exact particular conclusions could ever be drawn from them.

(117.) But to arrive at laws of this description, it is evident that every step of our inquiry must be perfectly free from the slightest degree of looseness and indecision, and carry with it the full force of strict numerical announcement; and that, therefore, the observations themselves on which all laws ultimately rest ought to have the same property. None of our senses, however, gives us direct information for the exact comparison of quantity. Number, indeed, that is to say, integer number, is an object of sense, because we can count; but we can neither weigh, measure, nor form any precise estimate of fractional parts by the unassisted senses. Scarcely any man could tell the difference between twenty pounds and the same weight increased or diminished by a few ounces; still less could he judge of the proportion between an ounce of gold and a hundred grains of cotton by balancing them in his hands. To take another instance: the eye is no judge of the proportion of different degrees of illumination, even when seen side by side; and if an interval elapses, and circumstances change, nothing can be more vague than its judgments. When we gaze with admiration at the gorgeous spectacle of the golden clouds at sunset, which seem drenched in light, and glowing like flames of real fire, it is hardly by any effort we can persuade ourselves to regard them as the very same objects which at noonday pass unnoticed as mere white clouds basking in the sun, only participating, from their great horizontal distance, in the ruddy tint which luminaries acquire by shining through a great extent of the vapors of the atmosphere, and thereby even losing something of their light. So it is with our estimates of time, velocity, and all other matters of quantity; they are absolutely vague, and inadequate to form a foundation for any exact conclusion.

(118.) In this emergency we are obliged to have recourse to instrumental aids, that is, to contrivances which shall substitute for the vague impressions of sense the precise one of number, and reduce all measurement