(No Model.) 2 Sheets—Sheet 1.

S. H. & C. F. ROPER.

METAL SCREW MACHINE.

No. 300,736. Patented June 17, 1884.

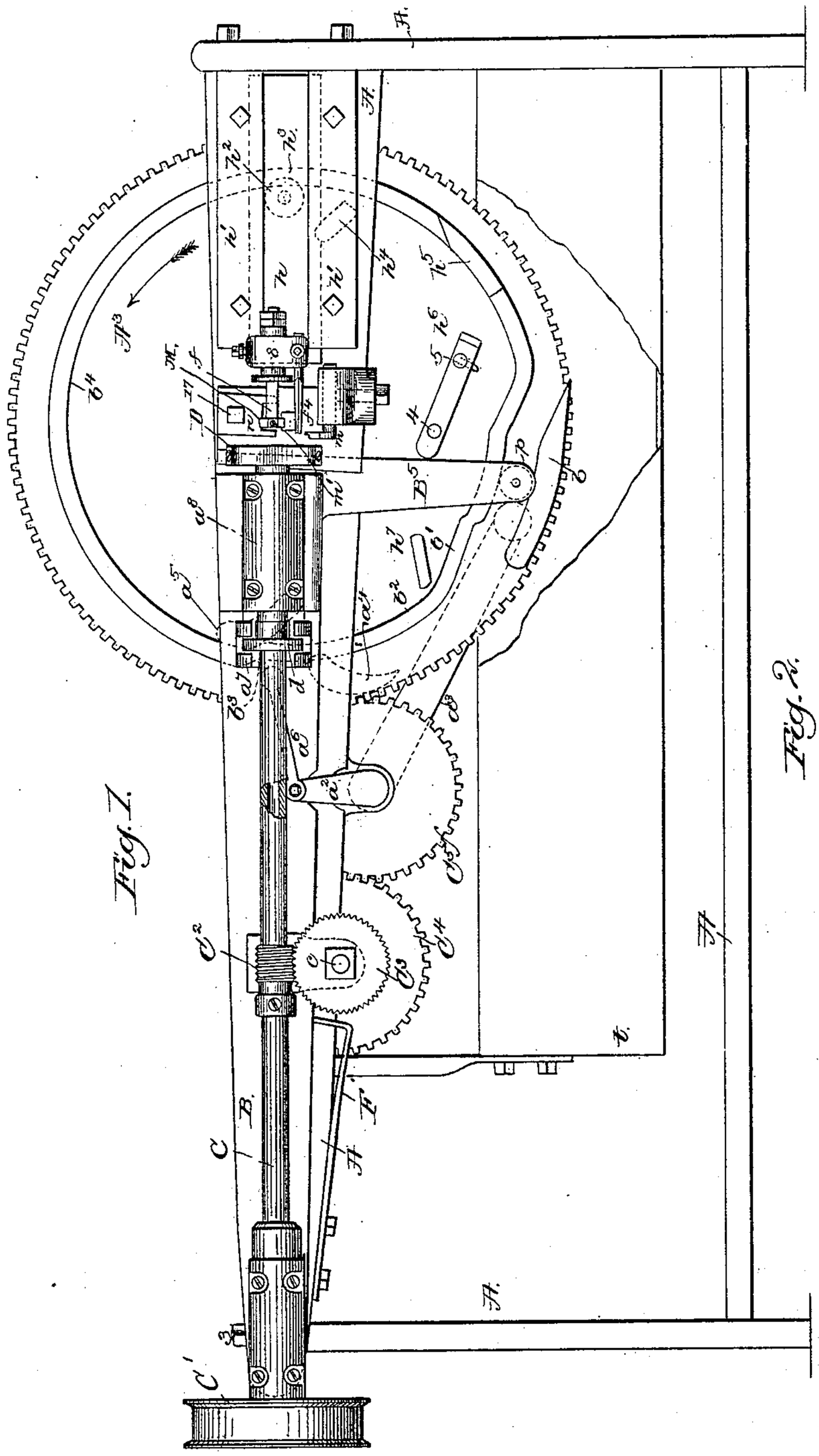

Fig. 1.

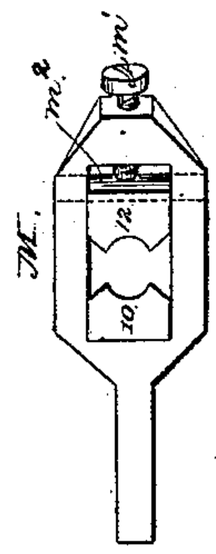

Fig. 2.

