(No Model.) 2 Sheets—Sheet 1.

H. A. HARVEY.

MACHINE FOR ROLLING SCREW THREADS.

No. 328,217. Patented Oct. 13, 1885.

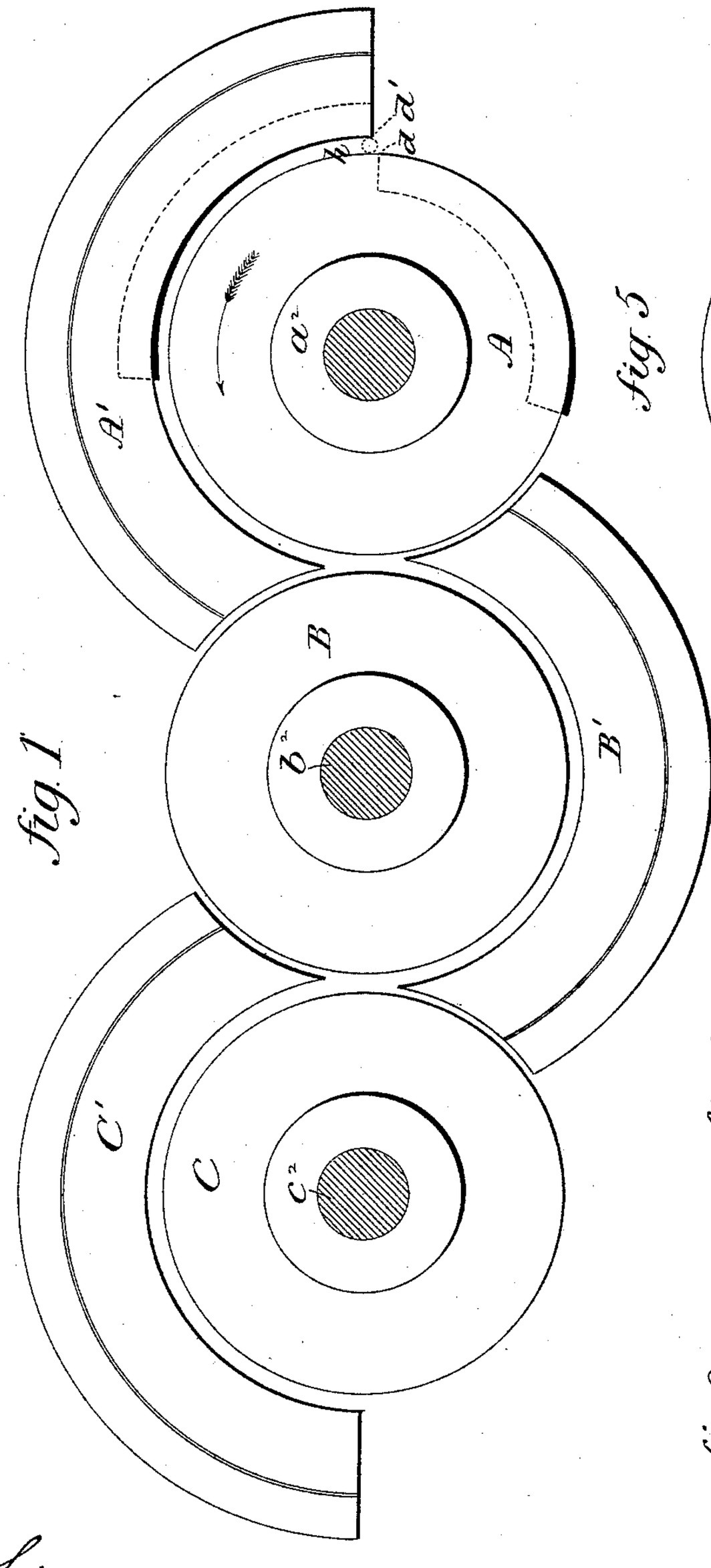

fig. 1

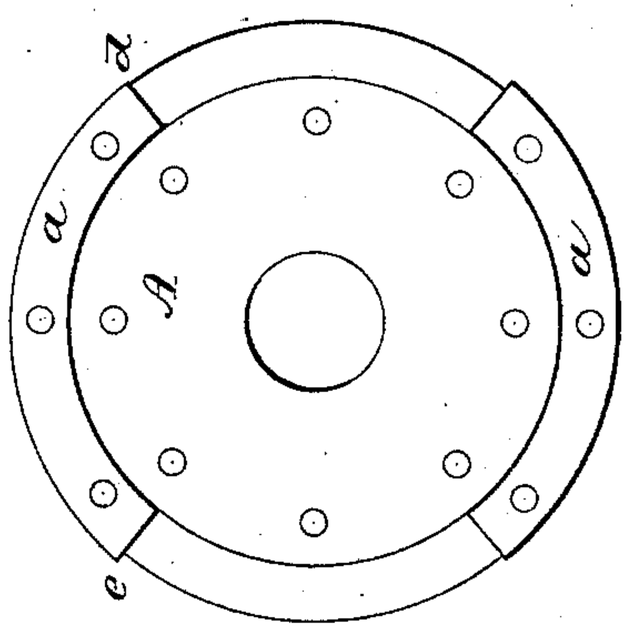

fig. 5

fig. 4

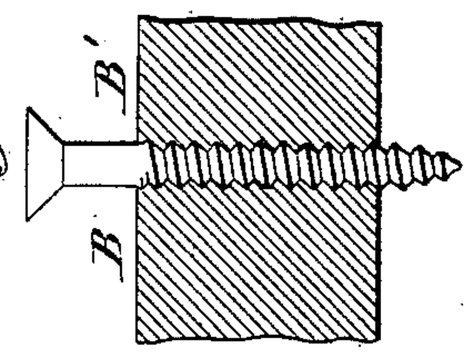

fig. 3

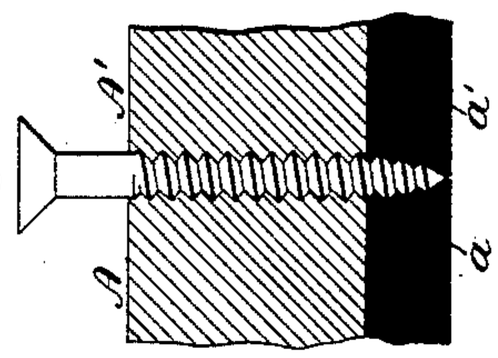

fig. 2

