2 Sheets--Sheet 1.

R. THOMPSON.

Machine for Making Cutters for Grooving Needles.

No. 159,863. Patented Feb. 16, 1875.

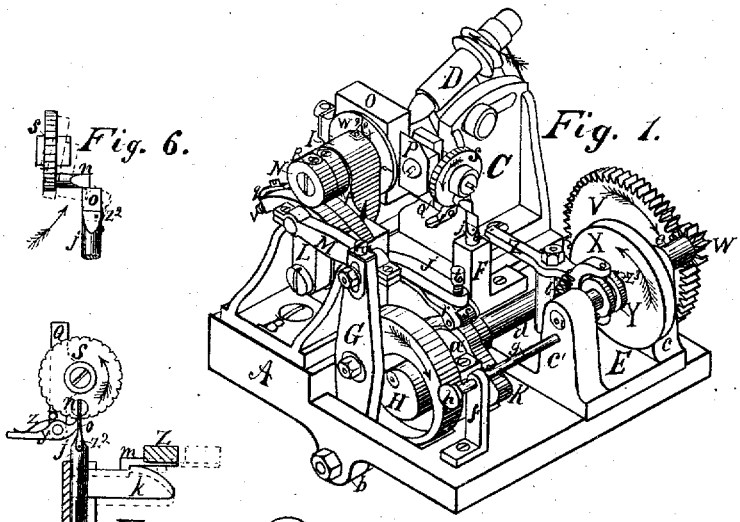

Fig. 1.

Fig. 6.

Fig. 5.

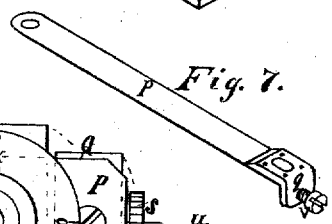

Fig. 7.

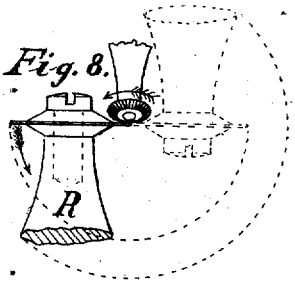

Fig. 8.

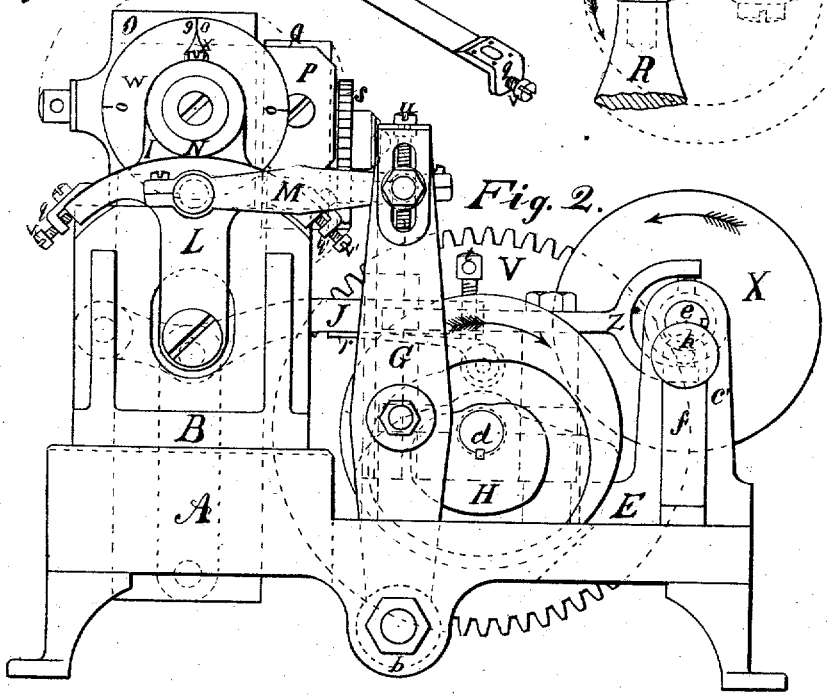

Fig. 2.

