

and this normal evidently passes through  $C$ , hence the curves may be used as the profiles of gear teeth.

The curves  $Pa$  and  $Pb$  are called involute curves, and when they are used as the profiles of gear teeth the latter are called involute teeth. The angle  $\theta$  is called the *angle of obliquity*, and evidently gives the direction of pressure between the teeth, so that the smaller this angle becomes the less will be the pressure between the teeth for a given amount of power transmitted. If, on the other hand, this angle is unduly small, the base circles approach so nearly to the pitch circles in size that the curves  $Pa$  and  $Pb$  have very short lengths below the pitch circles. Many firms adopt for  $\theta$  the angle  $14\frac{1}{2}^\circ$ , in which case the diameter of the base circle is .968 (about  $31/32$ ) that of the pitch circle. If the teeth are to be extended below the base circles, as is usual, the lower part is made radial. With teeth of this form the distance between the centres  $A$  and  $B$  may be somewhat increased without affecting in any way the regularity of the motion. In-

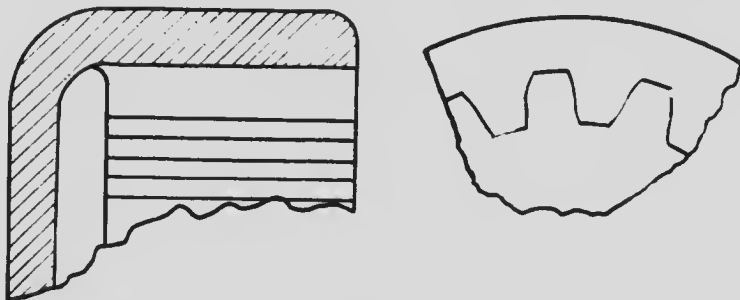


Fig. 16

volute teeth are also stronger in general than the corresponding cycloidal teeth.

The arc of contact in these teeth is usually about twice the pitch, and the number of teeth in a gear should not be less than 12, as the teeth will be weak at the root unless the angle of obliquity is increased.

Gears are sometimes made with the teeth on the inside instead of the outside of the rim, Fig. 16. Such gears are called *annular gears*, and they are always made to mesh with a spur pinion, the property being that both gear and pinion rotate in the same sense. The teeth on the annular gear are made in exactly the same way as those for the spur gear, and are involute or cycloidal.

When one gear of the pair has an infinite radius the pitch line becomes a straight line, and it is then called a *rack*, the teeth being cycloids in one case, and in the involute system being straight lines, forming an angle  $90^\circ + \theta$  with the pitch line, the gear meshing with the rack being called the pinion.