C. G. OLSON.

RECTIFIED TOOTH HOB.

APPLICATION FILED NOV. 1, 1920.

1,393,818. Patented Oct. 18, 1921.

Fig. 1.

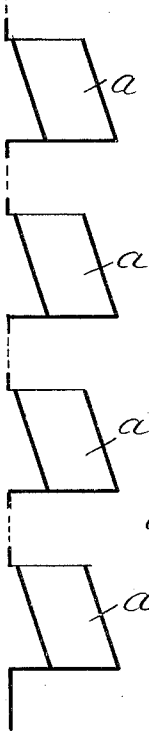


Fig. 2.

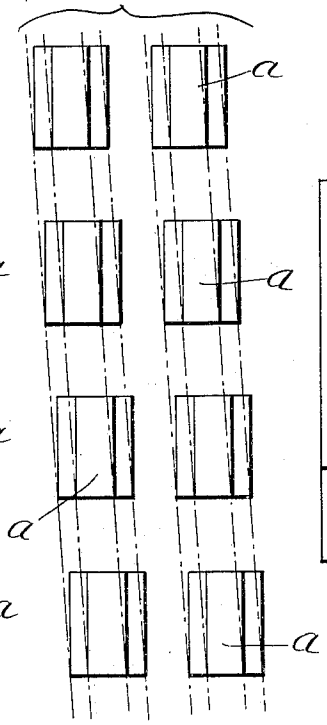


Fig. 3.

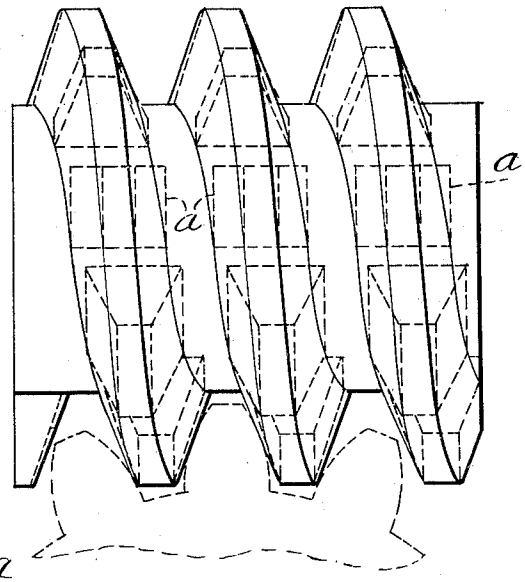


Fig. 4.

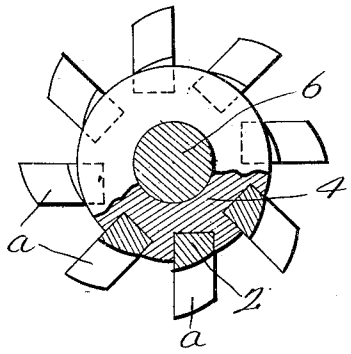
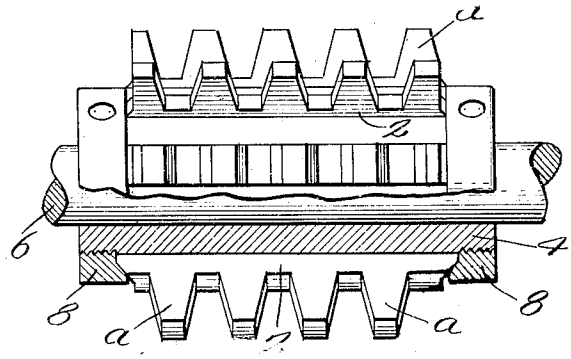


Fig. 5.



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UNITED STATES PATENT OFFICE.

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RECTIFIED-TOOTH HOB.

1,393,818. Specification of Letters Patent. Patented Oct. 18, 1921.

Original application filed January 5, 1920, Serial No. 349,487. Divided and this application filed November 1, 1920. Serial No. 420,997.

To all whom it may concern:

Be it known that I, CARL G. OLSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Rectified-Tooth Hobs, of which the following is a specification.

My invention is embodied in a hob in which the individual teeth are rectified in the sense of either lying in the plane of rotation or conforming to a helix having a slower pitch than the lead of the hob. One method of producing a hob of this invention is shown in my prior Patent 1,357,815, of which this present application is a division.

As explained in said patent, in cutting gears or spline shafts (that is, shafts having integral splines) with ordinary hobs, the hob must be set at an angle to the work corresponding to the helix angle of the hob. This angular setting of the hob requires that the machine in which the hob is used be especially adapted for the purpose, and this makes the machine more complex than it would have to be if the hob could be set at right angles to the axis of the gear being cut. Also the act of adjusting the machine for using the ordinary hob requires time, skill, and care. One object of my invention is to produce a hob which can be placed with its axis at right angles to the axis of the gear being cut. This is not broadly new, as evidenced by the Zimmermann Patent 1,151,324. But in the hob shown by Zimmermann, the teeth conform to the helix or spiral of the hob and the result is that the utility of the hob is limited to a narrow range of angles, that is, the hob must have a relatively slow pitch. One of the objects of my invention is to provide a hob which is usable through a wide range of pitch angles. To accomplish my objects, I modify the shape of the individual teeth. The cutting edges of the successive teeth are located in the helicoid, but the portion behind the cutting face is straightened or rectified so that the back portion of the teeth will not interfere with the teeth of the gear being cut. In my hob, the teeth are straightened away from the helix and against the lead of the thread. The degree to which the individual teeth are straightened will be affected by the helix angle, the diameter of the hob and the pressure angle. The modification will occur between the two extremes one of which is the true helix of the hob, and the other is a ring encircling the hob at right angles to its axis.