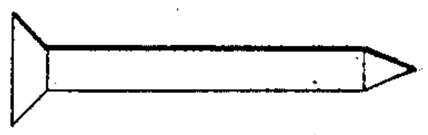

fig. 8

Witnesses.
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(No Model.) 2 Sheets—Sheet 2.

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MACHINE FOR ROLLING SCREW THREADS.

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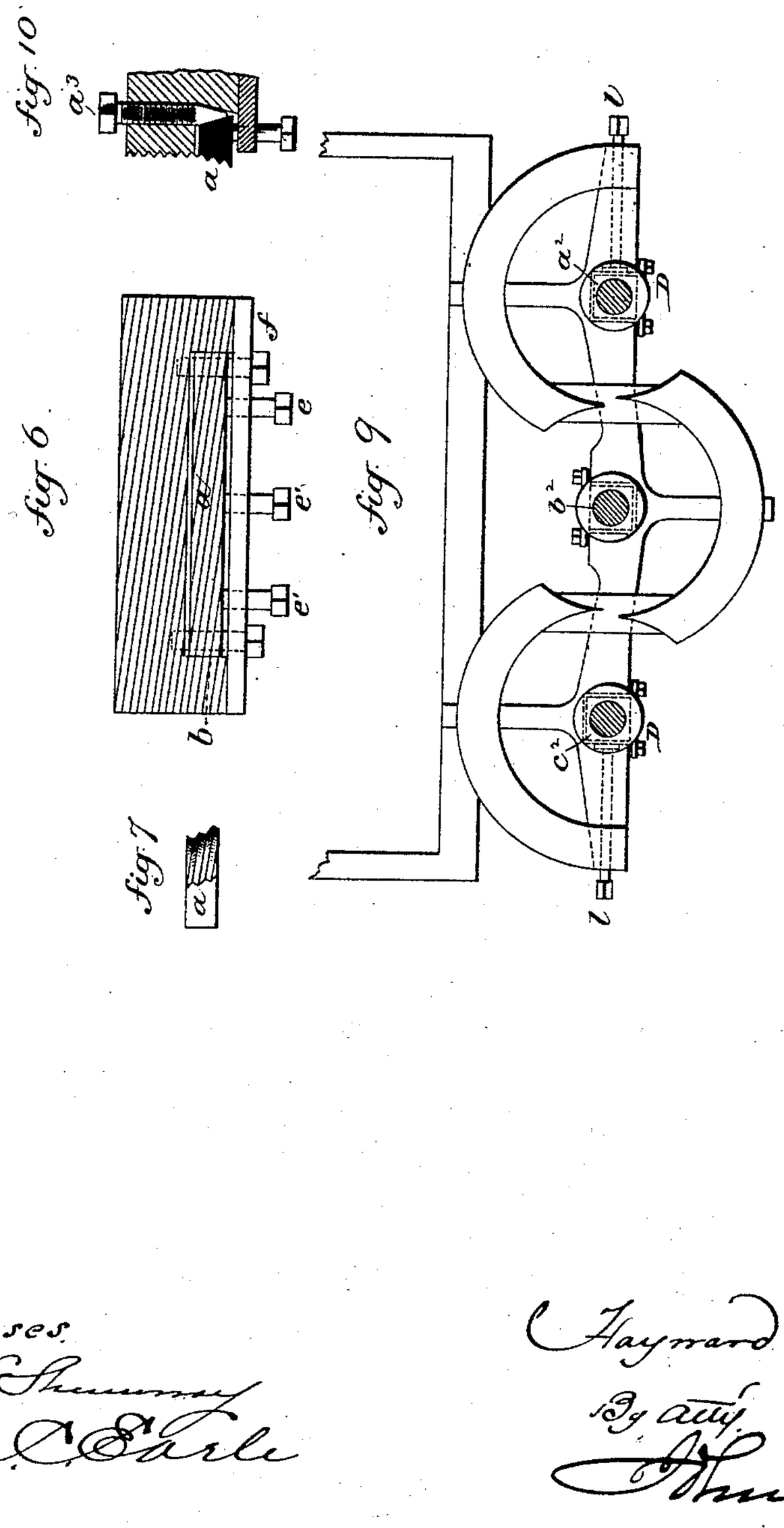

