

engine, in which a is the crank, b the connecting rod, and c one half of the walking beam, the other end of which would be connected with the piston rod.

In all such machines one link is fixed and forms the frame, here indicated by d . Thus O and R are fixed bearings and P and Q move in arcs of circles about O and R respectively. Let us now choose one of the moving links as the link of reference, either a or c will be the most convenient, as they have one fixed bearing, and a will be selected. Imagine that to a an immense sheet of cardboard is attached which extends indefinitely in all directions from O , and let us for brevity refer to this whole sheet as the link a .

A consideration of the matter will show that on the link a there are points having all conceivable velocities in magnitude, direction and sense, thus if a circle be drawn on a with centre at O all points on the circle will have velocities of the same magnitude, but of different direction and sense; or if a vertical line

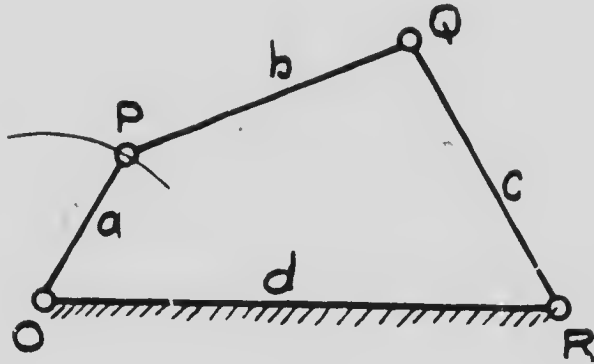


Fig. 2.

be drawn through O all points on this line will move in the same direction, i.e., horizontal, those above O moving in opposite sense to those below O , and the magnitudes of all the velocities being different. Thus, if any point be chosen on a the magnitude of its velocity will depend upon the distance from O , the direction of its velocity will be normal to the radial line joining it to O , and its sense will depend upon the relative positions of the point and O on the radial line. It must be remembered that the above statements are true whether a has constant angular velocity or not and are also true although O is moving.

From the foregoing it follows at once that it will be possible to find a point on a having the same motion as that of any point, such as Q , in the machine, which motion it is desired to study; and thus we can collect on a a set of points, each representing the motion of a given point in the machine, and since this set of points is all on the one link their relative velocities is at once