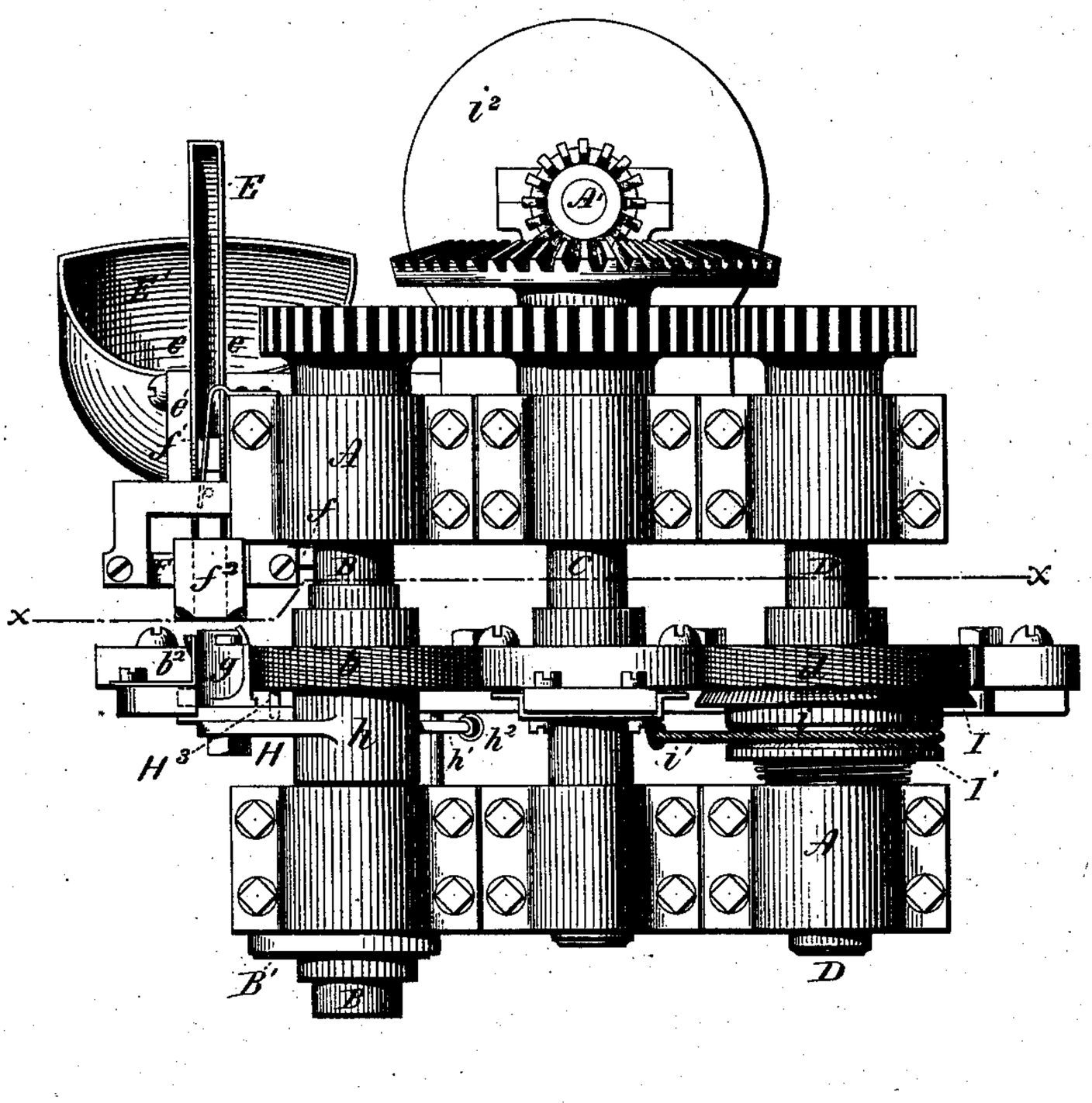
(No Model.) 3 Sheets—Sheet 1.

H. A. HARVEY.

PROCESS OF THREADING SCREWS.

No. 248,167. Patented Oct. 11, 1881.

fig 1



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(No Model.) 3 Sheets—Sheet 2.