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2 Sheets--Sheet 2.

R. THOMPSON.

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Fig. 3.

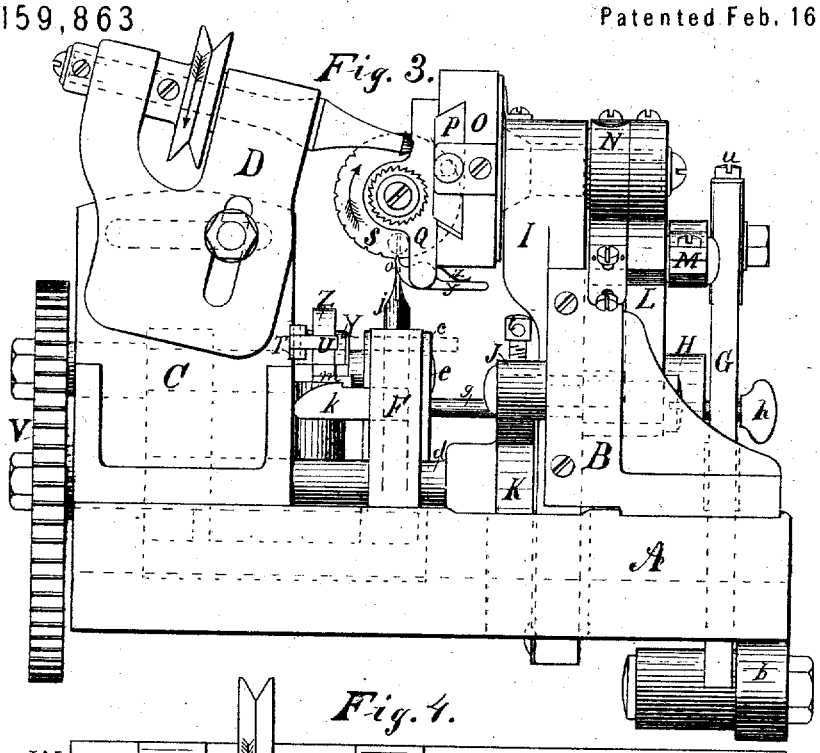
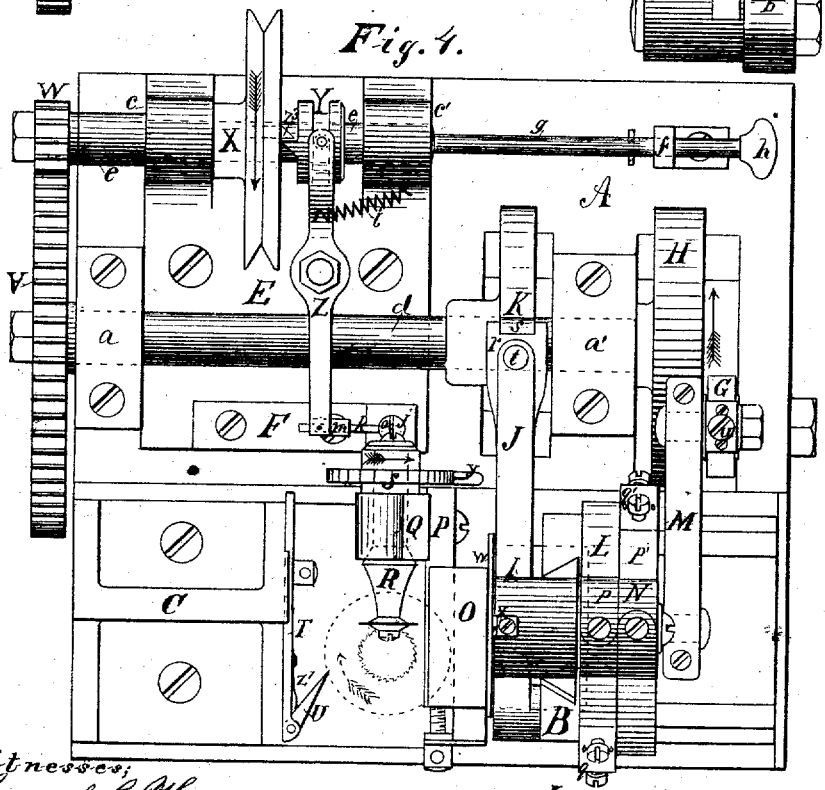


Fig. 4.



