

applied throughout, to understand which the simplest arithmetical attainments are alone necessary.

Great stress is laid upon the "strength of joints," since the essence of good bridge-building lies in their proper design. A joint must be as strong as the parts it serves to connect; as in a chain, wherein a defective link determines *its* strength, so in a bridge the absence of a necessary rivet would determine *its* strength. First-class bridge-builders recognize this relation as an axiom of their art, and it is oftentimes simply from a conscientious application of this vital principle that engineers, in making tenders for work, find themselves underbid by ignorant or unscrupulous builders, who have no other ambition than that of getting work. Ordinarily, the cheapest proposal wins the day, simply because to the average committeeman one iron bridge is as good as another, no matter from what source its plan emanates. To such a man, difference in price has no other meaning than that of being a measure of the relative greed of contractors, and he does not realize that there exist precisely the same reasons for large variations of price in iron bridges as for the difference in price between the lowest grades of shoddy and carefully woven goods. That the wisdom of such a committeeman is evidenced by a remarkable freedom from bridge accidents throughout the country is no defence for the purchase of the