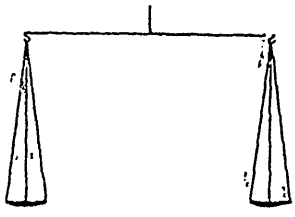
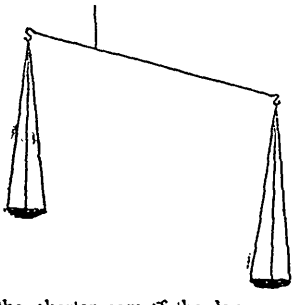
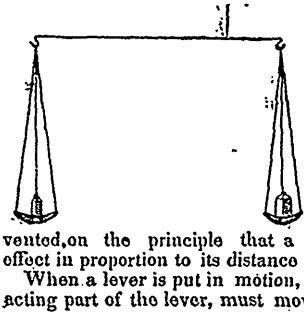
is suspended, is a lever, and the point by which it is suspended, called the prop or fulcrum, is also the centre of motion. The two parts of a lever, divided by the fulcrum, are called its arms.



Now, both scales being empty, they are of the same weight, and consequently balance each other. We have stated that if two bodies of equal weight are fastened together, the centre of gravity will be in the middle of the line that connects them; the centre of gravity of the scales must, therefore, be in the middle between them, as the fulcrum is, and, this being supported, the scales balance each other.

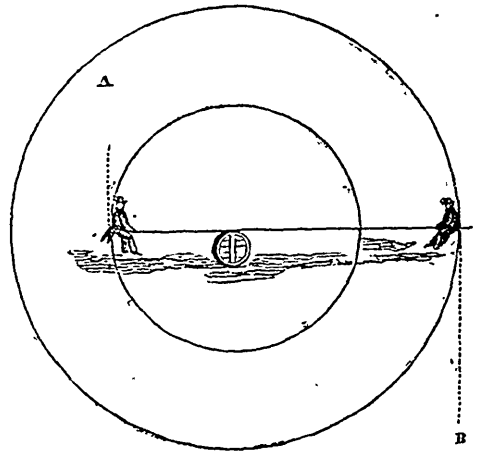
You recollect, that if a body be suspended by that point in which the centre of gravity is situated, it will remain at rest in any position indifferently: which is not the case with this pair of scales, for when we hold them inclined, they instantly regain their equilibrim. The reason of this is, that the centre of suspension, instead of exactly coinciding with that of gravity, is a little above it. If, therefore, the equilibrium of the scales be disturbed, the centre of gravity moves in a small circle round the point of suspension, and is therefore forced to rise; and the instant it is restored to liberty, it descends and resumes its situation immediately below the point of suspension, when the equilibrium is restored. It is this property which renders the balance so accurate an instrument for weighing goods. If the scales contain different weights, the centre of gravity will be removed towards the scale which is heavier, and being no longer supported, the heaviest scale will descend. If the lever be taken off the prop, and fastened on in another point, that other point then becomes the fulcrum. In this case the equilibrium is destroyed; the longer arm of the lever is heaviest, and descends. The centre of gravity is not supported, because it is no longer immediately below that point, as it is now situated, the scales will again balance each other. Thus if a heavier weight be placed in the scale suspended to the shorter arm of the lever, and a lighter one into that suspended to the longer arm, the equilibrium will be restored. It is not, therefore, impracticable to make a heavy body balance a light one; and by this an imposition in the weight of goods is sometimes effected. An ingenious balance, called a steelyard, has been invented, on the principle that a weight increases in effect in proportion to its distance from the fulcrum.





When a lever is put in motion, the longer arm, or acting part of the lever, must move with greater velocity than the shorter arm, or resisting part of the lever, because it is further from the centre of motion. When two boys ride on a plank drawn over a log of wood, the plank becomes a lever, the log which supports it the fulcrum, and the two boys, the power and resistance at each end of the lever. When the boys are of equal weight, the plank must be supported in the middle to make the two arms equal; if they differ in weight, the plank must be drawn over the prop, so as to make the arms unequal, and the lighter boy must be placed at the extremity of the longer arm, in order that the greater velocity of his motion may compensate for the superior gravity of his companion, so as to render their momentums equal. But we know that the action of the power must be greater than the resistance in order to put a machine in motion. For this purpose each boy at his descent touches the ground with his feet; and the support he receives from it diminishes his weight, and enables his companion to raise him, thus each boy alternately represents the power and the weight, and the two arms alternately perform the function of the acting and the resisting part of the lever.

A lever in moving, describes the arc of a circle, for it can move only around the fulcrum or centre of motion. It would be impossible for one child to rise perpendicularly to the point A, or for the other to descend in a straight line to B; they each describe arcs of their respective circles; and it may be judged from the different dimensions of the circle how much greater the velocity of the little child must be than that of the bigger one. Enormous weights may be raised by levers of this description, for the longer the acting part of the lever is in comparison to the resisting part, the greater is the effect produced by it; because the greater is the velocity of the power compared to that of the weights.



We have all seen a heavy barrel or tun rolled over by thrusting the end of a strong stick beneath it and resting it against a log of wood, or any other object which can give it support, near the end in contact with the barrel. The stick, in this case, is a lever, the support, the prop, or fulcrum; and the nearer the latter is to the resistance, the more easily will the power be able to move it.