If we wish to determine, then, the greatest weight which the beam is capable of bearing applied at the point \( w \), we institute the following equation: \( W \cdot L = \frac{1}{6} C \cdot t \cdot D^2 \), in which \( W \) = the weight, and \( L \) = the length \( wd \). Or, to make the expression more general, \( L \) = the distance from the centre of motion \( c \), to the line in which the force \( (W) \) acts.

From the above equation we have \( W = \frac{C \cdot t \cdot D^2}{6L} \).

XLIX. This formula will enable us to determine the transverse forces which a rectangular beam will sustain, when we know the material and dimensions of the beam, and the lines in which the forces act, are parallel with the sides of the beam.

In case the positive strength of the material exceed the negative, the same formula, \( (W = \frac{C \cdot t \cdot D^2}{6L}) \), holds true, if we consider \( C \) to represent the negative strength of the material instead of the positive.

This formula is deduced on the supposition that the material is perfectly elastic, so as to suffer no permanent change of shape until the strain produces actual rupture. There are few substances if any, and certainly wood and iron are not of the number, that fulfil this condition so nearly but that considerable discrepancies are found between the deductions of theory and the results of experiment. Indeed, in the case of cast iron, experiment shews the transverse strength to be fully twice as great as it is made to appear by the above formula.

If in the expression \( \frac{C \cdot t \cdot D^2}{6L} \), we make \( L = D \), it may be reduced to \( \frac{1}{6} C t D \), which shews that the power of the projecting end of a beam to sustain weight at a distance from the fulcrum equal to the depth of the beam, is only \( \frac{1}{6} \) as great as the positive, (or negative, in case that be the smaller,) strength of the beam.