Witnesses.
John F. C. Printzlerk
Arthur Lipperlein.

Inventors,
Sylvester H. Roper and
Charles F. Roper.
by Crosby Gregory attys.

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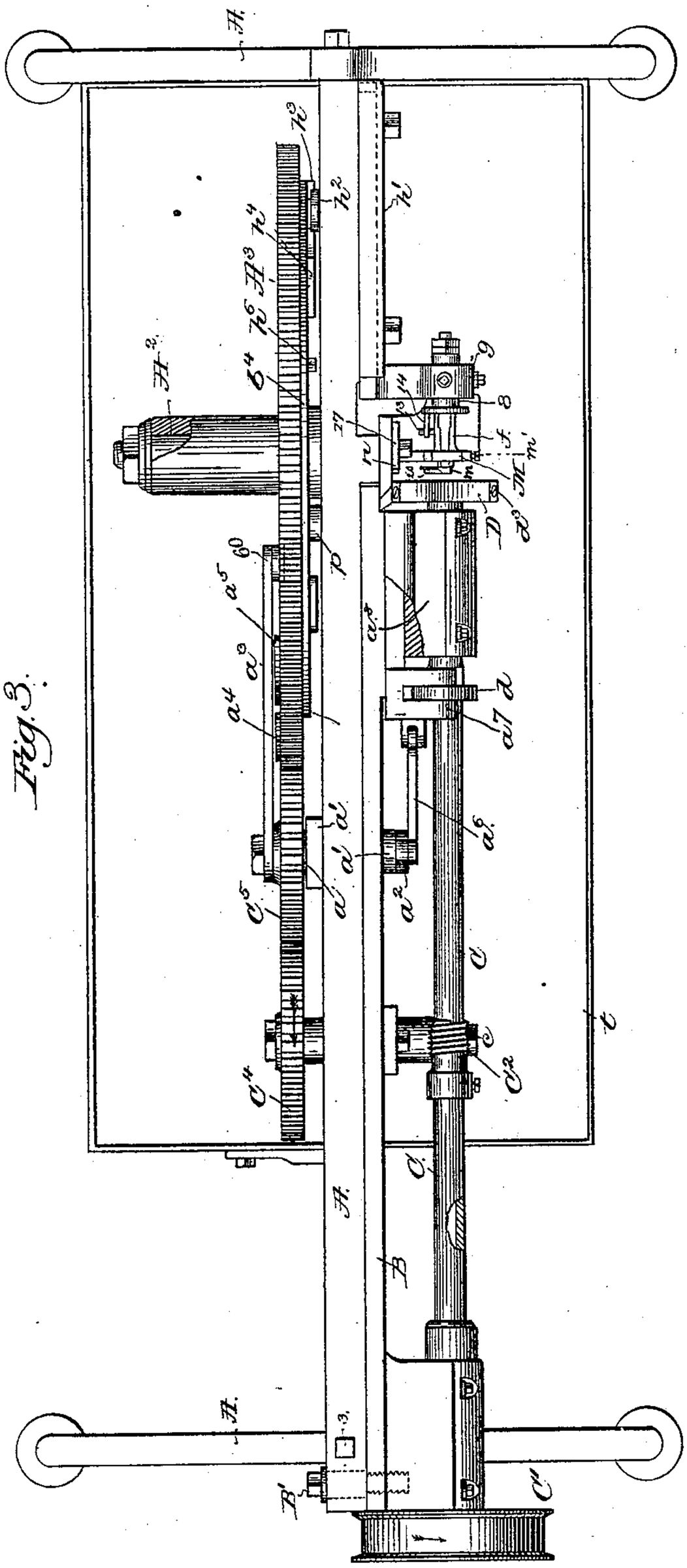

Fig. 3.

