shall therefore only establish the principle, as above stated, in a few of the more simple cases, by proving that it leads to the relations of equilibrium already found.

The geometrical relations in a machine being such that the spaces described in different displacements are always proportional, it will be only necessary to prove the principle for a particular displacement, and we may select this as convenient.

Straight lever.

79. *The straight lever under weights at its ends.*

Fig. 16.

Let the lever BAC be horizontal, and displace it round A into the position B_1AC_1 the directions of P and W meeting BAC in b, c. Then B_1b is P's *virtual velocity*, and C_1c is W's.

The principle then asserts that

$$P.\ B_1b = W.\ C_1c$$

but by similar triangles, $$\frac{B_1A}{B_1b} = \frac{C_1A}{A_1c};$$

hence $P.\ AB = W.\ AC$, the condition found in § 57.

Wheel and axle.

80. *Wheel and Axle.*

Fig. 5.

Suppose the machine to make one complete turn; then, the space descended by P is the circumference of the wheel; and by W, that of the axle. The principle then asserts that

$P \times$ circumference of wheel $= W \times$ circumference of axle,

and the circumferences are as the radii: therefore,

$$P \times \text{radius of wheel} = W \times \text{radius of axle},$$

the condition found in § 63.

Pullies.

81. *Pullies.*

In the single fixed pully, the principle is obviously true.

Single pully.

In the single moveable pully (fig. 6), let the pully be raised through one inch, then W is raised through one inch, and