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UNITED STATES PATENT OFFICE.

ROSEWELL THOMPSON, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO WHEELER & WILSON MANUFACTURING COMPANY, OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR MAKING CUTTERS FOR GROOVING NEEDLES.

Specification forming part of Letters Patent No. **159,863.** dated February 16, 1875; application filed January 21, 1875.

To all whom it may concern:

Be it known that I, ROSEWELL THOMPSON, of Bridgeport, in the county of Fairfield and State of Connecticut, have invented a new and Improved Machine for Making Semicircular-Toothed Milling-Cutters; and I do hereby declare the following to be a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification.

The object of my invention is to more accurately and rapidly operate a part of the machine for making semicircular-toothed milling-cutters for grooving sewing-machine needles, for which Letters Patent were granted to me September 22, 1874; and my present improvement consists in applying certain mechanical devices and combinations to the mechanism, to which the cutter-blank arbor is attached for the purpose of operating the same automatically, and at the same time with greater regularity and uniformity of speed than can be imparted by means of the hand-levers, as before constructed.

To enable others skilled in the art to make and use my invention, I will now proceed to describe the construction and operation of my improved machine with reference to the accompanying drawings.

Similar letters of reference indicate corresponding parts.

Figure 1 is a perspective view of my improved machine, showing the manner in which the automatic attachment is applied to the oscillating mechanism, to which the cutter-blank arbor is attached. Fig. 2 is a right-end elevation of the same. Fig. 3 is a front elevation of the machine, showing the position of the oscillating mechanism and cutter-blank at the center of the return motion, together with the milling-cutter spindle and cutter. Fig. 4 is a plan of the machine, with the milling-cutter spindle and bearing removed. Fig. 5 is a detached view of a part of the mechanism, which is applied to the machine for the purpose of stopping the movement of the automatic attachment after the final tooth has been milled upon the edge of the cutter-blank. Fig. 6 is also a part of the same mechanism. Fig. 7 is a detached perspective view of one of the thin elastic bands of steel used in connection with the automatic attachment. Fig. 8 is an enlarged drawing of the milling-cutter and a portion of the spindle to which the same is attached, together with a view of the cutter-blank and a portion of the arbor, and is designed to clearly show the relative position of the latter with respect to the milling-cutter during the operation of milling a semicircular-tooth upon the edge of said blank.

A is the bed of the machine, constructed with two upright bearings, *a a'*, and an ear, *b*, on the under side of the same. B is a vertical bearing fitted to a cross-groove on the top side of the bed. C is the upright head-bearing, and is secured to the top side of the bed. D is the milling-cutter spindle-bearing, secured to the upright C. E is an adjustable slide, constructed with two upright bearings, *c c'*, and is fitted to a groove on the top side of the bed. F is a vertical bearing, secured to the slide E. G is a lever pivoted to the ear *b* on the under side of the bed. H is a cam for imparting an oscillating motion to lever G. *d* is a shaft fitted to the upright bearings *a a'*. I is a vertical sliding bearing fitted to a beveled groove in the horizontally-adjustable bearing B. J is a lever pivoted to the side of the bearing B, the side of said lever being connected to the sliding bearing I to regulate the motion and position of the same. K is a cam secured to the shaft *d*, and is designed to impart motion to the vertical bearing I and parts connected therewith through the horizontal lever J. L is a segmental lever pivoted to the vertical sliding bearing I through a slot in bearing B. M is a bar connecting levers L and G. N is a a pulley secured to a spindle, which passes through the top end of the sliding bearing I. O is a bearing secured to the opposite end of said spindle. P is an adjustable slide fitted to a beveled groove in bearing O. Q is the cutter-blank arbor-bearing, and is secured to the adjustable slide P. R is the cutter-blank arbor, and is fitted to bearing Q. S is an index secured to the cutter-blank arbor. T is an adjustable bar fitted to a groove in the side of the upright head-bearing C. U is a pawl pivoted to the end of