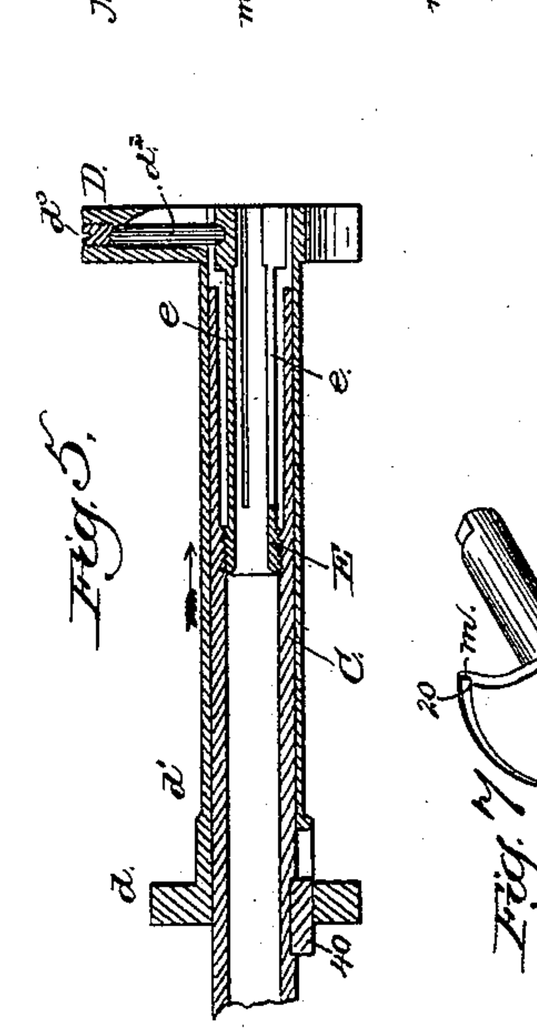

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Witnesses.
John F. C. Brinkerhoff
Arthur Lippenden.

Inventors.
Sylvester H. Roper and
Charles F. Roper.
By Crosby & Gregory Attys.

UNITED STATES PATENT OFFICE.

SYLVESTER H. ROPER, OF BOSTON, AND CHARLES F. ROPER, OF HOPEDALE, ASSIGNORS TO FREDERICK P. FISH, TRUSTEE, OF CAMBRIDGE, MASSACHUSETTS.

METAL-SCREW MACHINE.

SPECIFICATION forming part of Letters Patent No. 300,736, dated June 17, 1884.

Application filed November 5, 1883. (No model.)

To all whom it may concern:

Be it known that we, SYLVESTER H. ROPER, of Boston, county of Suffolk, and State of Massachusetts, and CHARLES F. ROPER, of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Metal-Screw-Making Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object the production of a rapidly-operating and simple machine to make metal screws and articles from metal rods.

Our improvements are herein shown as applied to that class of machine represented in application No. 57,535, filed April 6, 1882, by Charles F. Roper. In all other metal-screw-making machines known as "automatic" machines, and employing mechanism for automatically rotating and feeding a metal rod, to which class of machines our invention is applied, the threading-tool has been so made that it was necessary to either reverse the rotation of the spindle or give to the tool a greater speed in the direction of rotation of the spindle, to thus enable the tool to be withdrawn from the threaded screw-blank.

One object of our invention is to provide automatic metal-screw-cutting machines of this class with an opening threading-tool, which, as soon as the thread has been cut upon the screw-blank to the desired length, according to the adjustment of the machine, will be automatically separated or opened to permit the quick removal of the threading-tool from the end of the threaded blank, and this without reversing the spindle or increasing the speed of the tool. The cam which effects the removal of the separated or opened threading-tool from the threaded end of the rod is so shaped as to move the tool away from the rod at a greater speed than the said tool was moved upon the rod when forming the thread. The machine herein represented contains a novel chuck or rod-holder, which is an improvement upon that shown in United States Patent No. 262,321, dated August 8, 1882. In that patent the spring-jaws which grasped the rod to rotate it, and which jaws were acted upon by the struts, were moved longitudinally to effect the grasp and release of the rod; but in this our present invention the head which receives and supports the outer ends of the struts is made movable longitudinally, while the spring-jaws have no longitudinal movement, this difference in construction enabling the rod to be fed forward more accurately.

Figure 1, in side elevation, represents a metal-screw machine embodying our invention, the threading-tool being in position to commence threading the end of the rod; Fig. 2, an end view of the threading-tool; Fig. 3, a plan view of Fig. 1; Fig. 4, a longitudinal section of the threading-tool closed, the dotted lines showing it open; Fig. 5, a sectional detail of the chuck; Fig. 6, an end view of the chuck, showing its head and struts; and Fig. 7, a detail of the parting-tool.

