If the weight be removed, the reaction of the beam will cause it to regain its original figure if not resisted by a pressure at the ends. The force of this reaction will be proportional to the degree to which the fibres are strained, and as the strain upon the fibres is nothing at the ends $A$ and $B$, and increases uniformly to the middle point, the force of reaction will be in the same proportion, and the point of application of the resultant of the whole of the reacting forces will correspond to the centre of gravity of a triangle, whose base is $B f$; it will consequently be at a distance from $B = \frac{2}{3} B f$.

The effect of this resultant acting at a distance $\frac{2}{3} B f$, must be the same as the weight $\left(\frac{w}{2}\right)$ acting at a distance $B f$, and must consequently be in proportion to $\frac{w}{2}$ as $3 : 2$. The value of the resultant is therefore $\frac{3 w}{4}$.

The line of direction of the pressure at $B$ being the tangent $B C$, the force of reaction at $h$ may be considered as applied at the point $k$ of its line of direction, and as $k h B$ and $C f B$ are similar triangles, $C f : f B :: \frac{3}{4} w$ : horizontal pressure at $B = \frac{3}{4} w \times \frac{f B}{f C} = \frac{3}{4} w \frac{\frac{1}{2} l}{2 d} = \frac{3 w l}{16 d}$. Representing this force by $P$ we have

$$P = \frac{3 w l}{16 d}.$$

As the deflection of a beam within the elastic limits is always in proportion to the weight, if $(w') =$ the weight that will produce a deflection equal to unity, the deflection $(d)$ will require a weight $= (d w')$, and by substituting this value in the equation, we find

$$P = \tfrac{3}{16} \cdot \frac{d w' l}{d} = \tfrac{3}{16} w' l.$$

In this expression $(d)$, which represents the deflection, has disappeared, and as $(w')$ is a constant quantity for the same beam, representing the weight that produces a deflection equal