rectly to the abutments, or other fixed supports, a great part of the weight that they would otherwise be required to sustain.

It may perhaps be objected, that the pressure of the arch-braces or arches would injure the abutments: in answer to this, it may be remarked that a certain degree of pressure is very proper; the embankment behind an abutment exerts a very great force upon it, the tendency of which is to push it forward; if, then, a counter-pressure can be produced by the thrust of arch-braces, or by wedging behind the ends of the lower chords, two important advantages are gained; the abutment is not only increased in stability, but the tension on the lower chord of the bridge is diminished by an amount equal to the degree of pressure thus produced.

It is, however, proper to observe, that when the situation of the embankment exposes it to the danger of being washed away from the back of an abutment, the pressure on its face must not be sufficient to destroy its equilibrium; should this effect be apprehended, the horizontal ties must be sufficient to sustain the thrust of the bridge.

An essential condition in every good bridge is, that it shall not only be sufficient to resist the greatest dead weight that it can ever be required to sustain in the ordinary course of service, but it must also be secure against the effects of variable loads. This is generally effected by the addition of counter-braces; but the lattice truss possesses this peculiarity, that it is counter-braced without the addition of pieces designed exclusively for this purpose: to prove this, invert the truss, when it will be apparent that the braces become ties, and the ties braces, possessing the same strength in both positions.

The foregoing remarks will, it is believed, enable the reader to understand the objects of the proposed improvements and the principles on which they are founded.

1st. The braces, instead of being single, as in the common lattice, are in pairs, one on each side of the truss, between which a vertical tie passes; this arrangement increases the stiffness upon the same principle that a hollow cylinder is more stiff than a solid one with the same quantity of material, and of the same length, and obviates the defect of warping.