No. 611,277. Patented Sept. 27, 1898.

J. G. REINECKER.

APPARATUS FOR MANUFACTURING WORM WHEELS.

(No Model.) (Application filed Feb. 13, 1895.) 2 Sheets—Sheet 1.

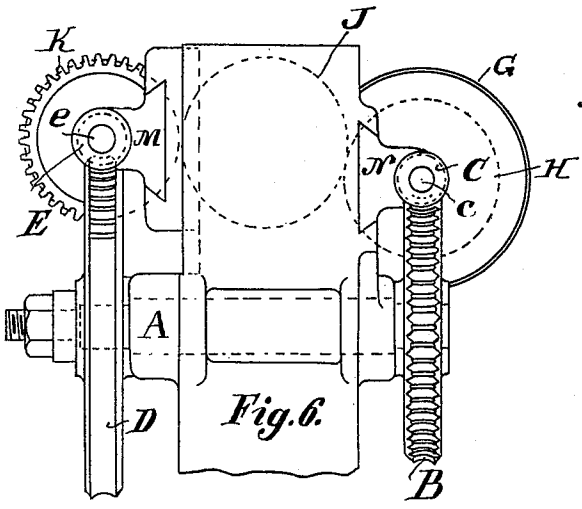


Fig. 6.

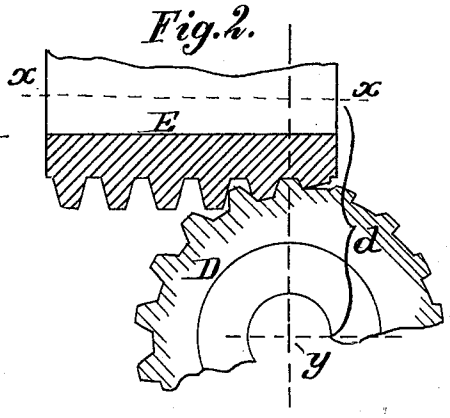


Fig. 2.

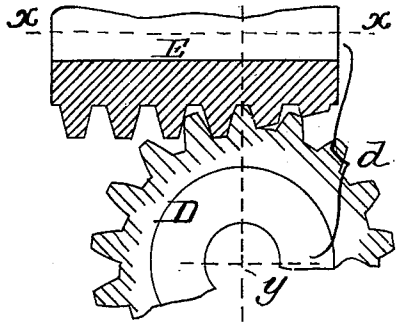


Fig. 3.

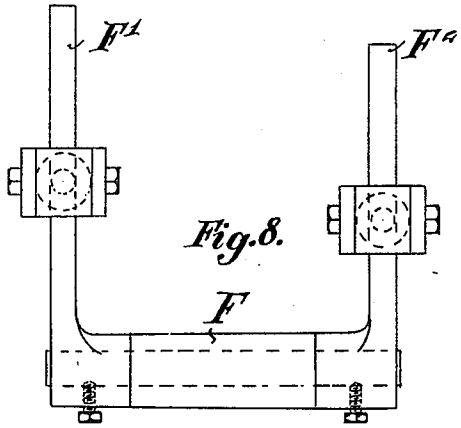


Fig. 8.

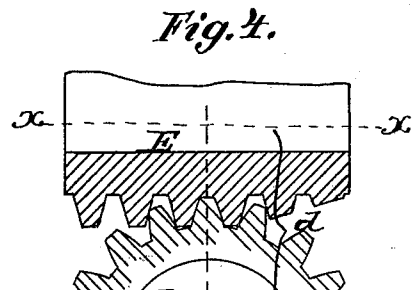


Fig. 4.

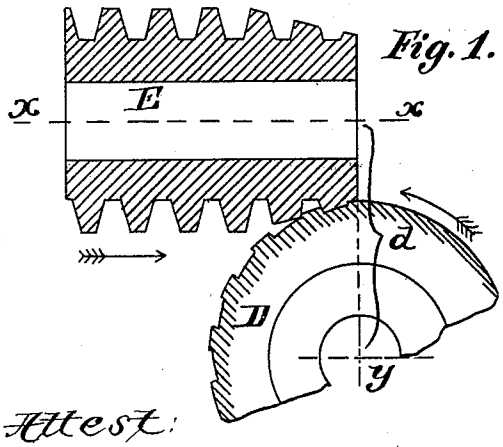


Fig. 1.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 611.277. Patented Sept. 27, 1898.

J. G. REINECKER.

APPARATUS FOR MANUFACTURING WORM WHEELS.

(Application filed Feb. 13, 1895.)

(No Model.) 2 Sheets—Sheet 2.

