in Fig. 3. Thus G^1 is a point on K having the same motion as the point G in some external body.

It is to be noted that we cannot assume the sense of the motions nor the magnitude, only the two directions. We could, however, assume the magnitude, direction and sense of $G \sim E$ and find G^1, provided the angular velocity of K were known. If K turns in the clockwise sense then the senses of the lines representing the motion of G are $G \sim 1$ and $G \sim 2$, and if the angular velocity of K is ω radians per second the magnitude of the velocity of $G \sim E$ is $G^1E \cdot \omega$ and of $G \sim F$ is $G^1F \cdot \omega$.

We shall now apply these principles to the solution of problems connected with machinery, first calling particular attention to the fact that the usual information given us is such as we have chosen above, viz., the directions of motion of an external

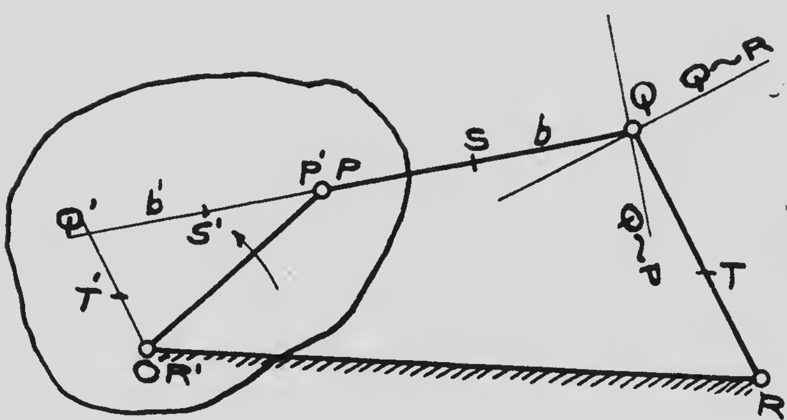

Fig. 4.

point relatively to two points in the link of reference. The simple mechanism with four links and four turning pairs will be chosen as the first example, and is shown in Fig. 4, the letters a, b, c, d, O, P, Q, R having the same significance as before, and a being chosen as the link of reference, and a rough outline of this link is shown to indicate its large extent. It is required to find the linear velocity of the point Q. Points will first be found on a having the same motions as Q and R, which are external to a, and the points so found shall be referred to as the **images** of Q and R and indicated by accents, thus Q^1 is a point on a having the same motion in every respect as Q and similarly with R^1.

Inspection will at once show that since P is a point on a, P^1 will coincide with P, and if we call ω the angular velocity of a in radians per second (which may be constant or variable), then the linear velocity of P is $OP \cdot \omega = a\omega$ ft. per sec., and is in the direction $\perp$ to OP and in the sense indicated by ω. Such