GENERAL DESCRIPTION.

and the supporting columns of an elastic material, they will yield a little, when one span is fully taxed with a maximum load, while the adjoining spans are empty. This yield will be imperceptible to the eye, but will, no doubt, be susceptible of measurement. And as this movement will not result from the free working of the different members of the system, but will be entirely due to the elastic yield of the materials, it may be repeated indefinitely without impairing the integrity and safety of the structure.

Since wire possesses a much greater degree of elasticity than bar-iron, one very great advantage of the cables and stays will be, that ordinarily, when not taxed by any load, the greater part of the weight of the structure will be borne by the wire. Under the action of light loads, the cables and stays will continue to bear the greater share; but when taxed with heavy trains, then the arches will also receive their full proportion. When the structure is relieved, the cables and stays will again contract and support the largest share. And so long as this process is kept within the limits of natural elasticity, allowing for an ample margin, the structure will remain perfectly safe and intact.

Each of the two cables is represented in this plan as composed of 19 wire-ropes. Ropes will be found in practice to be the most economical means of forming the cables; also the easiest to put up, and the quickest. But cables made of wire laid parallel may also be constructed by those who have experience in this process, and know how to make a good cable. But I will state the fact here, that the same amount of wire laid parallel into cables will give less strength than the same amount of wire laid into rope. Provided the lay in the latter is long, and that its manufacture has been conducted with the necessary care and proper machinery. It is impossible to obtain perfectly uniform tension in a parallel cable, but it is possible to do so in a rope. The cost of the two, per pound, will be about the same, and of course the strongest should be preferred.

In place of making the cables of wire, they can also be made of iron or steel bands, provided the bands are rolled full length, so that they can be laid into the cable without splicing. The rolling of bands, say four inches wide and a quarter-inch thick, and one thousand feet or more in length, is a process which has never been attempted. But this process is perfectly practicable, on a continuous mill, constructed on the same principle as is Mr. Bedford's train, of the firm of Richard Johnson & Nephew, of Manchester, England. The billets are, of course, to be heated in a long Siemens' furnace, in close proximity to the train. Such a train, indeed, would be more simple than Mr. Bedford's rod-train.

The greatest difficulty in the application of bands to cables will be the fastening of the ends; but I shall, in a later number of this work, give such plans and directions as will enable those who will undertake it, to accomplish it in a proper way.

I have spoken of the different methods of constructing cables, for the purpose of meeting the charge of self-interested motives on my part, myself being engaged in the manufacture of wire-ropes. In a later number of this work I also propose to give a full description of my method of constructing parallel cables, which will enable others to apply the same in their own practice.

Plate I. shows an elevation and also a top view of the whole work. The greatest depth of the superstructure in the central span is 44 feet, while its width is only 21 feet 5 inches. It is plain that this width is not enough to insure sufficient lateral stability in heavy storms, or to prevent all horizontal oscillations under the passage of rapidly-moving trains. It is therefore very desirable, but not absolutely necessary, that a double-track bridge should at once be built; and in that case three or four girders, well connected, will be preferable to two. Where one or two tracks are wanted for the accommodation of common travel, in connection with railroad traffic, either the floor for common travel may be placed overhead, above the railroad floor, or on the same level. If the latter arrangement is preferred, then an increased width becomes necessary, and this will still more add to horizontal stability. In the plan before us, I have assumed a single track, for railway traffic only. To insure lateral strength, I have laid down (see Top View, Plate I.) two wire-cables in horizontal parabolic curves, anchored to one of the piers, suspended to the lower floor and fastened at intervals to the beams, which will insure an ample degree of safety under all circumstances. These horizontal cables, forming one system with the flooring, will expand and contract alike with the superstructure; they can consequently be screwed up tight, to insure their efficiency.

The top chords as well as arches are sufficiently braced among themselves, horizontally, to impart to the superstructure a high degree of internal rigidity; and the same system is also carried out vertically between opposite posts, every twenty feet, so far as the arches rise above the top chords.