This is a convenient way of expressing transverse strength, viz: as equal to a force of so many pounds to the square inch of cross section, the force being understood as acting on a leverage equal to the breadth of the beam in the direction of the force. If we call 18,000 lbs. to the square inch the positive strength of cast iron, we may call the transverse strength, (according to the above deduction,) \( \frac{1}{6} \times 18,000 \) lbs. = 3,000 lbs., meaning that a bar 1 inch square will sustain upon its projecting end, 3,000 lbs. at 1 inch from the fulcrum, and proportionally less as the distance is greater.

Now, experiment shews that it will sustain twice this amount, and frequently more, so that in reality we may reckon the transverse strength of cast iron at about 6,000 lbs. to the square inch.

I know of nothing to which to attribute this great discrepancy between theory and experiment, except a want of complete elasticity in the material.

Cast iron, when exposed to a transverse strain, suffers extension on one side and compression on the other; and the power of resistance to both these effects, increases very nearly as the amount of extension or compression till they approach a certain point or maximum, and after passing this point the power diminishes. Now it is reasonable to suppose, in fact, we can hardly suppose the contrary, that for a certain interval on each side of the maximum point, the power of resistance remains nearly stationary. But this stationary interval is reached on the positive, much sooner than on the negative side, and the inevitable consequence must be, that the neutral plane is transferred farther from the positive side, so as to preserve the equilibrium between the resistance to extension and the resistance to compression. Hence, the amount of resistance on the positive side is increased, both by the increased area of the cross section of extension, and increased leverage, or distance from the neutral plane.