I conclude, on the whole, that the trusses before us (without including the feature of the arch), will be quite as stiff as are the Niagara trusses. The latter proving stiff enough for all practical purposes, this comparison ought to be considered quite satisfactory; at any rate, more so than a complicated mathematical reasoning, which is apt to mislead when formulas are based upon false premises.

My observations on the Niagara bridge satisfy me that the comparison I am offering here will be sustained by experience. But the case before us assumes a different aspect when we add the arch, and thereby increase the depth of trussing to 44 feet in the centre. Who will doubt the rigidity of this superstructure! And when we add still more to this rigidity, by relieving the spandrels almost entirely of vertical strain, by the effective assistance of the stays, we may feel assured that ample provisions have been made to meet the variable action of passing loads.

When compressive action takes place in chords and arches, experience has demonstrated that four tons of 2,000 lbs. each, or 8,000 lbs. per inch maximum pressure, is as much as soft, puddled iron should ever be taxed. But this resistance depends so much upon lateral conditions that the above allowance of four tons would scarcely be safe for single arches not assisted by cables. But the great feature of safety in the Parabolic Truss is the cable. The arch is only an auxiliary to the cable. With ordinary loads, the cables and stays will support the greatest part of the strains; and the more they are strained the greater their tendency to maintain their vertical positions, and to assist the arches in preserving their true alignment. Lateral flexure is the great danger to arches. The more jointed and articulated the system is, the greater is this danger. Now, these considerations must be taken into view when deciding upon the choice of material for the arches. The question of steel or iron is of course a question of comparative estimate. But if, for instance, we allow 8,000 lbs. maximum compression for iron, and 12,000 lbs. for a mild Bessemer steel, and the steel arch costs the same as the iron arch, both possessing the same supporting strength, then, I say, the iron arch should by all means be preferred to the steel arch, and for the following reasons:

1. The greater section of the iron arch will insure greater lateral stiffness than can be obtained from the diminished section of soft steel.

2. The greater weight of the iron structure adds to its stability under the action of variable loads in direct proportion to its superior weight when compared with steel. Vibrations caused by fast-moving trains will be felt more by the lighter structure than by the heavier one.

As the length and weight of spans increase, in the same ratio will the comparison turn in favor of steel. But experienced engineers will be slow before they endorse the general opinion now so much prevailing, and so often repeated without any discrimination, in favor of steel, and even steel of high temper.

Before closing my remarks on arches, I will add, that one of the best features of the Parabolic Truss as here designed, is, that the principal members of this system are nearly uniform in their sections, and that they are not alternately exposed to such opposite strains as compression and tension in succession.

The cables and stays experience tensile strains only, while the arches are exposed to compressive action alone. This feature will add much to the lifetime of the structure.

An objection may be raised to the parabolic form of the arches, because of the variation of bevels at the joints. The difference, however, between the segment of a circle and the parabolic curve, with the proportions here observed, is so small, that the substitution of the one for the other will not have the slightest practical influence. It will therefore facilitate the work, to cut all the joints to the same bevel for a circular arch. Respecting the cables, however, I advise that the suspenders be calculated for a parabolic curve.

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**FLOOR-BEAMS.**

The beams supporting the railroad track are 5 feet apart and 12 inches deep, and weigh 40 lbs. per linear foot. If manufactured of good iron, a load of 23 tons, equally distributed, will not produce a sensible deflection, and a load of 15 tons on the two rails will be far within its elastic limit. The lower flange of each beam is riveted to the upper flanges of the channel-bars composing the chords, 16 rivets of 1 in. diam. for each beam. This forms a very stiff horizontal connection of the opposite chords, and renders all further diagonal bracing unnecessary. This stiffness is further increased...