

of the unproved verbal generalization of Galileo, we should be in great danger of allowing ourselves to be referred successively from one truth to another, without any reasonable hope of ever arriving at any thing ultimate and fundamental.

But though this Principle of Virtual Velocity cannot be looked upon as a great discovery of Galileo, it is a highly useful rule; and the various forms under which he and his successors urged it, tended much to dissipate the vague wonder with which the effects of machines had been looked upon; and thus to diffuse sounder and clearer notions on such subjects.

The Principle of Virtual Velocities also affected the progress of mechanical science in another way: it suggested some of the analogies by the aid of which the Third Law of Motion was made out; leading to the adoption of the notion of *Momentum* as the arithmetical product of weight and velocity. Since on a machine on which a weight of two pounds at one part balances three pounds at another part, the former weight would move through three inches while the latter would move through two inches; we see (since three multiplied into two is equal to two multiplied into three) that the *Product* of the weight and the velocity is the same for the two balancing weights; and if we call this Product *Momentum*, the Law of Equilibrium is, that when two weights balance on a machine, the Momentum of the two would be the same, if they were put in motion.

The Notion of Momentum was here employed in connection with Virtual Velocities; but it also came under consideration in treating of Actual Velocities, as we shall soon see.

*Sect. 5.—Attempts at the Third Law of Motion.—Notion of Momentum.*

IN the questions we have hitherto had to consider respecting Motion, no regard is had to the Size of the body moved, but only to the Velocity and Direction of the motion. We must now trace the progress of knowledge respecting the mode in which the Mass of the body influences the effect of Force. This is a more difficult and complex branch of the subject; but it is one which requires to be noticed, as obviously as the former. Questions belonging to this department of Mechanics, as well as to the others, occur in Aristotle's Mechanical Problems. "Why," says he, "is it, that neither very small nor very large bodies go far when we throw them; but, in order that this may