THE ARCH TRUSS.

CXXXVII. A parabolic Arch Truss of the same length, depth and load as allowed in the five preceding cases, and having 9 panels, will compare, as to representative of amount of material, as follows:

Let \( w \), represent the variable, and \( w'' = \frac{3}{2}w \), the permanent panel-load. Then, taking the greatest depth of truss (15'), as the unit of length, as before, the length of chord will be 6.666, and the verticals respectively 1, 0.9, 0.7, and 0.4.

The length of panel (11.111'), being divided by 15', (the unit), gives 0.74074. Hence, tension of chord = \( 4 (w + w'') \times \frac{.74074}{.4} = 1.3 \times 7.4074w \), which, multiplied by length of chord (6.666), and \( w \), changed to \( m \), gives representative of material = 9.8765 \times 6.6 \times 6 = 65.843m; in which \( m \) is the unit of material, proportional to the unit of length (15') \times unit of stress, \( w \).

The maximum tension of diagonals, as determined instrumentally by process explained [xxvii, &c.,] varies from 1.11w, to 1.5w; and, taking the highest, multiplying by the aggregate length (15.4), and changing \( w \), to \( m \), we obtain material = 20.52m.

The verticals sustain tension, each = 1.5w, with an aggregate length of 6, giving material = 8m; making a total of tension material = 94.876m.

The horizontal thrust of the arch, must be in all parts the same as the tension of the chord (at the maximum under full load), and it is manifest that the material for each segment, must be to that of the middle segment, as the squares of respective lengths to unity; that is, equal to material in said middle segment, multiplied by squares of respective lengths.