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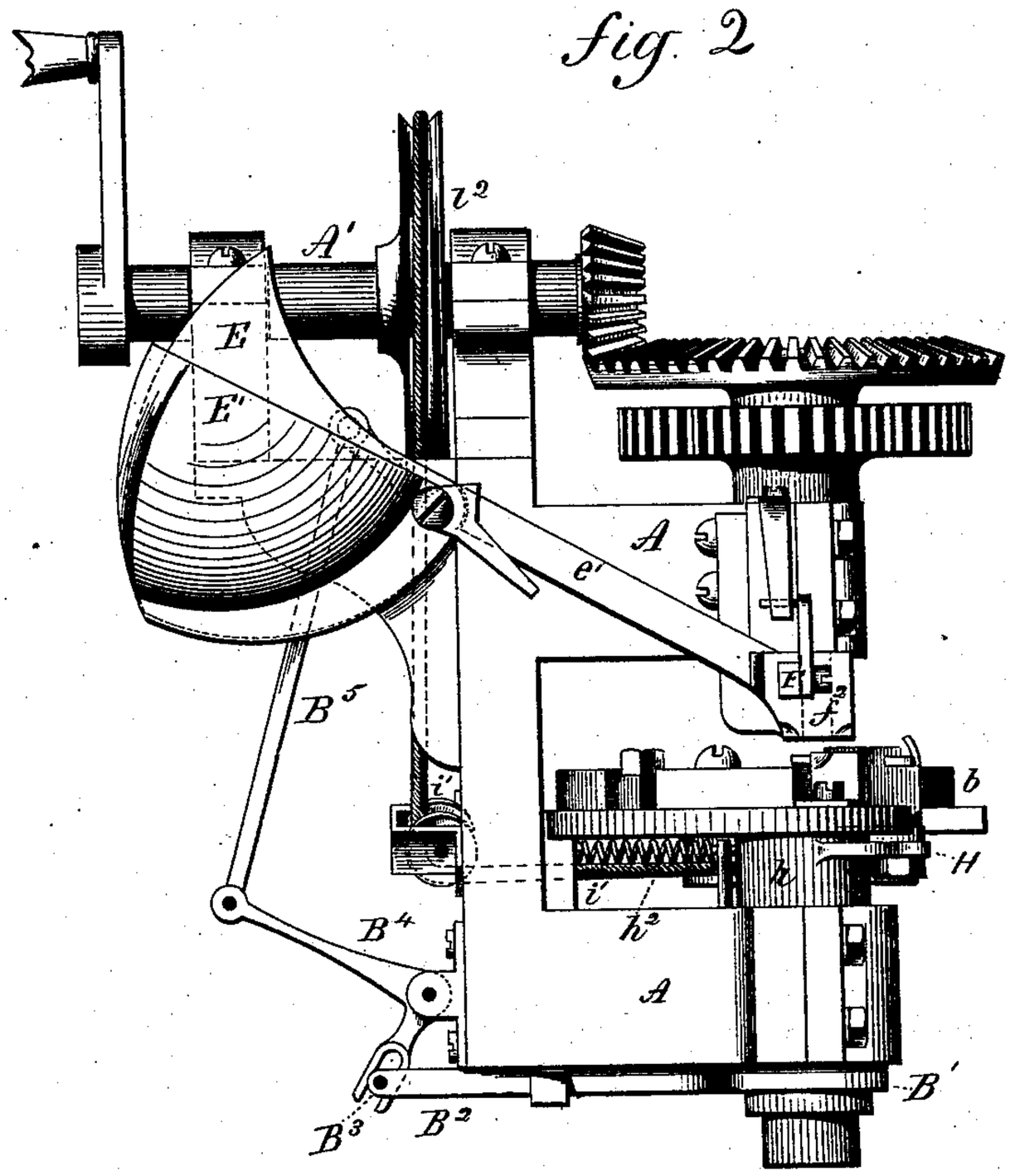
fig. 2



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(No Model.) 3 Sheets—Sheet 3.

