LATERAL, OR TRANSVERSE STRENGTH.

XCIV. The transverse strength of bars or beams, would seem to be deducible from the positive strength of the material, in the following manner:

Let $ab$, Fig. 26, represent a portion of a rectangular beam or bar, projecting from a wall in which it is firmly fixed. If a weight be applied at $w$, the upper part of the beam will be extended, and the lower, compressed; and, where these portions meet, is what is called the neutral plane. Experiment shows that this plane, in rectangular beams, is central between the upper and lower surfaces; or at least, very nearly so, for all elastic substances, until they approach rupture.

The tendency of the weight at $w$, then, is to produce rotation about the point $c$ (or, the line of intersection of neutral plane and face of wall) and the cohesion of the upper portion $cd$, and the repulsion of the lower part, $cb$, tend to resist rotation. Now, to determine the amount of this resistance, which is the measure of transverse strength, we will first consider the upper portion; and it is obvious that, at every part of the cross-section, the resistance to rotation is as the resistance to extension, multiplied by the distance of the part above the neutral plane. But the resistance to extension, by the law of elasticity, is as the degree, or amount of extension, which is determined by the distance from the neutral plane; parts at 2 inches from this plane, or the centre of motion, being extended