of its length according to experiments made by the writer, and the extensibility of wood according to Tredgold, is \( \frac{1}{470} \) of its length, without injury. From these data, the relative extensions in any given case can be calculated. In an arch of 500 feet span, and 50 feet rise, the extension amounts to \( \frac{5}{70} \) of a foot or 6 inches.

The effect of this expansion, if the truss is of the form represented in the diagram, is more than half counteracted by the expansion of the ties in the most unfavorable case, and when the posts which support the roadway are not very far apart, the expansion of the ties may, of itself, be more than sufficient to counteract the expansion of the arch; but even if it should not be, the only effect would be to extend and compress laterally the wooden beam \( mm' \), which is able to bear without injury four times the extension which change of temperature would produce upon the arch. It is reasonable to suppose, then, that a system connected in this way would have nothing to fear from changes of temperature.

Other forms of trusses are more liable to be affected by changes of temperature, and it is important in arranging the details of an iron truss, to take this fact into consideration; the extension of bar iron within the elastic limits, is as great as that caused by atmospheric changes, and this elasticity is in general sufficient to effect a compensation, and prevent any injury from excessive strains. The principle of the counter-braced arch seems to be peculiarly well adapted to the construction of iron bridges, as the compensation is almost perfect, and the only effect of expansion or contraction will be, to raise or depress very slightly the crown of the arch.

Arches composed entirely of cast-iron have been much used for bridges in England, but the author does not place much confidence in the material, where it is liable to be subjected to impulsive forces; an arrangement, which he considers far preferable, and which has been adopted for two of the bridges on the Pennsylvania Railroad, consists of rolled plates laid one upon another so as to break joint, and clamped together, with or without a centre rib of cast-iron.