on diagonals will be very nearly compensated by the gain on verticals; hence this would seem to be about the most advantageous arrangement for diagonals acting by thrust, in combination with verticals acting by tension.

In case of diagonal ties and vertical struts, a trifling saving of material could be effected by increasing the horizontal reach of the diagonal beyond an equality with the perpendicular, but scarcely sufficient to compensate for the sacrifice in the simplicity of figure, unless other considerations conspire to favor such a departure from simplicity.

XXIX. Nextly, as to the proper height to be given to the truss, we have seen, [Art. 27,] that the horizontal thrust produced by the weight $w$ in the centre of the truss, is equal to $\frac{af}{ed}$, or directly as the length and inversely as the height of the truss. Now this being also true with respect to all other positions of the weight, it follows that the horizontal parts have their powers of sustaining the action of the weights, increased directly as the height.

With regard to the other parts, those which act by tension, remain the same in amount, for though increased in length, they are diminished in number in the same ratio, other things the same, as far as it respects the diagonals, and the stress of the verticals received through the medium of the diagonals. For illustration the weight $w$, [Fig. 12,] will require the same length of diagonals, and the same stress upon them, to transmit its pressure from $w$ to $a$ and $b$, whether it be done through the parts $w, c, g, h, i, a$, or $w, c, h', a$, and so of the half transmitted to $b$. Also the same length and stress of verticals. But these, acting by thrust when the diagonals act by tension, have their power of resistance diminished with increase of length, and consequently will require an increase of cross section, such that the cube of the diameter may have a constant ratio to the square of the length.* If the length

* See Note foot of page 31.