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UNITED STATES PATENT OFFICE.

HAYWARD A. HARVEY, OF ORANGE, NEW JERSEY, ASSIGNOR TO THE HARVEY SCREW AND BOLT COMPANY, OF CONNECTICUT.

MACHINE FOR ROLLING SCREW-THREADS.

SPECIFICATION forming part of Letters Patent No. 328,217, dated October 13, 1885.

Application filed April 2, 1883. Serial No. 90,261. (No model.)

To all whom it may concern:

Be it known that I, HAYWARD A. HARVEY, of Orange, in the county of Essex and State of New Jersey, have invented new Improvements in Machines for Rolling Screw-Threads; and I do hereby declare the following, when taken in connection with accompanying drawings, and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a top or plan view of the rotating and stationary dies in their proper relation to each other; Figs. 2, 3, and 4, a transverse section through the working-faces of said dies; Fig. 5, an under side view of the rotating die, showing the segments for forming the gimlet-point; Fig. 6, a face view of the rotating die, illustrating the method of adjusting the segment; Fig. 7, an end view of the segment; Fig. 8, the pointed blank; Fig. 9, a partial plan view, on a reduced scale, of the frame, illustrating the method of adjusting the rotating dies with relation to each other; Fig. 10, a section through the dies, showing the radial adjustment of the segments.

My invention relates to apparatus for forming the threads of screws by the combined action of a curved stationary and a cylindrical rotating die upon a blank introduced between the dies and rolled along the face of the stationary die by the friction of the rotating die, and is an improvement upon the invention patented to me January 20, 1880, Letters Patent No. 223,730.

My said invention consisted, principally, in the combination, with each other, of two or more pairs of dies, the first pair of dies being so organized as to form a comparatively shallow groove in the path of the thread around the shank of the blank, and the next pair of dies being so organized as to make such groove deeper, either to the extent of finishing the thread or partially finishing it, preparatory to subjecting the blank to the action of a third pair of dies, and so on until a thread of the desired depth was formed.

In my said patent the faces of the dies were represented as vertically parallel to each other, so that the thread would be formed on the blank of an equal diameter throughout, and thus, so far as the operation of the dies was concerned, would only produce a blunt-pointed screw.

The object of my present invention is, principally, to adapt my said invention to the making of gimlet-pointed screws—that is to say, screws in which the end of the body is reduced or drawn into a pointed shape, and the spiral rib which forms the thread continued from the body down around this contracted or conical-shaped point, producing a point substantially like that of a "gimlet," and from which such a screw takes its name; and the invention consists, principally, in a rotating cylindrical die and a stationary curved die, for forming the threads of screws, in which the working-faces for impressing the thread upon the body of the blank present parallel ridges at the proper angle of inclination with the plane of motion of the rotating die, the lower portion of said faces inclined toward or gradually approaching each other, the said inclined portion of the faces provided with properly-inclined ridges, whereby the rib formed on the blank will be continued from the body of the blank down onto the pointed or contracted portion of the blank, and as more fully hereinafter described.

