with perfect uniformity in all its parts, so that all the different members will be exposed to the same uniform proportional strain. Uniformity of strain in a plate-girder, in a lattice-girder, or in any other triangular or panelled truss, is out of the question. The arch alone, upright or suspended, comes nearer than any other system toward fulfilling this condition. When a load is placed upon any one point of the arch, the compression or tension thereby produced upon its section will be felt nearly alike throughout its whole extent, so long as its statical form is maintained. The capacity of the arch to maintain its form, is strongest about the centre. Impressions upon the haunches are more apt to produce dislocations in other corresponding parts. To meet this weakness, stays are introduced next to the towers. So far as they extend, they are strong enough to support the maximum weight of that part of the structure as well as the load. Each stay in connection with the floor and tower, forms a fixed triangle. This simple system of stays, as here designed, is the perfection of trussing. Nothing can be more perfect, or more simple, effective, and economical. In the Niagara, Cincinnati, and Alleghany bridges, the conditions upon which the true action of stays depend, are only partially fulfilled because of the different material of the towers and the neutrality of the floor. And yet with these drawbacks, the stays in these works answer such an admirable purpose, that they could not be supplanted by another arrangement. But in the plan before us, all parts are composed of the same material, and are allowed to expand and to contract freely, and consequently their harmonious action cannot be disturbed on that score.

Suppose the section of the arch was doubled, and made strong enough to support a maximum load and the superstructure. And suppose, further, that its ends were connected by a chord strong enough to resist the thrust; all that would then be needed, would, by common consent, be spandrels of sufficient stiffness to preserve its form under the action of variable loads. No engineer would doubt the stability of this simple arch. Now, in the plan before us, we employ the same arch, but of only half the section. This deficiency of strength is made up by the suspended arch; and in place of heavy spandrels we introduce a light panel-trussing throughout its whole extent, which will be found more effective in reality than any system of spandrels can possibly be made. This panel-trussing, judging from my experience on the Niagara bridge, will be found abundantly effective to preserve the form of the arch. If there were no adjoining spans, and if there were no necessity for towers for the support of the cables, nothing more would be needed. But the towers being there, the application of stays becomes at once one of the most economical as well as most efficient means to still further secure the stability of the whole system. Only 14 panels are left without stays in the centre opening, reducing this distance to 280 feet. In this space the arch and the panel-work have to maintain their form alone, not counting upon the assistance of the cables. With reference to stiffness alone, the plan before us may also be considered in the light of a simple bowstring-girder, with this difference in favor of the Parabolic Truss, that the haunches of the arch are greatly assisted by the stays.

The harmony of action between the arches and cables, when under the influence of variable loads, now remains to be considered. Inside of the space of the central opening, between the two longest stays, a distance of 280 feet, a want of uniformity of action is utterly impossible, because the least impression upon the arch will be equally felt by the cable throughout its whole extent, and will be checked by the upward resistance of the superstructure. As the cable becomes depressed, every other point tends to rise, but is prevented by the weight and stiffness of the truss, the arch, and the panels. Considering now that the weight of the middle span is 640 tons, the local impression made by a 10-ton locomotive will be no more than is due to the natural elasticity of the material composing the truss. The cables being the most sensitive members of the system, their action will greatly tend to spread every local impression over a large extent, and thus neutralize its effects by engaging all parts of the system to resist.

So far as the stays extend, no local depression whatever can be produced, because every attachment of stay forms a fixed point, which, in connection with the arches, cables, and panel-braces, will be found sufficiently rigid to resist the severest local action beyond that due to the natural elasticity of the materials. I am very positive in this statement, because my observations on the suspension-bridges I have built fully justify me in making it. If any one will take the trouble to scrutinize the action of the Niagara bridge under the passage of a single heavy locomotive and tender, with sufficient care and attention, and, by means of a level placed in one of the towers, will observe the progressive depressions of that structure, which take place from the tower toward the centre, he will discover scarcely any depression inside of the reach of the stays. Beyond the stays, toward the centre, the depression increases rapidly, and becomes greatest in the centre. Similar facts will be noticed on the Cincinnati bridge, under the action of a number of heavily-laden trains, following each other in close succession. I again repeat, that stays properly applied offer the most efficient, and at the same time the most economical means of support and stiffness.

The cables and stays are securely fixed upon the cast-iron saddles, which are mounted upon the tops of the wrought-iron towers by means of cushions, held down by screws. The height of the towers being 62 feet above the base,