bar T. V is a gear-wheel secured to the end of shaft *d*. *e* is a shaft fitted to bearing *c c'*. W is a pinion secured to the end of shaft *e*. X is a pulley fitted to shaft *e*, but so as to revolve freely on the same. Y is a shipper, also fitted to shaft *e*, but so as to slide freely on the same, and is made to revolve with said shaft by means of a spline fitted between them. Z is the shipper-lever, and is pivoted to a stud on the adjustable slide E. *f* is a vertical bearing secured to the bed A. *g* is a rod passing through vertical bearings *f* and *c'*, and is allowed to slide freely through the holes, the end of said rod reaching the side of the shipper Y. *h* is a knob secured to the opposite end of rod *g*. *i* is a spiral spring, one end of which is attached to the upright bearing *c'* and the other end to the shipper-lever Z. J is a sliding rod fitted to the hole in the vertical bearing F. *k* is a catch secured to the sliding rod *j*. *l* is a spiral spring under the sliding rod *j*. *m* is a latch secured to the end of the shipper-lever Z. *n* is a stud secured to the side of the index S. *o* is a thin steel plate pivoted to the top of the sliding rod *j*. *p p'* are thin elastic bands of steel connecting the pulley N with segmental lever L. *q q'* are blocks riveted to the ends of bands *p p'*. *r* is a forked spring secured to the under side of lever J. *s* is a roll attached to the spring *r*. *t* is a screw passing through the end of the lever J for the purpose of adjusting the position of the spring *r* with respect to the end of said lever. *u* is a screw secured to the top of lever G, for the purpose of regulating the position of the end of the connecting-bar M, with respect to the fulcrum of said lever. *v v'* are screws passing through blocks *q q'*, for the purpose of adjusting the positions of the elastic bands *p p'* with respect to the oscillating mechanism. *w* is a protractor secured to the face of the bearing O. *x* is a pointer secured to the top of the vertical bearing I. *y* is a pawl pivoted to the cutter-blank arbor bearing Q, the point of which enters the teeth of the index S. *z* is a spring secured at one end to the arbor-bearing Q, the opposite end pressing upon the pawl *y*. z^1 is a spring secured to the adjustable bar T, the opposite end of which presses upon the pawl U. z^2 is a spring secured to the side of the sliding rod *j*, the opposite end of which presses against the edge of the plate *o* at the top of said sliding rod. z^3 is a stud in the side of the pulley X for the purpose of imparting motion to the automatic attachment when said stud is connected with the shipper Y.

I will now describe the practical operation of my improved machine with reference to the accompanying drawings.

It is to be understood that the shipper Y and latch *m* are now disconnected with the stud z^3 and catch *k*, respectively, thus allowing the driving-pulley X to revolve freely upon the shaft *e*, the motion being in the direction indicated by the arrow drawn upon the same. Motion is also imparted to the milling-cutter spindle in the direction indicated by the arrow drawn upon the same. A blank of suitable thickness and diameter is now secured to the arbor R in the manner shown in Figs. 4 and 8, said arbor being at this time in about the position shown in the drawings, Figs. 3 and 4. Motion is now imparted to the automatic attachment by means of the rod *g*, which, being pushed by the operator toward the shipper Y, causes the latter to slide on the splined shaft *e*, carrying with it the forked end of the shipper-lever Z, the same being retained in this position by means of the latch *m*, which now engages with the catch *k* upon the sliding rod *j* in the manner shown in the drawings, Figs. 3, 4, and 5, the shipper Y being thus secured in this position on the shaft *e*. The stud z^3 upon the side of the revolving pulley X now strikes the projecting horn on the side of said shipper, which causes the latter to revolve with said pulley, carrying with it the splined shaft *e*, pinion W, spur-gear V, shaft *d*, and cams K and H, the latter being rigidly secured to the revolving shaft *d*. An oscillating motion is now imparted to the lever G by means of a stud in the side of said lever, which is fitted to a groove in the side of the cam H, the form of said groove being such as to cause a pause to said lever at the end of each extreme stroke during a portion of the revolution of said cam. A similar motion is also imparted to the segmental lever L, for both levers, being connected by means of the connecting-bar M, are operated simultaneously, though with angular velocities according to the relative positions of the connecting ends of said bar with respect to the fulcrums of the respective levers.

