43. *The centre of Parallel Forces.*

Centre of parallel Forces.

When given parallel Forces, acting at given points of a rigidly connected system, are reducible to a single Resultant, its direction passes through a point whose position is invariable with regard to the points of the system, whatever be the direction of the Forces.

Take any two of the Forces P, Q, acting at the given points B, C. Join BC and let their resultant R cut it in A. Then, the moment of R about any point in the plane being equal to the algebraic sum of the moments of P, Q, about this point; let these moments be taken about A.

The moment of R about A is zero; hence, drawing $b\ A\ c$ perpendicular to the direction of the forces,

$$P.\ Ab - Q.\ Ac = 0.$$

and, by similar triangles,

$$\frac{AB}{AC} = \frac{Ab}{Ac}, \text{ and therefore,}$$

$$= \frac{Q}{P}.$$

Hence $B\ C$, which is given, is cut in the point A in a ratio which is independent of the direction of the forces with regard to $B\ C$, and the position of A is therefore *given* with regard to B and C.

Now, taking any third force, acting at D, we may combine it with the resultant of P and Q, and the point in which the new resultant cuts $A\ D$ will be given in position with regard to A and D or to A, B and C.

And thus we may go on till we arrive at the final resultant.

Hence, the proposition as enunciated is true.

This point is called the *centre of Parallel Forces.*