algebraic form. He has only to institute a train of experiments on the natural agent, and select that velocity which gives the highest product when multiplied by its corresponding pressure.

106. When this selection has been made, we have two ways of giving our working-machines the maximum of effect, having once ascertained the pressure f which our natural power exerts on the impelled point of the machine when it is not allowed to move.

1. When the resistance arising from the work, and from friction, is a given quantity; as when water is to be raised to a certain height by a piston of given dimensions.

Since the friction in all the communicating parts of the machine varies in the same proportion with the pressure, and since these vary in the same proportion with the resistance, the sum of the resistance and friction may be represented by $b\,r$, b being an abstract number. Let n be the undetermined velocity of the working-point; or let $m : n$ be the proportion of velocities at the impelled and working-points. Then, because the pressures at these points balance each other, in the case of uniform motion, they are inversely as the velocities at those points. Therefore we must make

$$b\,r : p = m : n, \text{ and } n = \frac{p\,m}{b\,r}, = \frac{\frac{q^q}{\overline{q+1}^q} f\,m}{b\,r}, = m\,\frac{q^q f}{\overline{q+1}^q\,b\,r},$$

or $m : n = \overline{q+1}^q \times b\,r : q^q f$.

2. On the other hand, when $m : n$ is already given, by the construction of the machine, but $b\,r$ is susceptible of variation, we must load the machine with more and more work, till we have reduced the velocity of its impelled point to $\frac{e}{q+1}$.

In either case, the performance is expressed by what expresses $p\,m$, that is, by $f\,e \times \frac{q^q}{\overline{q+1}^{q+1}}$. But the useful per-