

course of the thread may be continued. BC is then the distance between two contiguous threads, and we have

$$\tan BAC = \frac{BC}{AC}$$

$$\text{or } \tan \alpha = \frac{\text{distance between two contiguous threads}}{\text{circumference of cylinder}}$$

75. The Screw is kept at rest by the weight (W) which acts vertically, by the power P which acts horizontally, and by the reactions of the groove on the thread at the various points in contact. Fig. 14.

Since the thread is smooth, the reaction at each point of it is normal to the thread; and the angle between the directions of this normal and the axis, being the same as that between the thread and the horizontal tangent which are respectively perpendicular to them, is α , the *pitch*.

If then we resolve this reaction at any point, R (suppose) into two forces; one, vertical, and the other, horizontal and touching the cylinder, the former will be $R \cos \alpha$, and the latter $R \sin \alpha$. Fig. 15.

All these vertical portions being parallel, will form a single vertical resultant whose magnitude is $\cos \alpha \sum (R)$, and this must counterbalance the weight W , since all the other forces are horizontal.

$$\text{Hence } \cos \alpha \sum (R) = W. \quad \dots \quad (1)$$

Again the horizontal portions of the R 's tend to turn the cylinder about its axis, and since each acts in a horizontal direction touching the cylinder, the radius of the cylinder is itself the perpendicular distance between the axis and the direction in each case. Hence the moment of one of these ($R \sin \alpha$) is

$$R \sin \alpha \times \text{radius of cylinder,}$$