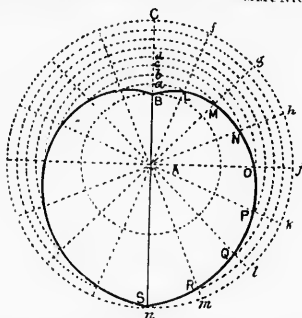
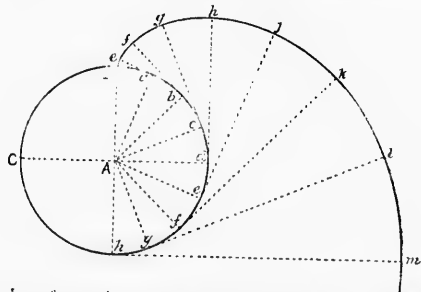


PROBLEM 75.—To Draw a Double Spiral of 180° Forming a Heart-Shaped Cam, Suitable for Communicating Uniform Motion.



Assume the axis of rotation **A**, the minimum and maximum radii **AB** and **AC**. Describe circles with centre **A** and radii **AC**, **AB**. Divide the outer circumference equally in the points **f, g, h**, etc., and draw the radii **AF, AG, AH**, etc. Divide **BC** into the same number of equal parts as the semicircle in **a, b, c**, etc. From the centre **A** with radii **Aa, Ab**, etc., describe arcs to meet the radii **AF, AG, AH**, etc., in the **l, m, n**, etc., marking points in the required curve. Join the points freehand to form the cam **BNQS**.

PROBLEM 76.—To Describe a Portion of the INVOLUTE OF A GIVEN CIRCLE **BCD**.

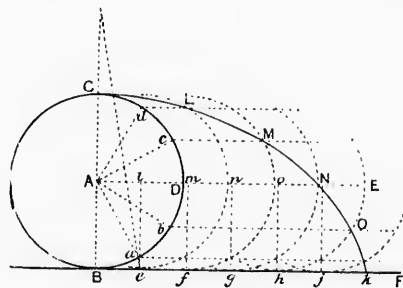


Divide the circumference into any number of equal parts in the points **a, b, c**, etc., and draw tangents **ae, bf, cg**, etc., to the circle. Make **ae** equal to the length of the arc **AB**, **bf** equal to the arc **Bb**, equal to twice

ac, and similarly obtain the points **g, h, i, k**, etc., increasing the tangent in each case by a length equal to the rectified arc **ab** so as to equal the length of the corresponding arc.

NOTE:—This curve is formed by a point in a fine thread when kept taut and unwound from a circular disc. It is much used in mechanism and is one of the forms given to the teeth of wheels.

PROBLEM 77.—To Draw the Cycloid Generated by a Point **C** IN THE CIRCUMFERENCE OF A GIVEN CIRCLE **BCD**.



Draw the diameter **CAB** and through **A** and **B** draw lines **AE, BF**, at right angles to **BC**.

Divide the circle into any number of equal parts in the points **a, b, c**, etc. Mark off on **AE** the points **l, m**, etc., at intervals equal to the rectified length of the arc **Ba**.

Draw circles with radii equal to **AC** from the centres **l, m, n**, etc.

Through **a, b, c, d**, draw lines parallel to **AE**, meeting the circles in the points **l, m, n**, etc., which will be in the required cycloidal curve.

NOTE:—This construction is equivalent to rolling the given circle along a straight line: the centre of the circle successively occupying the points **l, m, n**, etc. while the point **C** in the circumference takes the positions **l, m, n**, etc. A cycloid is described by any point in the circumference of a circle which rolls on a straight line called the **director**.