

Engineering clockwheels

In an ideal world you should be able to spin some numbers around and come up with something that will work. In the real world it is difficult to hand fabricate something and make it match the numbers sufficiently closely to guarantee success. This section is mainly for reference, but it may prove useful to tell you why something didn't work and provide leads for you to follow while fixing any problems that might show up.

The easiest description that I have come across for clockwheels would have you imagine two rollers pressed tightly together, one driving the other. In a clock, it's almost always the larger one (the wheel) that is doing the driving while the smaller one (the pinion) is the one being driven. The relative speed of each would depend on the ratio of the outer

diameters, and if slippage could be prevented, we would have rollers inside clocks.

Alas, friction is not our friend (at least inside a clock), so we need teeth to keep the wheel from slipping against the pinion. The teeth must mesh so well that the wheels can rotate as smoothly as if they were rollers. The effective size of intermeshed gears is a little smaller than the actual outside circumference. It is equivalent to the size of the imaginary rollers and is called the pitch circle (see the figure).

The relationship between the outer diameter (OD) of a clockwheel with N teeth and its pitch diameter (PD) has been expressed for centuries as:

$$PD = OD (N / (N+2))$$

Dividing the number of teeth by the pitch