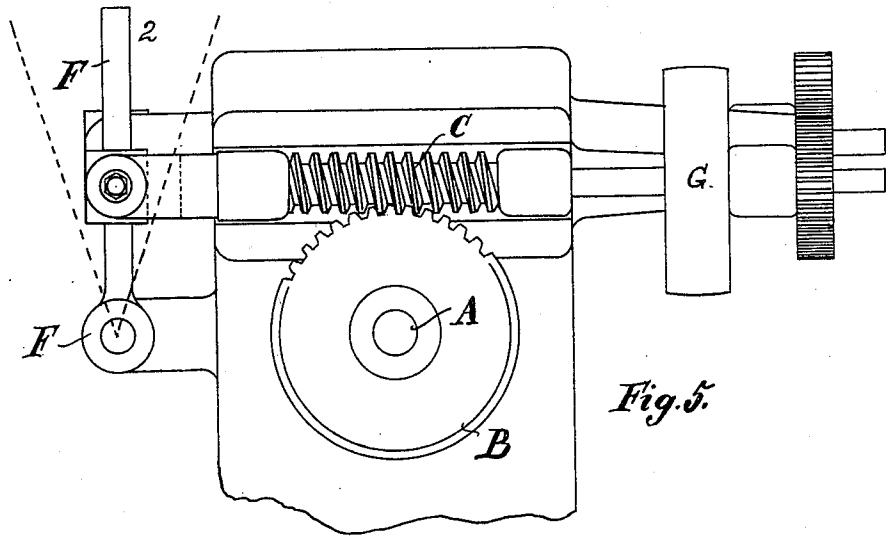


Fig. 5.

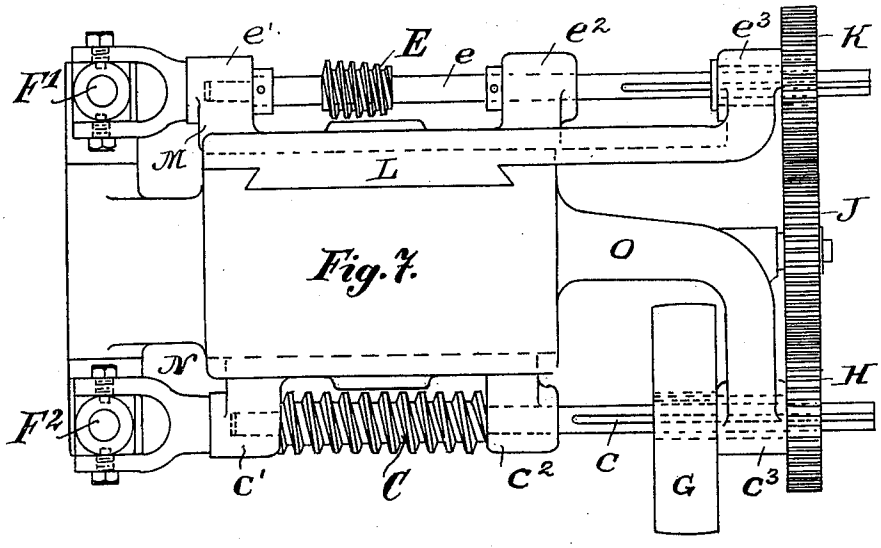


Fig. 7.

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UNITED STATES PATENT OFFICE.

JOHANNES GEORG REINECKER, OF GABLENZ, GERMANY, ASSIGNOR TO THE FIRM OF J. E. REINECKER, OF SAME PLACE.

APPARATUS FOR MANUFACTURING WORM-WHEELS.

SPECIFICATION forming part of Letters Patent No. 611,277, dated September 27, 1898.

Application filed February 13, 1895. Serial No. 538,232. (No model.) Patented in Germany October 27, 1894, No. 81,418; in France December 4, 1894, No. 243,378; in Hungary January 18, 1895, No. 1,989; in England January 23, 1895, No. 1,613; in Switzerland February 14, 1895, No. 9,781, and in Austria July 10, 1895, No. 2,521.

To all whom it may concern:

Be it known that I, JOHANNES GEORG REINECKER, a subject of the King of Saxony, residing at Gablenz, near Chemnitz, in the Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Apparatus for Manufacturing Worm-Wheels, of which the following is a specification, the said improvements being embraced in Letters Patent granted to me in the following countries: Germany, No. 81,418, dated October 27, 1894; France, No. 243,378, dated December 4, 1894; Austria, No. 2,521, dated July 10, 1895; Hungary, No. 1,989, dated January 18, 1895, and Switzerland, No. 9,781, dated February 14, 1895, and in Letters Patent of Great Britain granted to me and Julius Eduard Reinecker, No. 1,613, dated January 23, 1895.

My invention relates to apparatus for manufacturing worm-wheels.

