On the maximum span of a wooden bridge.

It requires no demonstration to prove that, in order that the maximum span may be attained in a bridge, it is necessary that every part should be properly proportioned to the strain that it may be required to bear. The strength of a system is the strength of its weakest point; this is the point of fracture; and any increase of strength at other points, produced by increasing the amount of material beyond its minimum quantity, only increases the weakness by increasing the weight. It follows, therefore, that no plan which does not distinctly recognise this principle of accurately proportioning the dimensions to the strains, and apply it in detail, can be employed for the maximum span.

Many large bridges have been constructed, several of which have considerably exceeded 300 feet in span; but in all these were some defects, some points too heavily loaded by timbers of unnecessarily large dimensions.

Tredgold, in his treatise on carpentry, gives a plan for a bridge of 400 feet span, the support of which consists of framed voussoirs, as they are termed; and as no mention is made of any variation in size, it was no doubt the design of the architect to make the dimensions uniform.

Fig. 66.

The defects of this arrangement naturally appear from the preceding explanation of the manner in which the pressures are distributed, varying as the distance from the neutral axis.

The points A and C sustain less than B and D, and if the sections are everywhere the same, it follows, that if B and D are sufficiently strong, A and C must possess surplus strength, and with it unnecessary weight of material.