let A, Fig. 1, represent a part of this rod, in which are two points B and C, which we shall for convenience assume are in the plane of the paper. Let the body A move to the new position A^1, B and C taking the positions B^1 and C^1 respectively, and although we are uncertain as to the actual history of the motion during the change of position, it is quite evident that it may have been accomplished by (a) a motion of translation of the body A through the distance CC^1, during which C reaches its new position C^1 and B arrives at B_1. During this motion B and C have moved through the same distance in the same direction and sense, and hence have had no relative motion. The second part of the motion consists of (b) a motion of rotation of the whole body A about an axis normal to the paper through the point C^1, rotation taking place through the angle $B_1C^1B^1$.

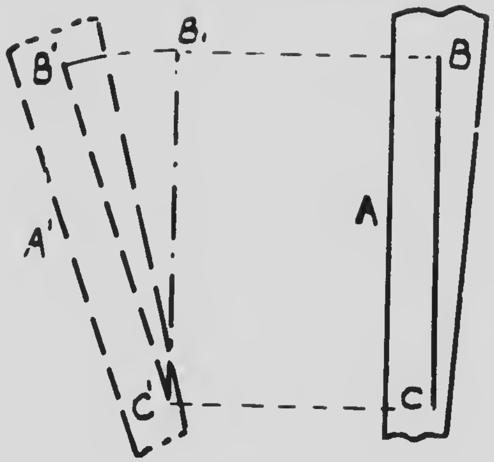

Fig. 1.

During the motion of A therefore B has had only one motion not shared by C, or B has moved relatively to C through the arc B_1B^1, and at each stage of the motion the direction of this arc was evidently at right angles to the radius from C^1, or at right angles to the line joining B and C.

Thus when a body has plane motion any point in the body can move relatively to any other point in the body only at right angles to the line joining the two points. It follows from this that if the line joining the two points should lie normal to the plane of motion the two points could have no relative motion.

We shall now employ this principle to the determination of velocities. Let Fig. 2 represent diagrammatically a machine having four links a, b, c, d, joined together by four turning pairs at O, P, Q, R. If the link d is nearly vertical and the length of a be decreased this could be taken to represent one-half of a beam