Hence, if the compressive forces acting upon two pieces of different lengths, be to one another as the squares of the lengths of pieces respectively, and the diameters be as the lengths, the forces are as the cross-sections, and proportional to the power of resistance in each case, and the material in the two pieces, acts with equal advantage, as far as regards cross-section, so that the products of stress into length of pieces, are the true exponents of amount of material required in the two pieces respectively. It follows, that, if on dividing the forces acting upon the pieces in question respectively, by the squares of the lengths, the quotient be the same in both cases, the two pieces have the same power of resistance to the square inch, and in general, the greater the value of such quotient, the greater the power per inch, and the greater the economy, though not necessarily in the same precise ratio.

XIV. Applying this rule to thrust members in plan Fig. 3, being the braces, the compressive force equals \( \frac{1}{2} w \sqrt{5} \), and square of length = 5. Hence the quotient \( \frac{1}{10} w \sqrt{5} = 0.2236w \).

The piece \( ki \) Fig. 4, has length = 4 and compression = \( w \), whence, force divided by square of length gives \( \frac{1}{10} w = 0.0625w \). This shows the material to be capable of sustaining much more to the square inch in the former, than in the latter case, though it does not give the true ratio. On the other hand, \( ek \) and \( gi \), with length = 1, and stress = \( \frac{1}{2} w \), give quotient = \( \frac{1}{2} w = 0.5w \). Hence, with similar cross-sections, these parts have greater power to the inch than either of the former, but not enough to balance the inferiority of \( ki \), as compared with \( ad \) and \( dc \), in Fig. 3.