A semicircular oscillating motion is now imparted to the mechanism to which the cutter-blank arbor is attached by means of the elastic bands *p p'*, which, being secured, respectively, at one end of the face of the pulley N, and at the other end to the sides of the segmental lever L, cause the former to oscillate with the latter, though in an opposite direction, and with a different angular velocity, the motion of said lever being just sufficient to impart a semicircular motion to the pulley N, and mechanism connected therewith.

At each extreme end of the stroke of the oscillating mechanism a reciprocating motion is imparted to the vertical sliding bearing I, to which the former is attached, by means of the horizontal lever J and cam K, the form of said cam being such as to cause a pause to said bearing and lever during the movement of said oscillating mechanism, said reciprocating motion being applied for the purpose of regulating the position of the cutter-blank during the oscillating movement of the same, the form of cam K being such as to cause said cutter-blank to be brought in contact with the milling-cutter, in the manner shown in the enlarged drawing of the same, Fig. 8, at the commencement of the forward oscillating movement, and to remain in contact with said

cutter during the entire stroke of the oscillating mechanism, which causes a perfectly-semicircular tooth to be milled upon the edge of said cutter-blank. Immediately after the tooth is thus milled the blank is removed from contact with the milling-cutter by a downward movement of the mechanism to which the same is attached, and caused to remain disconnected during the return motion of said mechanism, at the completion of which the upward movement is again applied to the vertical sliding bearing I, and mechanism connected therewith, when another semicircular tooth is milled upon said cutter-blank in the manner above described.

As it is necessary to present a new uncut edge of the cutter-blank to the milling-cutter at the commencement of each successive forward oscillating movement of said blank, in order to mill the several teeth required, the index S, which is provided with the desired number of teeth, and secured to the cutter-blank arbor, is made to revolve automatically by means of the pawl U, which, being pivoted to the adjustable bar T, is secured in such a position as to cause the point of said pawl to enter one of the teeth of said index near the termination of the return oscillating motion of the same, and move it the distance of one tooth during the remaining portion of said motion, said index being held in its new position during the succeeding forward movement by means of the pawl *y*, the point of which has, by the motion above described, passed into another tooth upon the edge of said index.

The position of the index at the termination of the return oscillating motion is shown in the broken outline of the same, Fig. 4.

It is to be understood that the operator is to commence milling the first tooth upon the edge of the blank with the point of the pawl *y* in the tooth of the index just at the right of the one it now occupies in the drawings, the final tooth being milled with the point of said pawl in the tooth opposite the stud *n*, as shown in the drawings.

When the cutter-blank has made nearly a complete revolution, and all the teeth except the final one have been milled in the manner above described, the stud *n* in milling the final tooth strikes against the thin side edge of the plate *o*, which is pivoted to the top of the sliding rod *j*, and causes said plate to spring off sufficiently to allow said stud to pass the same during the forward oscillating movement while milling the final tooth, in the manner shown in the broken outlines, Fig. 6; but, upon the return motion of said stud, the latter strikes the top edge of said plate, in the manner shown in the drawings, Figs. 1 and 6, which causes the same, together with the sliding rod *j* and catch *k*, to move downward sufficiently to unlatch the shipper-lever Z, which up to this time has been confined by the catch *k*, in the manner shown in the drawings, thus allowing the spring *i* to detach the shipper Y from contact with the driving-pulley X, when the latter again runs freely on the shaft *e*, and the movement of the automatic attachment and oscillating mechanism, to which the cutter-blank is connected, are disconnected, leaving the cutter-blank in about the position shown in the drawings, Figs. 3 and 4.