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fig. 3

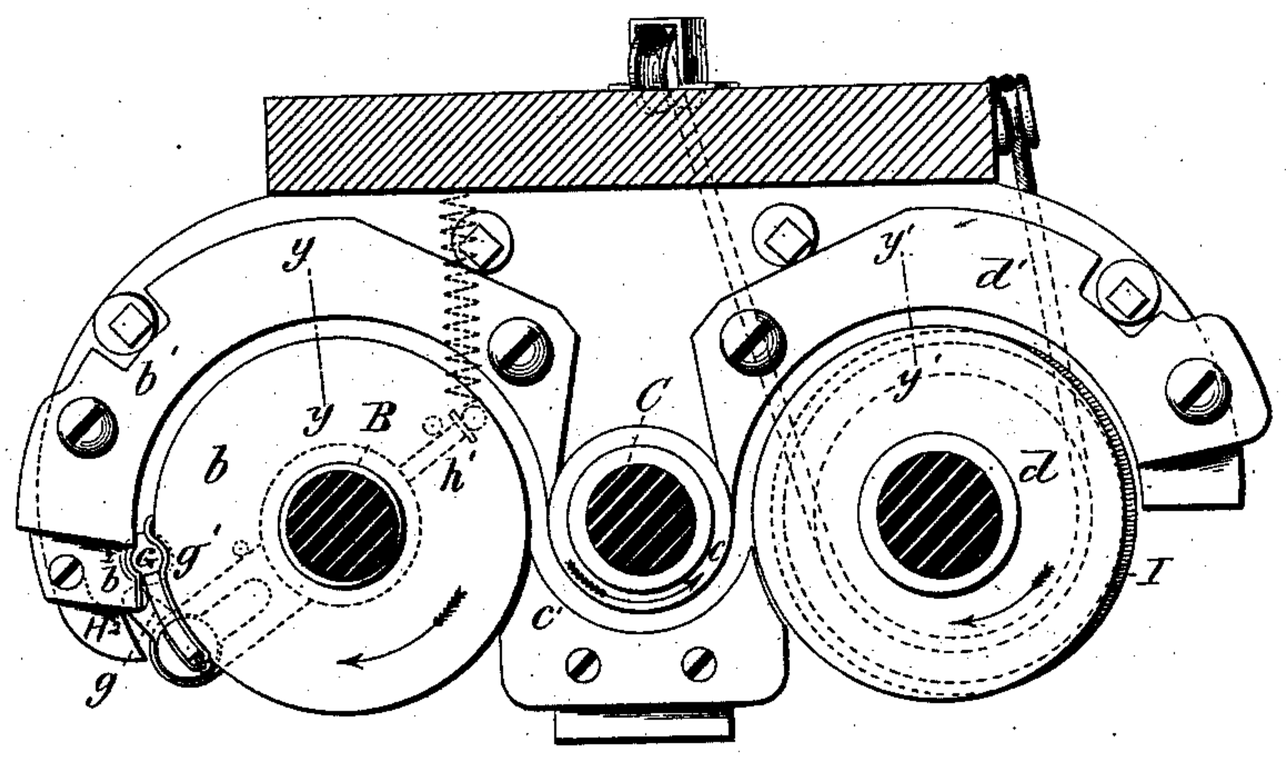


fig. 4

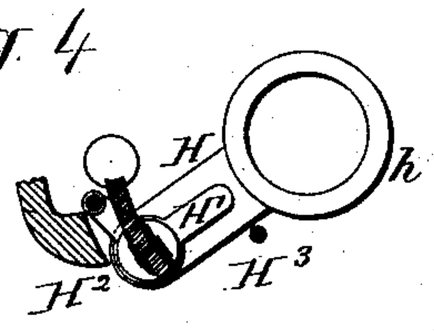


fig. 5

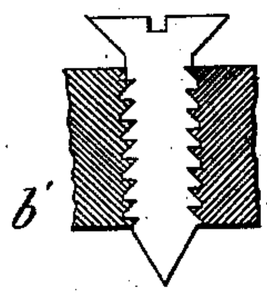


fig. 6

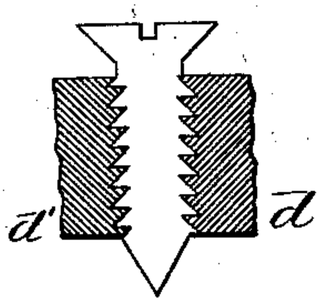
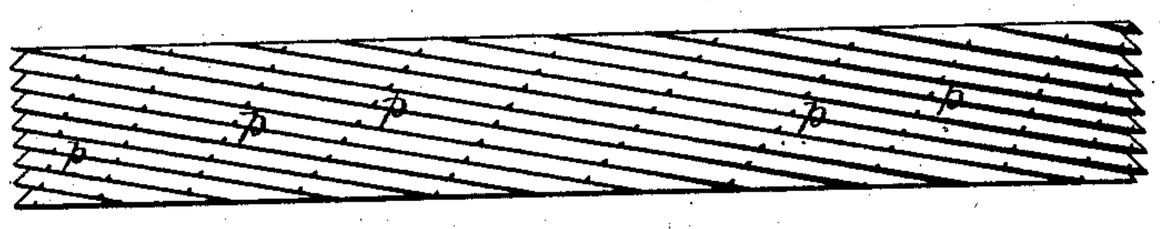


fig. 7



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UNITED STATES PATENT OFFICE.

HAYWARD A. HARVEY, OF ORANGE, NEW JERSEY.

