sheets, and the fact is strikingly illustrated in the competing cantilever plan for which, to avoid such strains, remodelling is required.*

IV.—Perfect fulfillment of the requirements, not merely of our "specifications," which leave some latitude for arrangement, but of convenience, in the disposal of the thoroughfares.

The ample width of 57 feet, from outside to outside of external arches, allows to be centrally placed (as it should be) the railway track, while the two outside compartments are given up to exclusive use of the two roadways, each with its sidewalk. The breadth of base which allows this ample room for the thoroughfares, is also an important element in the stability of the bridge against wind strains.

V.—Superiority in the main elements which constitute the structure, and fewness of parts.

The great bearing elements, i.e.: the main "arch" of each "lunette," or half strut, the abutment strut which continues the arch form to the ground, and the columns of the piers, etc., are made of the "Phœnix columns," admittedly the best wrought iron "post," or compressive member, yet designed, and, in my opinion, incomparably preferable to the latticed channel-iron posts, or compressive members, we find in all the other competing designs. The Phœnix columns have been found experimentally to have (see Bender, "Iron Truss Bridges in America," p. 35) an ultimate strength far higher than given by Hodgkinson's and Gordon's formulas, by which it is usual (as our specifications require) to determine the quantity of metal in such members. These members, therefore, thus calculated, possess an excess of "safety" beyond our safety "coefficients." But not only do they possess this extra strength, but they have been calculated (according to the specifications) so as in no case to receive a compressive strain of more than 8,000 pounds per square inch. Under the formula which follows this specification, but which was qualified by it, for compressive members

*See on this point Mr. Bender's pamphlet, "Iron Truss Bridges in America," p. 24, §2.