ROLLER-PLATES.

The whole length of parabolic superstructure is 1184 feet, and forms one single continuous truss, whose integrity and continuity must not be interfered with in any way whatever. Hence the great importance of providing for efficient means to facilitate the free contraction and expansion of the work in consequence of changes of temperature. The superstructure is permanently fastened and anchored upon one of the middle piers, and from this fixed point the side span adjoining is allowed to expand and contract. A roller-frame is therefore placed upon the abutment or upon the pier, which serves as such. On the opposite side, the middle span together with the side span contracts and expands as one, and consequently roller-frames are placed upon the second middle pier, as well as upon the abutment.

No strike or interference between the different parts of the structure can take place while this process of contraction and expansion is going on, because all parts are made of the same kind of material—wrought-iron—and therefore the arches, cables, chords, and towers will go and come in the same relative ratio. When the temperature increases, the chords, arches, and cables will increase their length, and the whole structure will be lengthened out. The panel or tree-posts will increase their length; in the same ratio the arches will rise and the cables will sink, preserving a uniform tension among the suspenders and panel-rods. At the same time the towers will raise their heads and compensate for the increased length of cables and stays. The whole truss may be considered as fastened to one metallic sheet in a vertical position, expanding or contracting in all directions.

A bar of wrought-iron 150,000 feet in length, will expand or contract one foot for every degree of change. Now assuming the extremes of temperature at 150 degrees, the extreme limit of contraction and expansion of one middle and side span which measures 857 feet in length will be 0.857 feet. The roller-plates on that abutment must therefore allow of this much play. Whether the temperature of the iron rises to 120° in a July sun, or falls to 30° below zero in the dead of winter, we are sure that all parts of the structure will freely accommodate themselves to these changes, and will never fail on that account to support their allotted parts.

An inspection of the cross and longitudinal section of roller-plates on Plate 5, will make their simple construction perfectly plain. Both the upper and lower plates are of cast-iron; the rollers between are of wrought-iron. The inner faces of the plates must be planed off true, so that the bearing of the rollers, which are all turned off to the same diameter, will be even and uniform. It is customary in Europe to connect the rollers by a frame; but this is an unnecessary expense and no improvement. I never use frames in my practice, and my observations have fully satisfied me of the correctness of my views. The edges of the rollers are slightly rounded off, say 1/8 inch, and the plates confine the rollers between flanges 1 inch deep. These flanges are sloped 1/4 inch, which prevents friction between them and the rollers. At the same time the slope is too steep to admit of the mounting upon it of the edges of the rollers. To insure parallelism between the rollers, I place them close together where the pressure is very great, and where the pressure is light, as in the case before us, I space them by inserting between them strips of seasoned pine-wood well soaked in linseed oil. With the weight of the structure upon the plates the rollers will of course keep their relative position. It is easier and cheaper to insure parallelism on this plan than by the employment of roller-frames; at least my experience has taught me so. Steel rollers are sometimes used in place of iron rollers. But this is objectionable in connection with cast-iron plates. The rollers on the towers of the Niagara bridge are made of cannon-metal and are five inches in diameter; but I do not recommend cast rollers unless the metal is very strong. When steel is used for rollers both plates should also be faced with steel; if not, then the hard rollers will make an impression on the softer cast-iron.

The rollers exhibited on Plate 5, are 4’ 4” long and 3” in diameter. The plates are 3” thick. The lower plate is well settled on a heavy bed of rich cement-mortar. The wooden strips between the rollers are not represented on the plates which support the tower on Plate 4.