

In a bridge, the office of the chords is to resist the horizontal forces, and that of the ties and braces the vertical forces, and as the strain resulting from the uniform load is zero at the centre, it follows, that the sizes of the intermediate timbers may be much smaller here than at the abutments, as they have very little more strain to bear than that which results from the portion of the variable load, which acts immediately over them, which, in a long span, is comparatively trifling.

Each successive brace, in passing from the centre to the abutment, is more and more strained, and consequently should, if properly proportioned, be increased in size, but as such increase would add greatly to the expense and trouble of framing, it is preferable in practice to make all the timbers uniform and compensate for the additional strain at the ends by additional braces called arch braces.

As the preceding method of investigation might be considered objectionable, and doubts be entertained of the correctness of the important consequences which result from it, on the ground that the analogy is not perfect between a beam supported at the ends and the framed truss of a bridge, we will endeavor to present a different view of the subject.

The important principle that we aim to establish is, that a great difference exists between the strains on the ties and braces at the centre and at the ends, the precise law of increase or diminution is of secondary importance, and will not now be considered.*

It has been stated that when a truss settles, the rectangles formed by the ties and chords become oblique parallelograms, the diagonal in the direction of the brace being compressed and the opposite one extended. Could we ascertain the exact degree of reduction which the length of the brace experienced, we would have a certain measure of the strain. To determine this by calculation would be difficult, as the change of figure

* This paragraph was penned about eight years ago, at which time the writer was not aware that any bridges had been constructed in such a way as to recognize the existence of this increased strain at the abutment. But in several of the plans that are now in use the principle seems to have received attention.