

which influenced his decision on that occasion have been in any degree weakened by the successful use of the Niagara Bridge.

Whatever opinions may be entertained on that point, there can be only one in relation to the superior fitness of the "tubular" plan for the Victoria Bridge, as compared with the suspension principle, after reading the subjoined portion of Mr. Stephenson's report :

"Having given you my views with respect to the comparative merits of the different kinds of roadway, consisting of "beams" that may be adopted in the Victoria bridge, I now proceed to draw your attention to the adaptation of the "suspension" principle, similar to that of the bridge which has been completed within the last few months by Mr. Roebling, over the Niagara River, near the great "Falls."

You are aware that during my last visit to Canada I examined this remarkable work, and made myself acquainted with its general details, since then Mr. Roebling has kindly forwarded to me a copy of his last report, dated May 1855, in which all the important facts connected with the structure, as well as the results which have been produced since its opening for the passage of railway trains, are carefully and clearly set forth.

No one can study the statements contained in that report without admiring the great skill which has been displayed throughout in the design ; neither can any one

pension principle may be applied ; but until it is made rigid, I have my doubts about it." In answer to the question, "Do you think the present Menai Bridge could be so altered and improved and strengthened as to be made able to support a Railroad?" Mr. Stephenson replied, "I think it might ; but it would leave it merely a Suspension Bridge, which I do not like."—*Minutes of Evidence before the Select Committee on Railway Bills*, 1845.

In his history of the design of the Britannia Bridge, alluding to the difficult position in which he was placed by the requirements of the Admiralty, he says: "In this position of affairs I felt the necessity of reconsidering the question whether it was not possible to stiffen the platform of a suspension bridge so effectually as to make it available for the passage of railway trains at high velocities." \* \* \* \* "Amongst a variety of devices for the accomplishment of this object, the most feasible appeared to be the combination of the suspension chain with deep trellis turning, forming vertical sides traversed by the suspension rods from the chains, with cross bearing frames top and bottom to retain the sides in the proper position, thus forming a roadway surmounted on all sides by strongly trussed framework."

"A structure of this kind would no doubt be exceedingly stiff vertically, and has indeed been applied and successfully employed in America on a large canal aqueduct, and is clearly described in the 'Mechanics' Magazine' for 1846."

"The application, however, of this principle to an aqueduct is perhaps one of the most favourable possible, for there the weight is constant and uniformly distributed, and all the strains consequently fixed both in amount and direction: two important conditions in wooden trussing constructed of numerous parts. In a large railway bridge it is evident so far from these conditions obtaining under any circumstances, they are ever varying to a very large extent ; but when connected with a chain which tends to alter its curvature by every variation in the position of any superincumbent weight, the direction and amount of the complicated strains throughout the framing become incalculable, so far as all practicable purposes are concerned." \* \* \* \* "It was reverting to this bridge" (a small wrought iron box girder) "that led me to apply wrought iron with a view to obtaining a stiff platform to a suspension bridge, and the first form of its application was simply to carry out the principle described in the wooden suspended structure last spoken of, substituting for the vertical wooden trellis turning and the top and bottom cross beams, wrought iron plates riveted together with angle iron. The form which the iron now assumed was consequently a high wrought iron rectangular tube, so large that railway trains might pass through it, with suspension chains on each side."