The best form of machine for producing gimlet-pointed screws under my method of rolling employs three cylindrical rotating dies and three corresponding curved stationary dies.

In the drawings, A represents the first cylindrical rotating die, A′ its curved stationary die; B, the second rotating cylindrical die, and B′ its curved stationary die; C, the third cylindrical die, and C′ its curved stationary die. The depth of these dies corresponds substantially to the length of the threaded portion of the longest blank to be threaded therein. A side view of one of these dies—say A—is shown detached in Fig. 6. The rotating and stationary dies are each formed with parallel ridges of metal upon the faces at the proper angle of inclination with the plane of motion of the rolling dies, as in my previous patent, the ridges of the first pair forming a comparatively shallow spiral groove in the blank, the

ridges of the next pair deepening that groove, and the ridges of the third pair completing the groove, which raises and forms the spiral rib or thread on the blank, as in my previous patent.

Instead of making the surfaces of the pairs of dies vertically parallel, I contract the space between the dies of one or more pairs at the bottom or lower portion, as seen in Figs. 2 and 4, which represent a vertical section through the first and third pairs of dies. This contraction should be gradual, until at an advanced point the surfaces of this part of the two dies come substantially together. This contraction is best made by introducing into both the rotating and stationary die a segment, *a* and *a'*, Fig. 2. These segments occupy an extent equal to about one-fourth the circumference of the rotating dies. A recess, *b*, is cut in the under surface of the dies and the segment *a* made to fit that space; but, preferably, the recess in the die is little deeper than the thickness of the segment. The outer surface of this segment, as seen in Fig. 5, is eccentric to the surface of the die itself, so that starting substantially flush with the surface of the die, as at *d*, Fig. 5, it gradually increases its projection until at the opposite end, *e*, it reaches substantially half-way across the space between the dies. The working-surface of this segment is inclined from its upper edge downward, as seen in Fig. 7, the inclination being gradual from the starting-point *d* to the end *e*. This working-surface of the segment or pointing portion of the die is provided with ridges inclined at the proper angle, and operating as a continuation of the inclined ridges on the upper portion of the dies. The segment is adjusted in its recess, so that the ridges on the segments, as they commence their operation upon the blank, continue the formation of the spiral rib from the body down onto the point, and thereby produce the gimlet-point shape. This adjustment of the segments is best made by means of set-screws *e'* through a disk, *f*, fixed to the under side of the die, the said set-screws bearing against the under side of the segments, the surplus space above the die being filled with thin strips of metal, paper, or other suitable material, so that by the introduction or removal of such strips and the adjustment of the set-screws *e' e'* the segments may be adjusted into their proper relation to the die. This adjustment of the segments adapts the dies to rolling different lengths of screws, as for a longer screw the segment will be lower and for a shorter will be raised.

The curved stationary dies are provided with corresponding segments, as seen in broken lines, Fig. 1. The extreme inclination of the surface of the segments corresponds to the pointed portion of the screw to be formed by them, or the operation to be performed upon the blank.

The rotating dies are adjusted or arranged with relation to the circular die, as seen in Fig. 1, so that the starting-point *d* of the segment on the rotating die will coincide with the starting-point *d'* of the segment in the curved die, and so that the blank *h*, (see Fig. 2,) introduced at the proper time, will be received by said segments at their starting-point, or point where they are substantially flush with the surface of their respective dies. The revolution of the rotating die being in the direction indicated by the arrow, the blank *h* will be rolled along the surface of the dies, as in my previous patent, and during this rolling operation the point end will be gradually operated upon by the inclined surfaces of the segments and drawn into a pointed shape, with the spiral groove continued onto the point, as seen in Fig. 2.

I find it advantageous to omit any operation upon the pointed portion of the blank in its passage between the second pair of dies, and to complete it in the third pair, and thus I represent the operation in the drawings. The third pair of dies, C C', are each provided with segments *c c'*, corresponding to the segments *a a'* of the first pair of dies, and in substantially the same relation to each other, differing only in the fact that the ridges in their faces are of sufficient depth and sharpness to finish the point, the same as the faces of other dies, and as seen in Fig. 4.

It is desirable and economical to first point the blanks, as seen in Fig. 8, for the reason that it is less strain upon the dies as well as upon the metal of the blank—that is, when the entire drawing, reducing, or pointing is performed by the dies themselves—yet a cylindrical blank introduced between the dies, as before described, and being rolled through, the point, will be reduced, shaped, and threaded, as hereinbefore described.

I have illustrated two segments in the rotating die, by which it will be understood that but two blanks will be operated upon in a full revolution of the rotating die; but a greater or less number of segments may be introduced.

