APPENDIX NO. 3.

FROM THE "CHICAGO RAILROAD GAZETTE," JULY, 1870.

ENGLISH AND AMERICAN IRON BRIDGES.

Some two months ago tenders were solicited for the construction of iron railway bridges of spans of 100 and 200 feet, by the Intercolonial Railway of Canada, connecting Quebec and Halifax. This call was very generally responded to, there being tenders put in by nineteen English, one Belgian, and sixteen American bridge-builders.

The specification, which was a rigid one, called for uniformity of strength, but left the design open to each person. The bridges were all to be of wrought iron, capable of bearing 1½ gross tons per lineal foot, in addition to their own weight, without straining the iron in tension to over 10,000 pounds per square inch. The iron of the 200 feet spans was to be capable of bearing 60,000 pounds per square inch before breaking, and that of the 100 feet spans 50,000 pounds per square inch.

Much interest was felt as to the result of this competition, which was virtually one between English and American systems of bridge building. The decision was that the long spans were awarded to an American firm, Messrs. CLARKE, REEVES & CO., of Phoenixville, Pa., and the short spans to English bridge-builders, the Fairbairn Manufacturing Company, of Manchester. Of the thirty-six plans submitted, only three or four were rejected on account of not coming up to special strength.

The bridges of Clarke, Reeves & Co. were selected for the long spans, not only as being undoubtedly first-class, both in material and workmanship, but also as being the lowest responsible tender. Some curiosity has been expressed to know how American bridge-builders, using high-priced iron, and paying higher wages for labor than their English competitors, could yet build a less costly bridge.

While it is to some extent true that the specifications allowed of a lower quality and less expensive iron for the 100 than for the 200 feet span, yet one of the principal reasons why an American firm was lowest on the long and an English firm on the short spans is owing to the less weight of iron required by the American system of bridge, and this is more apparent the longer the span.

Some persons erroneously suppose that the more iron there is in a bridge the stronger it will be. But a little reflection will show that it is only the iron that is working, or, in other words, that is actually strained by the load, that contributes to the strength of the structure. All the rest is dead weight, and merely weighs down the bridge. In very short spans this is not disadvantageous, as it tends to diminish vibration, but in long spans where the weight of the bridge much exceeds that of the load passing over it, every pound of iron that does not contribute to the strength of the bridge is a positive injury. To illustrate this more clearly: if one bridge weighs 125 tons and another 250, and both are strained by the rolling load 10,000 pounds per square inch, the lighter is the stronger of the two. But if the 125 ton bridge be strained 10,000 pounds per square inch, while the 250 ton bridge is strained only 5000 pounds per square inch, then the latter has really double the strength and double the life of the former; for half the iron may corrode away, and then the working area of the bar will be equal. It is not clearly perceiving this fact—that the strength of the bridge depends upon the working area of its part—that has led our English friends to make such heavy bridges.

In several plans, if the strain per square inch are alike for similar loads they must all be of the same strength, providing the connections are equally perfect. Some take more iron than others to effect the result, but the result is the same.

The lightness of American bridges is due—1st, to the concentration of material along the lines of strain, which enabled a lighter web system to be used, and hence a higher truss; 2d, to this greater height of truss, which throws less leverage on the upper and lower chord system, and hence requires less iron in their members; 3d, to the use of eye and pin connections instead of rivets, by which there is no waste of metal to compensate for the deduction of rivet-holes.

American bridges are stiffer vertically and better braced laterally than English bridges, their greater...