which, there would be only the stiffness and strength of the beams \( AB \) and \( CD \).

By observing the effect of flexure upon this system, we are at once enabled to perceive the means by which it can be prevented.

The rectangles formed by the horizontal and vertical pieces are converted into oblique angled parallelograms, one diagonal of the rectangle, as \( A m \), being lengthened, and the other, as \( C n \), shortened; and, as this effect must take place to a greater or less extent whenever any degree of flexure is produced, it may be concluded, that the introduction of braces which would prevent any change of figure in the rectangles will effectually prevent flexure. This is in fact the case, and the combination of timbers represented in figure 45 is sufficient to form a complete truss, capable, when properly proportioned, of resisting the action of any uniform load.

It appears, therefore, that in the construction of the vertical frame or truss of a bridge, at least, three series of timbers enter as indispensable elements; these may be called, chords, ties, and braces, and these are all that any uniform load requires.

The manner in which such a combination of parts acts to sustain a weight will now be examined.

**Case 1.** Let the weight be uniformly distributed upon \( AB \). It is evident that in case of flexure the depression will be greatest in the middle.