mum or the greatest possible arc of action, and BOC the actual arc of action.

In Fig. 4 is shown an involute curve of 14½ degrees obliquity of each of the gears, the curves being of sufficient length to cover the maximum arc of action, and drawn

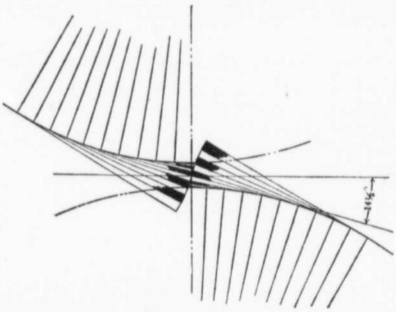

Fig. 4.—The Involutes are those of Fig. 2. The Alternate Shaded Divisions show the Portions of Each which are in Contact with the Corresponding Portions of its Mate during Equal Angular Movements.

to the same scale as Figs. 2 and 3. The alternately shaded divisions of the curves show the portion of each that is in contact with its mate during an equal angular movement of the gears. In Fig. 5 is seen a similar diagram for a tooth having an angle of obliquity of 20 degrees.

In Figs. 6 and 7 the involute curves of Figs. 4 and 5 are developed into straight lines, marked off into divisions corresponding with the divisions on the involutes. These

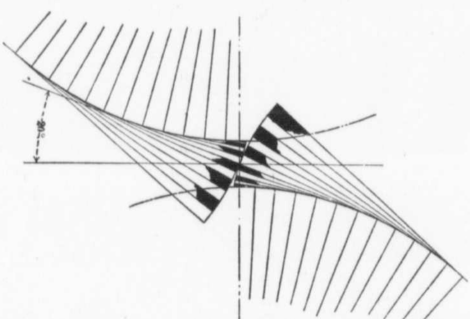

Fig. 5.—The Involute of the Stub-tooth Gear in Fig. 3, treated as in the Preceding Figure.

division points are connected by cross lines. It will at once be seen that the angularity of these cross lines may be taken as a measure of sliding that takes place at any given point, since a large division on one involute making contact with a small division on the other involves an amount of rubbing measured by the difference between the two distances. To any one who has labored under the impression that if the involute curves of a pair of gears are correct, the action is nearly a rolling one, a comparison of these diagrams will be both interesting and instructive. two points will be noted.

First, on account of the greater angle of the line of action of the sub-tooth, the maximum arc of action is much increased.

Second, the ratio of the actual to the maximum arc of action of the stub-tooth is much less than in the standard.

This latter point is a very important one, as we thus eliminate contact at both ends of the line of action. When we realize that this is the portion of the action in which the greater part of the sliding takes place, with its inevitable wear, we see that it is a good thing to cut it out if possible. The point of the tooth which wears out the flank of its mate is removed with the adoption of the stub-tooth, and this reduces the friction while increasing the efficiency. A comparison of Figs. 6 and 7 shows that the action of the stub-tooth is as nearly a rolling one as it is possible to obtain. The action of the standard tooth at the base line is that of a stone-boat being dragged over the ground, while the action of the stub-tooth can be compared with the same stone-boat mounted on wheels

It is, of course, impossible to entirely eliminate the wear

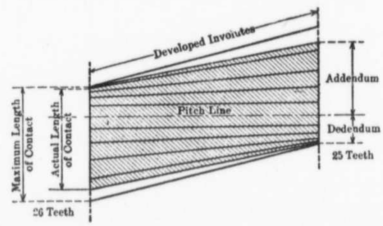

Fig. 6.—The Involutes of Fig. 4. Separated and Developed into Straight Lines with the Division Points Connected as shown. The Angularity of the Connecting Lines is a Measure of the Rubbing.

between the teeth of gears working under a load. But if the wear can be evenly distributed over the entire working face of the tooth, the correct form of tooth is retained indefinitely, and a worn-out gear should, aside from the excessive backlash, run as well as a new gear. And, if this wear can be evenly distributed, the durability of any gear will be increased many times.

We have so far discussed only the points of efficiency and durability, but there is another advantage of the stub-tooth over the standard form, and one which some might think entitled to first consideration, especially

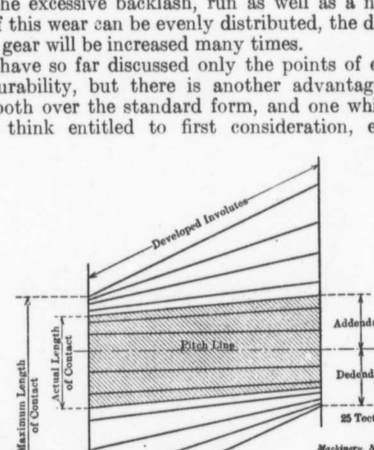

Fig. 7.—The Involutes of the Stub-tooth Gear in Fig. 5 treated as in the Preceding Figure.

in the transmission of any considerable amounts of power; this is the advantage of greatly increased strength.

A comparison of the two diagrams in Fig. 8 (drawn according to the well-known method proposed by Mr. Wilfred Lewis) shows an increase in strength for the stub-