Stub Tooth Gear: Features and Advantages

New Form of Gear Tooth, Differing Only from the Involute in having Greater Obliquity and Shortened Addendum, Giving a Better Rolling Action and Increased Strength and Durability, Advocated by Fellows Gear Shaper Co.

A new form of the involute gear tooth is being advocated by the Fellows Gear Shaper Co., Springfield, Vt., known as the "stub tooth gear." It is a shortened and strengthened involute tooth cut with a stub tooth cutter. The difference is that the stub tooth is shorter and the angle of obliquity greater than in the standard involute tooth. This company have published a booklet outlining

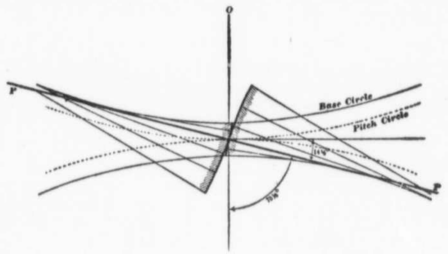

Fig. 1.—Method of Developing the Involute Tooth.

the reasons for advocating this change. Extracts are made from this booklet, and explanations added in order to make the comparison between the two more comprehensive to readers not familiar with the involute tooth.

Before touching on the "stub tooth," a brief description of the standard involute tooth will be in place.

In the involute system of gearing, the outlines of the working parts of a tooth are single curves, which may be traced by a point in a flexible, inextensible cord being unwound from a circular disc, the circumference of which is called the base circle, the disc being concentric with the pitch circle of the gear.

In Fig. 1, the two base circles are represented as larger

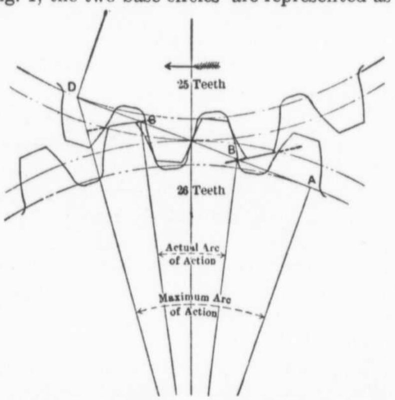

Fig 2.—Comparison of Actual with Maximum Arc of Action in the 14½ Degree System.

to the line P.P. This line is variously called "the line of pressure," "the line of contact," or "the line of action." In our practice this is drawn so as to make with the normal to the center line (00′) 14½ degrees. This angle is known as the angle of obliquity. In the stub tooth system this angle is larger, 20 degrees instead of 14½ degrees, and the tooth is shorter.

With the constantly increasing use of gears for transmitting power in widely varying quantities, the question of the correct shape and size of gear teeth becomes of far greater importance than ever before. It is not sufficient that a gear be well cut and the teeth properly spaced, but the shape and proportions of the tooth itself must be carefully considered.

The two most important features are the securing of the nearest approach to a rolling action that it is possible to obtain and the strongest tooth that will meet this condition. The first includes easy running, reduces the friction to the lowest point, and consequently has the least wear in action.

In the matter of length, it is a fallacy to argue that teeth should be made as long as possible in order to have two or more teeth in contact at once. An equal division

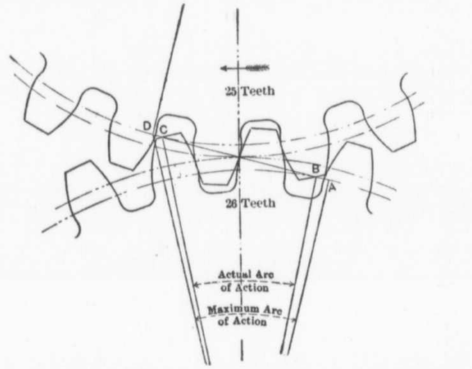

Fig. 3.—Comparison of Actual with Maximum Arc of Action in the Stub-tooth System.

of the load is never possible between two contact points, and it can be shown that the lengthening of the tooth to produce more points of contact gives an excessive sliding action at certain portions of the tooth action, especially with gears 14½ degrees of standard angle. By increasing this angle, the teeth may be shortened so that only such portions of the curve are used as will give nearly a complete rolling action. This increase in obliquity has been advocated before, but its advantages are very limited, if a tooth of the standard length is retained.

In Figs. 2 and 3 are shown comparisons of the tooth form of a gear of the standard and of the stub-tooth, the driver having 25 and the driven 26 teeth. If, in the diagrams, the gears are supposed to rotate in the direction of the arrow, the theoretical action begins at A and ends at D, the line AD being termed the "line of action." It is obvious, however, that the actual action can only begin at B, where the outside diameter of the upper gear intersects the line AD, and ends at the corresponding point C. Drawing the radial lines from these points to the center O (not shown) the triangle AOD defines the maxi-