PROCESS OF THREADING SCREWS.

SPECIFICATION forming part of Letters Patent No. 248,167, dated October 11, 1881.

Application filed February 19, 1881. (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 the Process of Threading Screws or Bolts; and I do hereby declare the following, when taken in connection with the 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.

My invention relates to an improved process for rolling the threads of screws or bolts.

Prior to my invention attempts had been made to form the threads on screw-blanks by passing them between a stationary die and a moving die, the adjacent faces of the two dies provided with parallel ridges or ribs at the proper angle of inclination to the plane of motion of the moving die, so that the blank introduced with its axis at right angles to the plane of the moving die, and rolled between said dies, would have a spiral groove impressed upon its surface, forming a spiral rib or screw-thread; but these attempts have resulted in substantially a failure, owing, to a great extent, to the nature of the wire from which screws are made. This wire is drawn from rods through dies to reduce it to the required diameter. This operation necessarily or unavoidably brings the fibers or particles of metal into longitudinal lines, or a condition in which the wire is easily crushed or split by the application of a transverse force. This crushing or splitting the more readily occurs when the transverse force is applied, as in rolling the wire between two surfaces, one or both of which move in a plane at right angles to the axis of the wire, as in the dies for rolling screw-threads before referred to; or, if the body of the blank is not crushed, the threads "chip" to a greater or less extent, and thus so large a proportion of the blanks are destroyed as to make rolling screws by a single pair of dies impracticable.

The object of my invention is to produce the thread by a series of rolling operations, the first partially forming the thread, each successive operation adding thereto, until finally the thread is complete, thereby what is called "humoring" the metal and avoiding the distress unavoidable in the prior process.

My invention consists in subjecting the screw-blank to a succession of rolling operations performed by two or more pairs of dies, one of each pair stationary and the other moving in a plane parallel to the plane of the stationary die, the working-faces of said dies ribbed diagonally to the plane of movement, each pair of dies impressing a spiral groove upon the body of the screw-blank and preparing the same for the action of the next following pair of dies by which the said spiral groove is widened or deepened.

In describing a practical apparatus for carrying my process into operation I shall refer to the machine for which Letters Patent of the United States were granted to me, dated January 20, 1880, No. 223,730, and illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation, showing the exposed portions of the faces of two rolling-dies, mounted in suitable bearings and geared to a central shaft carrying the intermediate transfer-wheel, the two systems of dies and the transfer-wheel being arranged in the same plane. Fig. 2 is an end elevation of the machine, affording a side view of a hopper for carrying a mass of blanks, and ways in which the blanks are conducted from the hopper to the tube, from which they are permitted to drop into a recess at the end of the stationary die. Fig. 3 is a transverse section through the machine on the line *x x* on Fig. 1, exhibiting in section the shafting upon which the dies and the transfer-wheel are mounted, and also showing an oscillating pusher, which pushes the blanks sidewise successively into the space between the first pair of dies. Fig. 4 is a view, in detail, of the pusher and the oscillating arm upon which it is mounted, showing the tripping-pawl, which is affixed to the oscillating arm of the lever, and which, after having been caught by a pin on the face of the die and moved a prescribed distance, is tripped from the pin, and thereby permits the oscillating arm to spring back to its normal position. Fig. 5 is a section, on an enlarged scale, through the line *y y* on Fig. 3, showing, substantially,

the shape of the working-faces of the first pair of dies, with the blank between them. Fig. 6 is a similar section through the line y' y' on Fig. 3, showing, substantially, the shape of the working-faces of the second pair of dies, with the blank between them. Fig. 7 is a view, on a still larger scale, of the working-face of one of the dies, showing the inclined parallel ridges formed in the face thereof.

The various parts of the machine are mounted in a substantial frame, A, which affords bearings for the vertical shaft B, upon which the rotating-die b is mounted, for the intermediate shaft C, upon which the transfer-wheel c is mounted, and for the shaft D, upon which the second rolling-die, d, is mounted. These three shafts are geared together, and are thus caused to rotate respectively in the directions indicated by the arrows in Fig. 3. The die b acts, in conjunction with the curved stationary die b', as the first pair of dies, the transfer-wheel c acts in conjunction with the curved guide-wall c', and the die d acts in conjunction with the curved stationary die d' as the second and, as here represented, the finishing pair of dies.

The shaft B is provided on its lower end with a cam or eccentric, B′, which imparts a reciprocating motion to the cam-bar B^2. The cam-bar B^2 is provided at the end with a transverse pin, B^3, which is inserted in the forked arm of the bell-crank lever B^4. By reason of this connection the bell-crank lever is caused to oscillate by the movement of the cam-bar B^2, and this oscillating motion is transmitted, by means of the pitman B^5, to the lifter E.