The manufacture of worm-wheels has heretofore presented a number of difficulties which have not been obviated by the apparatus employed of late for automatically manufacturing these wheels by positive motion. These difficulties are very considerable, particularly when cutting wheels for worms having a multiplex thread. According to my said invention I obviate these difficulties by the employment of apparatus which substantially differs from the apparatus heretofore employed, in which the worm-wheel cutter is adjusted from above in the wheel to be cut and is gradually lowered until the proper axial distance is obtained, in that the worm-wheel cutter is adjusted at the commencement to the proper axial distance from the worm-wheel and is displaced laterally—that is to say, toward the wheel to be cut—till it is in complete engagement with the same.

By my invention it is intended, furthermore, to obviate the undercutting of the teeth of the wheel, such as has frequently occurred, especially with great pitches of the worms, and resulted in the deformation of the teeth, and was often unavoidable with the apparatus employed up to the present time.

The invention consists in a peculiar construction and arrangement of the cutting-machine, which will be readily understood from a detailed description thereof, which will now be given in connection with the accompanying drawings, in which—

Figures 1, 2, 3, and 4 are details, partly in section and on an enlarged scale, of the cutter and the wheel operated upon, illustrating different steps of the cutting operation. Fig. 5 is a side view of a machine embodying the present invention, a portion of the frame-work being omitted. Fig. 6 is a front view of the same. Fig. 7 is a plan view thereof; and Fig. 8 is a detail illustrating means for axially displacing the cutter, which will be hereinafter referred to.

Referring now particularly to Figs. 5 to 8, the machine therein illustrated will be described. Upon a common axis A are secured both the generating worm-wheel B and the worm-wheel D to be cut. The worm C, engaging with the generating-wheel B, is operated by belt-gear G and drives the cutter E by means of wheels H J K, corresponding in size to the number of teeth of the wheel D to be produced, the said cutter, by means of a slide L, carrying the bearings e' e^2 e^3 for the shaft e of the cutter, being adjustable in the vertical direction relatively to the axis of the said wheel D and placed before the commencement of the cutting at the exact axial distance from this wheel. The proper axial distance between the cutter and wheel is clearly shown at d in Figs. 1 to 4.

It is an essential feature of my invention that at the commencement of each operation the cutter E be adjusted to the before-mentioned distance from the wheel to be cut and maintained thereat during the whole cutting operation. The cutter E is adapted to be displaced laterally from left to right; but it cannot turn relatively to its driving-wheel and during the cutting is displaced or adjusted from left to right, Fig. 7. For this purpose the cutter is supported upon a transverse slide M, (see Fig. 6,) having two of the before-mentioned bearings e' e^2 arranged in line with the third bearing e^3 for the cutter-shaft e. Now a displacement of the cutter

E would occasion a destruction of the teeth already cut in the wheel D if this wheel did not at the same time make a turning movement corresponding to the lateral displacement of the cutter E. In order to render this possible, the wheel B must also perform the same turning movement—that is to say, the worm C must likewise undergo a displacement whose extent bears the same proportion to the displacement of the cutter E as the diameters of the wheels B and D. This displacement may be effected through the intervention of the double-armed lever F, one arm F′ of which is in connection with the transverse slide M, carrying the shaft *e* of the cutter E, and the other arm F^2 in connection with the transverse slide N, carrying, by means of bearings c' c^2, the shaft *c* of the worm C. The third bearing c^3 of shaft *c* is formed at the end of an arm O, projecting from the frame of the machine. In the displacement of the cutter the aforesaid lever F F′ F^2 by acting upon the worm C effects a turning movement of the two wheels B and D, fixed upon the axis A, which movement corresponds exactly to the said displacement.

Although the worm-wheel cutter E is shown as provided with a conical end next the wheel to be cut, it is not necessary that the cutter should be so formed, and it may in fact have its full thread.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination with a shaft for supporting and rotating the wheel to be cut, of a generating-wheel fixed to said shaft, a worm for engaging and rotating said generating-wheel, a cutter adjustable in a right line to and from the axis of rotation of said shaft into position to engage the wheel to be cut, means for rotating the worm and cutter, and means for axially displacing the cutter, substantially as described.

2. In a machine for cutting worm-wheels, the combination with a double-armed lever, of a cutter, a transverse slide carrying said cutter, a shaft for supporting and rotating the wheel to be cut, a worm and connections for rotating said shaft, a slide carrying said worm, connections between said slides and lever and means for rotating said cutter, substantially as described.

3. In a machine for cutting worm-wheels, the combination with a driving-worm and a cutter arranged on parallel shafts geared together, means for rotating said shafts, a third shaft for supporting and rotating the wheel to be cut, a generating-wheel fixed to said last-named shaft, said cutter being adjustable in a right line to and from the axis of rotation of the latter shaft and axially movable in a plane at right angles to its movement of adjustment, and means for rotating said parallel shafts and for axially moving said cutter, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHANNES GEORG REINECKER.

Witnesses:

CARL JUL. DIETRICH,

RICHARD GUSTAV WOLF.