Taking the moment of the end lift with respect to the off rail, we have $\frac{1}{2}W \times 10 = 5W$, while the moment of weight on the near track, with respect to the off track, is $\frac{1}{2}W \times 5 = 2\frac{1}{2}W$, acting in the opposite direction. Hence, stress at the off track, is equal to $(5 - 2\frac{1}{2})W = 2\frac{1}{2}W$.

Again, assuming a point at 2' from the end, the moment of the lift at the farther end, is $\frac{1}{2}W \times 13' = 6.5W$. The sum of moments of weights upon the two rails is, $\frac{1}{2}W \times 8 + \frac{1}{2}W \times 3 = 5.5W$ in opposition to the effects of the end lift. The stress of the beam, therefore, at the given point, is $(6.5 - 5.5)W = W$; being the same result as if we had taken the moment at the near end, $\frac{1}{2}W \times 2 = W$, with no opposite force on the same side of the given point.

Hence, we see that the stress is the same at all points between the rails, while it obviously diminishes from the rail to the end, in proportion as the distance of successive points from the end diminishes. Therefore, the beam having a uniform depth, in order that the strain be uniform on all parts, the thickness should taper uniformly from the rail, to an edge at the supporting points. If the thickness be uniform (the cross-section being rectangular), the depth may diminish as the square root of distance from the support diminishes; that is, may have a parabolic form. This follows from the fact that the stress at different points in the length is as the distance from the support, and the power of resistance, as the area multiplied by the depth, in other words, as the square of the depth, the area being simply as the depth.

XCVII. Iron beams of a rectangular section will seldom be used in bridge work, the material acting