

known completely. This collection of points on a will be of great assistance in studying the motions of points in the machine, because if the motion of a is known, as is usual, that of any other point is known; whereas if the motion of a is unknown only the relative motions of the different points are known. This collection of points on the link of reference is called the *Phorograph*, as it represents graphically the motions of all points in the machine.

The method of determining the phorograph for a given machine may be explained as follows: Let any body K , Fig. 3, have plane motion, and let us choose in it two points E and F . We are, however, given no information about the nature of the motion of K . On some other body there is a point G , and we are told the direction only of the motions of $G \curvearrowright E^*$, viz.,

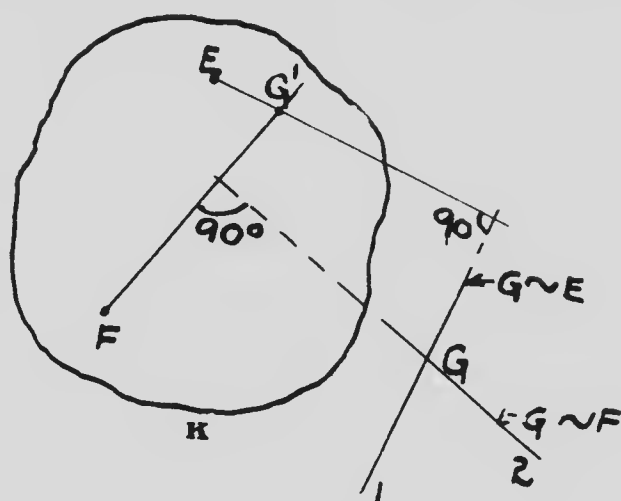


Fig. 3.

$G \curvearrowright 1$, and of $G \curvearrowright F$, viz., $G \curvearrowright 2$: it is required to find a point on K having the same motion as G .

Referring to our preliminary proposition we see that the motion of any point in $K \curvearrowright E$ is perpendicular to the line joining it to E , e.g., the motion of $F \curvearrowright E$ is $\perp$ to FE . But a point is to be found having the same motion as G , and as the direction of $G \curvearrowright E$ is given we are at once told the direction of the line joining E to the required point, it must be $\perp$ to GE and pass through E as it is only points on EG which have the desired direction $G \curvearrowright E$. If we call the point to be found G^1 then G^1 lies on $EG \perp$ to $G-1$. Similarly it may be shown that G^1 must lie on a line through $F \perp$ to $G-2$, and hence it must lie at the intersection of the lines through E and F or at G^1 , as shown

* The sign $\curvearrowright$ is used to mean "with regard to."