nuts being screwed up, the truss is brought to its proper degree of tension, and being made sufficiently strong to bear the weight calculated for the bridge, independent of the segmental girders, the weight and strain are brought upon the abutments in the most favourable manner.

Bridges thus constructed do not require any centering for their erection, as each side may be put together near the spot, and by means of purchases, may be lifted entire on to the abutments, or the whole bridge may be put together before the earth is excavated from between the abutments, excepting only as much as is necessary for receiving the trussing.

The dimensions are given of occupation bridges, calculated to bear 8 tons, which is stated to be a greater weight than is required by the landowners. The total weight of cast and wrought iron in an oblique bridge of a span of 86 feet 3 inches, and 11 feet wide, is 11 tons 7 cwt., and that of a square bridge of 106 feet 6 inches span, and 11 feet wide, is $14\frac{1}{2}$ tons: their total cost, including excavating the ground, the masonry, stone penning on the sides of the excavations beneath the bridge, the timber work and the painting, was, for the former £280, and for the latter £342. These sums are stated to be much less than the expense of similar bridges of stone or even of timber.

A design is given of a stronger kind of bridge of similar construction for carrying two lines of railway. The span is 90 feet, and the width 22 feet, between the side railings: the weight is 43 tons, and the total cost, including the masonry, is estimated not to exceed £1200. It is calculated to bear about 50 tons, which is as much as could be brought upon it by any passing train.

The author proposes to adapt this system of construction to bridges for crossing rivers, &c., in order that by the lightness of the piers, and their having to bear only a vertical thrust, the water-way may be less impeded than it is at present by the usual heavy stone structures.

A design is also submitted for a bridge, to consist of parallel cast iron girders, trussed with wrought iron bars, in such a manner, as to convert the depth of the girder into a strut, the weight of the passing load being entirely resisted by the tensile strain of the bars.

The author does not claim the introduction of wrought iron trussing for cast iron girders, as he is well aware of its being constantly practised, but he believes that it has not been commonly done to the extent which he proposes, and being satisfied of the practical utility of the system, he was desirous of bringing it more prominently under the notice of engineers through the medium of the Institution, and also of inviting discussion upon the plan, one great merit of which is, that it uses a material produced in this country, better and cheaper than elsewhere, and assists one of its staple manufactures, which is at this moment much depressed.

The communication is accompanied by five drawings of bridges, (Nos. 3409 to 3413) fully illustrating in detail the various modes of construction treated of.

Captain W.
S. Moorsom.

Captain Moorsom stated, that occupation bridges of 60 feet span by 18 feet in width, could be constructed of timber for £5 per lineal foot, including the cost of the excavation, the masonry of the abutments, &c.; that up to 90 feet or even 120 feet span, the expense would not exceed £4 per foot. He preferred timber bridges for railways, not only on account of their simplicity and the facility of repairing them, but also because a good deal of the small timber, which would otherwise be wasted, or used at a loss, might be made available for such bridges, and thus a useless expenditure for materials was avoided.

Mr. Grissell.

Mr. Grissell was also of opinion, that timber bridges could be constructed more cheaply than those of iron, as recommended in the paper. So much wrought iron would, he apprehended, materially increase their cost.

No. 611. "Description of a cast iron Bridge, completed in the year 1840, for carrying the Birmingham and Gloucester Railway over the River Avon, near Tewkesbury." By Captain W. S. Moorsom, Assoc. Inst. C. E.

Cast-iron
Bridge.

This bridge is situated about seven miles north of Tewkesbury: the approaches to it are formed on embankments about 25 feet high, crossing the valley nearly at right angles. In the construction it was desirable to provide for the effect of considerable floods, by aiding the egress of the water, and also to avoid any interference with the