In addition to its other advantages, my hob finishes the work more uniformly, because the angles at the two sides of the cutting faces are more nearly equal than is the case of ordinary hobs where the angle is obtuse at one side of the face and acute at the other. That portion of the cutting face of the tooth where the angle is obtuse (in an ordinary hob) does not cut as well as that portion where the angle is acute. In a hob produced according to my invention the angles are more nearly alike at both sides, and hence the cutting effect is substantially uniform at both sides and a better finish is produced.

A hob embodying my invention may be either solid—that is, with integral teeth, or it may be an inserted tooth hob—that is, one in which the individual teeth are formed separately and then inserted into the body of the hob. In the accompanying drawings

Figure 1 shows a row of hob teeth viewed axially, or from the side of the teeth and showing the radial relief. The individual teeth appear as they would when looking at the end of the hob, but with the teeth in a straight row instead of in a circle, the view in this sense being a development. The appearance of these teeth when viewed as in this figure is the same as in the case of an ordinary hob.

Fig. 2 is a development looking toward the left in Fig. 1, and shows in dotted lines the angle which the teeth of an ordinary hob would have and showing in full lines the rectified teeth which constitute the improvement of my hob.

Fig. 3 is a side view of a worm or helicoid showing, in dotted lines, the conformation of the teeth of my hob. It will be observed that the front faces or cutting edges of the teeth coincide with the worm while the portion behind is rectified to a greater or less extent; in other words, brought more nearly parallel to a plane perpendicular to the axis of the hob.

Fig. 4 is an end view of a hob embodying my invention, but having inserted teeth, and

Fig. 5 is a face view of an inserted tooth hob, a portion being broken away to illustrate the manner of holding the teeth in place.

Like numerals denote like parts throughout the several views.

Referring first to the diagrammatic views, Figs. 1 and 2:

The top view of the teeth *a* is shown in full lines while the dotted lines show what the appearance would be if the teeth were helicoidal. It will be seen that the front or cutting face of the teeth occur in the helicoid while the body of the tooth is rectified in the sense that it is either annular or at least has a slower pitch. Differently stated, the outline of the cutting face coincides with the profile of the thread helicoid at the flute or gash while the portion behind is rectified or straightened either to form a ring parallel to the plane of rotation or at least a helicoid having a slower pitch or smaller helical angle than the thread helicoid. Referring to Fig. 3, the full lines show a worm or helicoid modified according to the Zimmermann principle, while the dotted lines indicate the rectification from said helicoid.

The hob may be either solid as indicated in Fig. 3 or it may have inserted teeth as illustrated in Figs. 4 and 5. If solid, it may be formed according to the method and machine illustrated in the said copending application. In the case of hobs with inserted teeth as shown in Figs. 4 and 5, the teeth may be formed in sets in which the teeth of any given set are integral with a base portion 2 adapted to be secured to a sleeve 4. The individual teeth are rectified in the same sense as in the case of the solid hob, just described.

In use the sleeve will be mounted upon a mandrel 6 in the well known manner. The ends of the bases 2 have extensions adapted to be engaged by retaining rings 8 which screw onto the ends of the sleeve. The sets of teeth will be assembled equidistantly around the circumference of the sleeve and when thus assembled the hob will operate in the same manner, as a solid hob.

As the result of my invention the cutting faces coincide with a worm or helicoid which in silhouette presents the appearance of the conjugate rack, that is, the cutting faces conform to and are arranged in a helicoid having surfaces formed so that when projected on a plane perpendicular to a chordal plane and parallel to a diametral plane, a true conjugate rack will be enveloped; the bodies of the teeth, however, do not conform to such helicoid but are either truly annular or at least conform to a helicoid of slower pitch. In operation my hob can be placed with its axis at right angles to the axis of the gear being cut, and is usable through a wide range of pitch angles.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A hob having teeth, the cutting faces whereof coincide with one helicoid, viz: the one corresponding to the lead of the hob as a whole, and the individual teeth form truncated helicoids of slower pitch.

2. A hob having teeth the cutting faces whereof conform to and lie in a continuous helicoid which in silhouette presents the appearance of a rack having the basic form of the required system of gear teeth, the bodies of the individual teeth of the hob conforming to a helicoid of slower pitch.

3. A hob having teeth the cutting faces whereof conform to and lie in a continuous helicoid having surfaces formed so that when projected on a plane perpendicular to a chordal plane and parallel to a diametral plane, a true, conjugate rack will be enveloped, the bodies of the individual teeth of the hob lying approximately parallel to the plane of rotation of the hob.

In witness whereof, I have hereunto subscribed my name.

CARL G. OLSON.