

CHAPTER V

THE MECHANICAL POWERS.

the
Machines.

56. It is usual to treat of the *Simple Machines*, or *Mechanical Powers* as they are sometimes called, under six classes, namely—the Lever, the Wheel and Axle, the Pullies, the Inclined Plane, the Screw, and the Wedge. Of these, the Wedge will not be here considered, as in its practical application the investigation on the principles of the foregoing chapters would be of small utility.

Mechanical
advantage
defined.

When a power P sustains on any one of these machines a weight W , the ratio $W : P$ is called the *mechanical advantage* of the machine; and the machine is said to gain or lose advantage according as this ratio is greater or less than unity.

In the following investigations, bodies will be supposed rigid, surfaces smooth, strings perfectly flexible and of insensible size, and the parts of the machine to be without weight, unless otherwise specified.

57. *The Lever.*

Straight
Lever.

Archimedes
and Da Vinci.

A straight lever is a rod capable of turning freely in one plane about a point in itself which is fixed. This fixed point is called the *fulcrum*.

Fig. 1.

CASE 1.—The weight W at one end of the lever supported by a weight P at the other end.
 $B A C$ the lever; A the fulcrum.

Draw $b A c$ horizontal, and therefore perpendicular to the direction of the weights.