

base; but this fact alone does not make clear the real reasons for stability.

In the case of the stick on the tip of the finger, the center of gravity is at a higher level than the finger; and, since the base on which the stick stands is small—practically a point—a very slight tipping will cause the center of gravity of the stick to describe an arc *ab* (Fig. 9), about the tip of the finger as a center. By

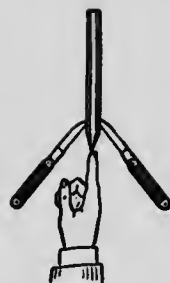


FIG. 8

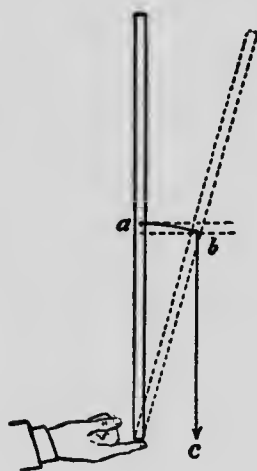


FIG. 9

this motion the center of gravity begins to descend; and it will continue to descend unless the performer takes quick action to prevent it. The stick remains balanced only so long as its center of gravity is at *a*, the highest point of the arc *ab*; for then the vertical line through its center of gravity passes through the point of support.

The case is the same with the bottle on the rim of a plate. Unless the juggler can keep the point of support of the bottle in the vertical line that passes through its center of gravity, over it goes, because its

base is but a point. Any rotation about this point gives the center of gravity a chance to descend. Because it is so difficult to keep bodies balanced in this way, we say they are in unstable equilibrium. *A body is in unstable equilibrium whenever it cannot be tipped without lowering its center of gravity.*

In the case of the block of stone on the ground, the base is larger. When the block is tipped up on edge, its center of gravity must be raised to a higher level (Fig. 10); and, if the stone is large and heavy, this operation requires hard work. The

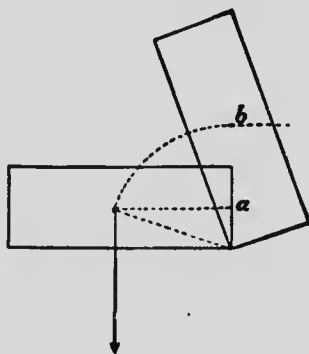


FIG. 10