

It is evident that no resultant can be found for a set of forces in equilibrium. Because, if that could be done, there would be a single force (the resultant) acting on the body, and, therefore, motion would take place, which is impossible with equilibrium.

**The Equilibrant or Balancing Force** of a set of forces is that one force which, when acting with the set of forces, produces equilibrium.

The Equilibrant and Resultant of any given set of forces are of equal magnitude, and act in the same direction, but with opposite senses; or concisely, they are two equal and opposite forces. For, since the Resultant produces the same effect as the set of forces, it is manifest from definition that the Equilibrant would, when acting with the Resultant, produce equilibrium. Experimentally, it may be shown that the only possible manner in which two forces acting on the same body can give a state of equilibrium is that they be of equal magnitude and act in the same line with opposite senses.

#### Graphical Determination of the Magnitude, Direction, and Sense of the Resultant of a Set of Forces.

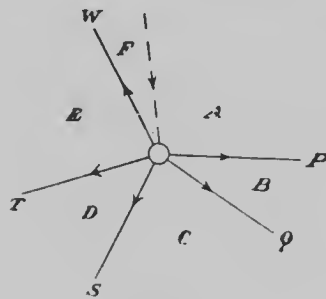


Fig. 6.

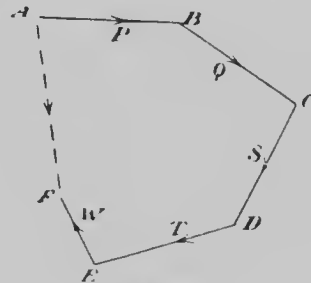


Fig. 6a.

Let there be given any set of forces, but, to make the problem clear, let us take a set of forces acting at a point. Fig. 6 is the Statical diagram of this set. Choose any initial point A as in Fig. 6a. From this point draw a line AB to represent **accurately** the force P in Fig. 6. From the point B, the line BC is drawn to represent the force Q (Fig. 6). In the same way the lines CD, DE, and EF are drawn to represent the forces S, T, and W, respectively. If now, the initial point A be joined to the final point E, then AE represents fully