In order to mill a perfectly-semicircular tooth upon the edge of the cutter-blank, the mechanism to which said cutter-blank arbor is attached is adjusted to a proper position with respect to the driving mechanism by the assistance of the protractor *w* and pointer *x*, said mechanism being so adjusted by means of the screws *q q'* and screw *u* on the top of lever G as to cause the zero-points on said protractor to coincide with the stationary pointer *x* at each extreme stroke of the oscillating mechanism, the point 90 on said protractor being the center of motion of said mechanism, as shown in the drawings.

The above-described oscillating motion may be imparted to said mechanism by means of gearing between the pulley N and segmental lever L; but by applying the elastic band, as before described, I avoid the backlash which would occur at each extreme stroke of said mechanism if the former system were adopted, and thus mill more perfect teeth upon the edge of the cutter-blank than otherwise would be made.

The form of the groove in cam H is such as to cause a slow uniform rate of speed to the forward movement of the cutter-blank during the operation of milling a tooth upon the edge of the same, but a more rapid return motion of said blank.

By referring to Fig. 3 of the accompanying drawings it will be noticed that the cutter-spindle bearing D is horizontally and vertically adjustable upon the upright C. This is made thus adjustable in order to present the beveled edge of the milling-cutter to any desired angle with respect to the edge of the cutter-blank, so as to produce any required form or inclination of teeth upon the edge of said blank. Said milling-cutter can also be so adjusted with respect to said blank as to mill the teeth deeper upon the edge than upon the sides of the same—the form generally desired.

Thus with the hereinbefore-described attachment I automatically operate the mechanism to which the cutter-blank is attached with greater regularity and uniformity of speed than can be imparted to the same by hand-power, and at the same time make all the necessary changes and movements required to mill the several semicircular teeth upon the edge of said blank.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. In combination with the cutter-blank arbor R and the hereinbefore-described mechanism to which the same is attached, the pulley

N, elastic bands *p p'*, segmental lever L, connecting-bar M, lever G, grooved cam H, shaft *d*, spur-gear V, pinion W, splined shaft *e*, shipper Y, and driving-pulley X, all constructed, arranged, and operated for the purpose of imparting a semicircular oscillating motion to said cutter-blank arbor and mechanism, substantially as and in the manner and for the object set forth.

2. In combination with the cutter-blank arbor R, oscillating mechanism connected therewith, and vertical sliding bearing I, to which said mechanism is attached, the horizontal lever J, adjustable spring *r*, and cam K, secured to the revolving shaft *d*, all constructed, arranged, and operated for the purpose of imparting a reciprocating motion to said arbor, oscillating mechanism, and sliding bearing, substantially as and in the manner and for the object set forth.

3. In combination with the oscillating cutter-blank arbor R and index S, the adjustable bar T and pawl U, constructed and arranged for the purpose of intermittently revolving said arbor and index, substantially as, and at the time, and in the manner, and for the object, set forth.

4. In combination with the oscillating cutter-blank arbor R and index S, the stud *n*, pivoted plate *o*, sliding rod *j*, catch *k*, vertical bearing F, latch *m*, shipper-lever Z, shipper Y, revolving shaft *e*, and driving-pulley X, all constructed, arranged, and operated for the purpose of stopping the movement of said oscillating cutter-blank arbor and index, substantially as, and at the time, and in the manner, and for the object, set forth.

5. The combination of the cutter-blank arbor R, bearing Q, index S, adjustable slide P, bearing O, protractor *w*, pointer *x*, vertical sliding bearing I, pulley N, elastic bands *p p'*, segmental lever L, connecting-bar M, lever G, horizontal lever J, spring *r*, cam H, cam K, shaft *d*, spur-gear V, pinion W, splined shaft *e*, shipper Y, driving-pulley X, shipper-lever Z, latch *m*, catch *k*, sliding rod *j*, pivoted plate *o*, stud *n*, adjustable bar T, and pawl U with the horizontally and vertically adjustable bearing D and milling-cutter spindle and cutter, all constructed, arranged, and operated substantially as and for the purpose specified.

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Witnesses:
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