ering the design of such a bridge as that to be erected for the Grand Trunk Railway of Canada

Independently of the comparative weights and cost, which I believe have been fairly placed before you, the comparative merits as regards efficiency have yet to be alluded to.

You may be aware that at the present time, theorists are quite at variance with each other, as to the action of a load in straining a beam in the various points of its depth, and the fact is not known, that all the received formulæ for calculating the strength of a beam subjected to a transverse load require remodelling; therefore, at present it is far beyond the power of the designers of *trellis* or *triangular* bridges, to say with precision what the laws are which govern the strains and resistances, in the sides of beams, or even of *simple solid beams*, yet one thing is certain, which is, that the sides of all these trellis or "Warren" bridges are useless, except for the purpose of connecting the top and bottom and keeping them in their proper position; they depend upon their connection with the top and bottom webs, for their own support, and since they could not sustain their shape, but collapsed immediately they were disconnected from these top and bottom members, it is evident that they add to the strain upon them; and consequently to that extent reduce the ultimate strength of the beams.

In the case of the Newark Dyke Bridge, when tested to a strain of 6¾ tons to the inch, its deflection was 7 inches in the middle, and when tested with its calculated load of one ton per foot run, the deflection was 4⅜ inches. The deflection of the Victoria tubes by calculation will not be more with the load of one ton per foot, than 1-6 inch; and we have sufficient proof of the correctness of this calculation in existing examples. That of the Boyne bridge with a uniform load of 530 tons, was 1-9 inch with the spans shortened in effect as described.

Much misapprehension has existed in reference to Mr. Stephenson's estimate of the fitness of bridges built on the suspension principles for railway traffic, and opinions have been attributed to him quite adverse to their safety or practicability for railway purposes. The present success of the bridge over the Niagara River is pointed to as a refutation of his supposed opinions, and as evidence that a cheaper structure on similar principles might have been adopted for the Victoria Bridge.

We doubt whether Mr. Stephenson ever entertained opinions such as we have alluded to. He certainly did not express any doubt of their *practicability*, either in his evidence before the Committee of the House of Commons in relation to the Britannia Bridge, nor in his published history of the design for that work. On the contrary, he at one time contemplated using the Menai Bridge for the Railway, and was deterred from so doing by considerations apart from those of safety,* and we do not believe that any of the reasons

* "I thought also that that span (360 feet) could only be exceeded by the adoption of the Chain Bridge, which I do not approve of for the passage of locomotive engines" * * * "I have thought of adopting another plan in connection with suspension which would render the platform quite rigid; and if the platform be quite rigid, then I think the sus-