

CHAPTER II.

TOOTHED GEARING

In many cases in machinery it is necessary to transmit power from one shaft to another, the ratio of the angular velocities of the shafts being known, and in very many cases this ratio is constant; thus it may be desired to transmit power from a shaft running at 120 revs. per min. to another running at, say 200 revs. per min. Various methods are possible, for example, pulleys of proper size may be attached to the shafts and connected by a belt, or sprocket wheels may be used connected by a chain, as in a bicycle, or pulleys may be placed on the shafts and the faces of the pulleys pressed together, so that the friction between them may be sufficient to transmit the power, a drive used sometimes in auto wagons, or, again, toothed wheels called gear wheels may be used on the two shafts, as in street cars and most automobiles.

Any of these methods is possible in some cases, but usually the location of the shafts, their speeds, etc., make some one of the methods the more preferable. Thus, if the shafts are not very close together, a belt and pulleys may be used, but as the drive is not positive the belt may slip, and thus the relative speeds may change, the speed of the driven wheel often being five per cent. lower than the diameters of the pulleys would indicate. Where the shafts are fairly close together a belt does not work with satisfaction, and then a chain and sprockets are sometimes used which cannot slip, and hence the speed ratio required may be maintained. For shafts which are still closer together either friction gears or toothed gears are generally used. Thus the nature of the drive will depend upon various circumstances, one of the most important being the distance apart of the shafts concerned in it.

We shall deal here only with drives of the latter class or toothed gears, which, broadly speaking, are used between shafts which are not far apart, and for which the ratio of the angular velocities must be fixed and known at any instant. We shall first deal with parallel shafts which turn in opposite senses, the gear wheels connected with which are called *spur wheels*, the larger one commonly called the *gear*, and the smaller one the *pinion*. Kinematically, spur gears are the exact equivalent of a pair of smooth round wheels of the same mean diameter, and which are pressed together so as to drive one another by friction. Thus if two shafts 15 in. apart are to rotate at 200 revs. and 100 revs. per min., respectively, they may be connected by two smooth wheels 10 in. and 20 in. in diameter, one on each shaft, which are pressed together so they will not slip, or by a pair of spur wheels of the same mean diameter, both methods