remedy at the expense of economy, by the introduction of from fifteen to thirty feet of additional truss.

A bridge whose corresponding timbers in all its parts are of the same size, is badly proportioned; some parts must be unnecessarily strong, or others too weak, and a useless profusion of material must be allowed, or the structure will be insufficient.

If, for example, the forces acting on the chords increase constantly from the ends to the centre, the most scientific mode of compensation would appear to be, to increase gradually the thickness of the chords; and for similar reasons the ties and braces should increase in an inverse order from the centre to the ends.

In accordance with this, it is found that in bridges that have settled to a considerable extent, the greatest deflection is always near the abutment; that is, the chords are bent more at this point than in the centre, and the joints of the braces are much more compressed. It is also found that the weakest point of a lattice bridge is near the centre of the lower chord; this might be expected, since from the nature of the force, and the mode of connection, the joints of the lower chords are only half as strong as the corresponding ones of the upper chord, it being assumed that the resistances to compression and extension are equal. This defect may be in a great degree removed by inserting wedges behind the ends of the lower chords. A variation in the size of every timber, according to the pressure it is to sustain, would of course be inconvenient and expensive; but as the principle of proportioning the parts to the forces acting upon them, is of great importance, such other arrangements should be adopted as will secure its advantages, and at the same time possess sufficient simplicity for practice; this is effected by the introduction of arch-braces or arches, than which, a more simple, scientific, and efficacious mode of strengthening a bridge could not perhaps be devised, as they not only serve, with the addition of straining beams, to relieve the chords, and give them that increase of thickness at the points of maximum pressure, which is essential to strength, but they also relieve the ties and braces by transmitting di-