

of a panel of the truss to the diagonal; so that if one is known, the other is readily determined by a simple proportion.

In a simple truss, consisting of chords, ties, and braces, the braces which project from the abutments sustain the whole load. The weight is not distributed equally amongst all the braces, as one unacquainted with the action of the system might suppose. The proportional strains on each successive brace, from the centre to the ends, may be illustrated by a chain suspended from a fixed point; the upper link sustains the whole weight, the lower none; each link transmits the weight of those below to the one above it; and similarly, each brace transmits the strain from the middle of the span to the end, adding to it the portion due to the panel of which it forms a part. The end braces, unless relieved by an arch, sustain the whole weight of the structure, and its load.

As the weight of the bridge under consideration is 480,000 pounds, each end must sustain 240,000 pounds, and at 1,000 pounds per square inch; in the cross-section, the ties must be 240 square inches, if of wood, and 24 square inches, if of iron, allowing in the latter case 10,000 pounds per square inch as a safe load, although in practice it is sometimes greatly exceeded.

If the panels be 12 feet wide, and 16 feet high in the clear, the diagonal or brace will be 20 feet, and the strain on the brace will be  $\frac{240,000 \times 20}{16} = 300,000$ ; thus requiring 300 square inches of wood, or 4 braces, of 75 square inches each.

The strain, exactly at the middle point with a uniform load, is theoretically nothing; and it increases from this point to the end, where it attains a maximum equal to one-half the whole weight of the bridge; but in practice there never is a brace exactly at the middle; the panels must have considerable magnitude in a horizontal direction, and the proper estimate of the strain is that which would be produced by half the maximum weight on two adjacent panels, or the whole weight on one panel. This weight, in an interval of 12 feet, will be 18 tons, or 36,000 pounds; requiring a cross-section of only 36 inches, or 9 inches to a tie, and  $11\frac{1}{2}$  to a brace.

In this case, the cross-section of the brace, as given by the condition that the strain shall not exceed 1,000 pounds per