classes of beams alluded to, which is, that *any change of proportion in the figure of a beam changes the amount of strain caused by the load, and consequently changes the weight of the beam itself.* The resistance to horizontal strain in the above classes of bridges, depends upon the distance between their top and bottom webs; such beams are said to vary in strength directly as their depths, and inversely as their spans. With regard to tubular beams, a practical rule has been established, which determines that the depth shall not be less than 1-15th of the span; but although this is the minimum depth given, there is no reason to consider it the maximum depth; indeed, the tubular bridges just named are of a greater depth than that proportion would give; for instance, the depth of Ferry bridge is 1-11th of its span, and that of the Victoria tubes, next the centre opening, is 1-12th of the span. These proportions are, I believe, very similar to those that are usually adopted for "Warren" or trellis-beams.

It is well known that the diagonal "struts" in these latter systems when under pressure deflect as if they themselves were beams, and any increase in the depth of the sides would be an increase of length in the diagonals, which in the "Warren" must be compensated by an increase in their sectional area; and in the trellis-beam, if they are not increased in area, they must be in number, so as to make more intersections; therefore an increase in depth of the sides of these systems would not only be a proportionate increase in their weight, but would be an increase per square foot of their surface. Now, the sides of a tube, from their nature, may be increased in depth up to a reasonable practical limit, without any increase in their thickness.

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 who has seen the locality fail to appreciate the fitness of the structure for the singular combination of difficulties which are presented.

Your engineer, Mr. Alexander Ross, has personally examined the Niagara Bridge since its opening, with the view of instituting as far as is practicable, a comparison between that kind of structure and the one proposed for the Victoria Bridge; and, as he has since communicated to me by letter the general conclusions at which he has arrived, I think I cannot do better than convey them to you, in his own words, which are subjoined below.