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A NEW LINKAGE FOR DESCRIBING A STRAIGHT LINE BY CONTINUOUS MOTION.

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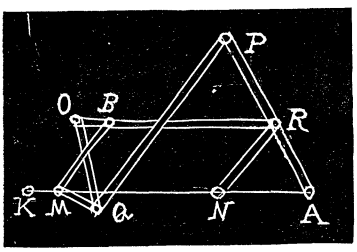
In the linkage given herewith the following conditions obtain: M and N are fixed points to which the whole system is pivoted.

$$MQ=OB=\tfrac{1}{2}OQ;$$

$$OQ=MB=PR=RA=NR=\tfrac{1}{2}QR;$$

$$PQ=OR;\ BR=MN.$$

It is required to find the locus of P and A for every movement of the system if all movable points except P and A describe circles.



1. From the stated conditions, MB is parallel to NR. Hence $\angle OBM=\angle BRN=\angle RNA$. Also $\triangle MOB$ is similar to $\triangle OPR$, since the respective sides are proportional.

Then $\angle OBM=\angle ORP$, being homologous angles of similar triangles. Hence $\angle PRN=2\angle RNA$. Hence it follows that the locus of P is a straight line perpendicular to MN.

2. Since P moves in a straight line, and R is the mid-point of PA, it follows that the locus of A is a straight line. The following corollaries follow immediately:

1. The locus of any point on PA, except R, the mid-point, is an ellipse.
2. On a straight line through MN lay off $MK=MQ$, then K is a fixed point equidistant from the point O.
3. If the link OQ be unfastened at Q, and the point Q fixed at K, the loci of P and A remain unchanged.