The lifter is composed of two parallel plates, e e, of segmental form, which are arranged at the desired distance from each other, and are fastened together and pivoted to the upper end of the ways e'. The two parallel plates of the lifter are in line respectively with the two parellel plates of the ways, and reciprocate in a vertical path in the center of the hopper E′. The bottom of this hopper is slotted to allow the movement of the lifter, and the range of movement of the lifter is such that the upper edges of the two parallel plates e e drop from the position in which they are shown in Fig. 2, to a point slightly below the mouth of the opening in the bottom of the hopper. Blanks are thrown indiscriminately into the hopper, which has, it will be seen, converging side walls. When the lifter falls to its lowest point the blanks are permitted to drop into the opening in the bottom of the hopper and are caught between the parallel plates of the lifter, and when the lifter rises hang therein by their heads and slide therefrom by gravity into the ways. Hoppers and lifters of this character are well known.

At the bottom of the ways there is the usual reciprocating gate or check F, which is thrust outward by the cam f on the shaft B, and is returned to its normal position as the cam continues its rotation by the spring f'. The gate or check F in its reciprocating movement cuts off a blank from the lower end of the row of blanks hung by the heads in the ways, and permits it to drop through the short tube or guide f^2 (indicated in dotted lines on Figs. 1 and 2) into the space between the periphery of the rolling die b and the guide-wall b^2 at the end of the stationary die b'.

The blank is held in a vertical position by the guide-wall b^2, the concave end of the pusher g, and the spring g', which is affixed to the pusher and partially embraces the body of the blank. The pusher g is affixed to a stud on the end of the oscillating arm H, projecting radially from a loose hub, h, on the shaft B, immediately beneath the rotating die b.

Loosely hung on the stud is a tripper, H′, in the form of a bell-crank lever, one of the arms of which points toward the hub h, while the other stands at about a right angle with the first and carries on its end a roller which bears on the stationary guide H^2. A pin, h', projecting radially from the hub h, is connected to the end of a spiral spring, h^2, the opposite end of which is secured to the frame of the machine, and the pull of this spring tends to hold the oscillating arm H in the position in which it is shown in Fig. 3.

The under side of the rotating die b is provided with a pin, H^3, which, as the die rotates, strikes against the inwardly-turned arm of the tripper H′, and carries the oscillating arm H around until the roller on the end of the outer arm of the tripper has traveled to the end of the concentric part of the guide H^2, at which point the tripper is free to turn on its axis, and hence releases itself from the pin H^3, while, in obedience to the action of the spiral spring h^2, the arm H moves back to its normal position. In the act of moving forward, however, the pusher g has delivered the blank caught in the recess G so far into the space between the rotating and stationary dies that the blank is caught by friction and rolled forward around the face of the stationary die. The dies b and b', by a continued compressing action upon the periphery of the blank, impress a shallow groove upon it in a spiral path corresponding to the path of the screw-thread. Having traveled to the opposite end of the stationary die b', the blank is delivered to and caught by the transfer-wheel c, which rolls it around the guide-wall c' and delivers it to the second rolling die d and stationary die d'. In passing through the second pair of dies the shallow groove upon the periphery of the blank produced by the first pair of dies, which is represented approximately in Fig. 5, is deepened or widened so that the central longitudinal section of the screw presents an approximation to the appearance indicated in Fig. 6.

In carrying out my invention I may arrange successive pairs of dies in close proximity to each other, so that the blanks will pass directly from one pair of dies to the next pair; or they may be otherwise arranged and the delivery from one pair of dies to the next succeeding pair automatic or otherwise performed,

I therefore do not confine myself to any particular arrangement of the several pairs of dies relative to each other, the essential feature of my process being that the operation of threading the screw shall be performed by two or more pairs of dies, one of each pair stationary and the other moving, each succeeding pair deepening or widening the spiral groove made or shaped by the last preceding pair.

I claim—

The herein-described process of rolling the threads of screws, which consists in subjecting the screw-blank to a succession of rolling operations performed by two or more pairs of dies, one of each pair stationary and the other moving in a plane parallel to the plane of the stationary die, the working-faces of the said dies ribbed diagonally to the plane of movement, each pair of dies impressing a spiral groove upon the body of the screw-blank, preparing the same for the action of the next following pair of dies, by which said spiral groove is widened or deepened, substantially as described.

HAYWARD A. HARVEY.

Witnesses:
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ASA FARR.