By suitable adjustment between the respective pairs of dies the blank being rolled between one pair readily passes from the space between one pair into the space between the next without the intervention of the mechanism which was employed in my previous patent, but to do this it is necessary that one rotating die shall stand so near the next that the spiral groove formed by the first pair of dies will be engaged by the corresponding rib on the next rotating die. To facilitate this adjustment of the rotating dies with relation to each other, I arrange the shaft a^2 of the first die and c^2 of the third in bearings D, which said bearings are arranged in a recess in the frame of a little greater extent than the diameter or width of the bearings, so that said bearings may have a certain amount of play or movement toward or from the center shaft, b^2, as seen in Figs. 9 and 10. Then through the frame from each extreme and toward the re-

spective bearings D, I introduce set-screws *l*, which bear, the one against one bearing and the other from the opposite direction against the other bearing. These screws tend to force the said bearings and the shafts which they carry toward the center shaft. Thus by turning the screws in one direction the extreme rotating dies will be forced respectively toward the central rotating die, or vice versa, as occasion may require, until the proper adjustment or relation of the respective dies is attained.

On the side of the bearings opposite the screws thin strips of metal are introduced, against which the bearings will be forced; or set-screws may be introduced from that side, if preferred.

To make a nice adjustment of the working-surface of the segments with relation to the general surface of the die in which they are set, I make the back of the segments inclined from the top downward and inward, and from the upper side of the die, near each end of the segments, I introduce an adjusting-screw, A^3, its lower end extending down in rear of the inclined back of the die, as seen in Fig. 11, the lower end of the screw tapered corresponding to the incline on the back of the die; hence by forcing either of the set-screws A^3 downward its inclined end will bear against the inclined surface of the die, and, acting like a wedge, will force that end of the die outward to make its projection beyond the surface of the body of the die greater. To reduce this projection withdraw the screw and press the segment inward.

Instead of using the set-screw, a key and wedge may be employed. This adjustment I find facilitates greatly the proper setting of the segment, as by it either end may be readily adjusted without effect upon the other. Instead of making the back of the die inclined throughout, the segments may be constructed with seats corresponding to the tapered end of the screw.

While I have described my machine as employing two pair of the series of dies for forming the gimlet-point—the first and third—I do not wish to be understood as limiting my invention to such an arrangement, as they may be rolled complete in a single pair of dies, and the gimlet-point formed thereon; or the gimlet-point may be formed entirely in one pair of the series—say the first or last.

I do not wish to be understood as claiming, broadly, dies for rolling a spiral groove upon a cylindrical surface, the faces of which dies are adapted to continue said groove down around the reduced or tapering end of the cylindrical surface, as such, I am aware, are not new.

I claim—

1. A rotating cylindrical die and a stationary curved die for forming the threads of screws, in which the working-faces for impressing the thread upon the body of the blank present parallel ridges at the proper angle of inclination with the plane of motion of the rotating die, the lower portion of said faces inclined toward or gradually approaching each other, the said inclined portion of the faces provided with properly-inclined ridges, whereby the rib formed on the blank will be continued from the body of the blank down onto the pointed or contracted portion of the blank, substantially as described.

2. A rotating cylindrical die and a stationary curved die for forming the threads of screws, in which the working-faces present parallel ridges at the proper angle of inclination with the plane of motion of the rotating die, a segment arranged in the lower portion of both the rotating and stationary dies, said segment presenting a face eccentric to the working-face of said dies, and inclined to the vertical plane of the said face of the dies, said segments gradually approaching each other, the said inclined portion of the faces provided with properly-inclined ridges, whereby the rib formed on the blank will be continued from the body of the blank down onto the pointed or contracted portion of the blank, substantially as described.

3. A rotating cylindrical die and a stationary curved die for forming the threads of screws, in which the working-faces present parallel ridges at the proper angle of inclination with the plane of motion of the rotating die, a segment arranged in a recess in the lower part of each of said dies, the said recess of greater depth than the thickness of the segment, the face of said segments gradually approaching each other, and having upon their faces properly-inclined ridges, whereby the rib formed on the body of the blank will be continued from the body of the blank down onto the pointed or contracted portion of the blank, said segments made adjustable radially in said recesses, substantially as described.

4. In a machine for rolling screw-threads, two or more pairs of dies, each pair consisting of a rotating die and a stationary curved die, the respective pairs of dies having the ridges on their working-faces at the proper angle of inclination with the plane of motion of the rolling die, one of said rotating dies made adjustable with relation to the next, substantially as described.

HAYWARD A. HARVEY.

Witnesses:
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