and a horizontal thrust equal to $\frac{ac}{bc}w$, and the same at $a'$.
Similar weights at $bb'$, in Fig. 3, would produce the same vertical pressure, but the thrust would equal $\frac{2ac}{bc}w + \frac{1ad}{bd}w$.

But $ad = 2ac$ and $b'd = bc$. Hence, by substitution, we have the horizontal thrust equal to $\frac{4ac}{bc}w$, which is one-third greater than in case of the truss shown in Fig. 4, having the same general dimensions.

Hence truss [Fig. 3,] requires one third more material in the tie $aa'$, or one-third more power of abutments to sustain thrust, than truss [Fig. 4,] and a similar excess of material in braces; and as an offset, truss 4 requires the additional braces $bd, b'c$, possessing about one-third the strength of the main braces $ab, a'b'$. This still leaves the balance in favor of truss 4, aside from the saving of horizontal thrust. Hence truss 4 is decidedly preferable, except where the abutments sustain the thrust. For it will readily be seen that the horizontal thrust of the braces $bd, b'c$, in truss 4, cannot act directly on the abutment, whereas the whole thrust of all the braces in truss 3, may be directly sustained by the abutments.

Again, let us suppose two trusses, 5 and 6, of the same length and height, with four bearing points at equal distances, and loaded at each of these points with a certain weight $w$.

In truss 5, let $aw, wc, \&c.$ be sub-chords of an arch of which $aa'$ is the primary chord, and let $aa' = 5$, and consequently $ab, bc, \&c.$ each $= 1$. Also let the vertical $wb = \frac{2}{3}h$, and the vertical $wc = h$. Now the points $a, w, w, \&c. a'$ are very nearly in a circular arch, and nearly in equilibrio under the pressure of the weights $w, w, \&c.$—The horizontal thrust produced by the weights on this truss is $2w \frac{ab}{bh} = 2w \frac{2w}{2h} = \frac{3w}{h}$.