allowance necessary to be made for either of these circumstances. Consequently, we can not determine with certainty how much of any given material may be relied on with safety, to sustain a given force. We must therefore lean to the safe side, with the greater penchant, in proportion as the consequences to be apprehended from a failure are the more disastrous. The failure of a bridge is liable, in almost all cases, to be a serious affair, even to the imminent hazzard of life and limb. They should therefore, be constructed of such strength as to render failure quite out of the range of probability, if not absolutely impossible.

It is generally considered that wrought iron of a good quality may be relied on to sustain a stress equal to one fourth part of its absolute capacity, with very nearly perfect safety, with reasonable care in selecting, and guarding against defective parts. I have therefore adopted the rule in practice, of estimating good wrought iron to be capable of sustaining a positive strain of 15,000 lbs. to the square inch of cross section.

XLVI. With regard to cast iron, it is not economical to employ it to sustain tension, and whenever it may be exposed to that action, I would not rely on it for more than about 4,000 lbs. to the square inch. I am confidently of opinion, however, that where cast iron is exposed to a crushing force, in pieces of such length as to be deflect ed and broken laterally, it may be loaded with safety to one third of its absolute average capacity. If a piece exposed to a negative strain have a defective part it does not diminish its power of resistance to the same extent as when it acts by tension. The power of negative resistance being inversely as the fleche or deflection produced by a given weight, and the fleche depending on the stiffness of the piece throughout its whole length, the power is manifestly only diminished as the amount of defect multiplied by the ratio of the length of the defective part, to the whole