The frame-work A, of suitable shape to sustain the working parts, has a stud, A^2, upon which is applied the main cam-disk A^3, provided at its periphery with gear-teeth. The frame A, as herein shown, has pivoted upon it a radius-bar, B, the pivot being a screw, B′, the body of which is inserted loosely through a hole in the frame, while the threaded part of the screw is screwed into the radius-bar B. This radius-bar has upon it suitable bearings to receive the hollow rotating rod-carrying spindle C, provided at its outer end with the belt-pulley C′, by which the said spindle is rotated from a suitable counter-shaft. The spindle C has fast upon it a worm-threaded sleeve, C^2, which engages a worm-gear, C^3, on a shaft, *c*, the said shaft at its opposite end having fast upon it a spur-gear, C^4, which, through an intermediate gear, C^5, loose on the shaft *a*, rotates the cam-disk A^3. The shaft *a*, held in bearings *a′*, has two arms, a^2 a^3, the latter, a^3, having its free outer end provided with an anti-friction roller or a stud, 60, which stud is acted upon by two cams, a^4 and a^5, formed at the rear side of the cam-disk A^3, and shown in dotted lines, Fig. 1, to rock the shaft *a*. The arm a^2 has connected with it a

link, a^6, which in turn is attached to a forked slide, a^7, a part of which is adapted to be slid longitudinally in guideways formed in the bearing a^8, attached to the radius-bar B by suitable screws. This forked slide embraces or engages the flange d of the chuck-sleeve d', splined, as shown in Fig. 5, at 40, on the rotating spindle C, the said sleeve at its inner end being provided with the head D, which acts to receive the outer ends of the struts d^2, the head being provided with adjusting-screws d^3, to support the outer ends of the struts in an adjustable manner. The spindle C, at its inner end, (see Figs. 5 and 6,) is provided with a collet, E, having spring-jaws e, which, at their outer ends, rest against the rod which is to be rotated and formed into screws. The inner ends of the struts d^2 rest in pockets at the outsides of the outer ends of the spring-jaws of the collet E, and as the sleeve d' is moved by the forked slide a^7 in the direction of the arrow, Fig. 5, the movement of the head D causes the struts to be moved into position at right angles to the axis of rotation of the spindle C, which causes the jaws e to be closed firmly upon the rod within the said spindle, so that the latter will rotate the rod in unison with it in the several steps of forming the screw. Movement of the sleeve in the opposite direction effects the release of the rod to permit the same to be fed forward sufficiently for the production of another screw.

The device herein shown for producing the forward or feeding movement of the rod is marked f^4, and is of approved construction. By preference it is substantially as in United States Patent No. 262,321, dated August 8, 1882, the said feeding device being herein designated by a letter the same as in the said patent.

The sleeve d' is supported by and rotates in the bearing a^8. The radius-bar is provided with a leg, B^5, (see Fig. 1,) having, preferably, a roller-stud, p, which is acted upon by the cams b b' b^2, attached to the front side of the cam-disk A^3. The cam b acts upon the leg or its roll to vibrate the radius-bar B about its center and place the rod held in the chuck just opposite the threading-tool f, and having so placed the rod the cam b keeps the bar B in place while the threading-tool is run upon and withdrawn from the end of the rod. After the withdrawal of the said tool f the cam b', in the movement of the disk A^3, commences to operate on the leg or its roll, and depresses the bar B, thus removing the rod from in front of the threading-tool, and placing its end in front of the feeding device f^4. In this present machine we have arranged to engage and feed the rod after the same is threaded, but before cutting off its threaded end or the threaded blank to form the screw. As herein shown, the roll of the said leg is kept against the cams b' b^2 b^3 b^4 by a spring, F, secured to the frame and acting against the under side of the bar B. In the rotation of the cam-disk A^3, so long as the cam b^2 acts against the roll on the leg B^5, the rod is held in place opposite the feeding device, and the latter is moved horizontally to effect the feed; but as soon as the cam part b^3 reaches the said roll the bar B is yet further depressed to bring the bar in proper position with relation to the cutting-off or parting tool m—herein shown as a broken disk, substantially such as represented in United States Patent No. 263,357, dated August 29, 1882, wherein the said disk is marked by the same letter; but the parting-tool herein shown differs from that in the said patent in having a second cutting-edge, 20, which acts to reduce the end of the rod as and after the said tool cuts off the blank, the edge 20 being longer or shorter to correspond with the length desired for the reduced body of the blank. The cam b^3 moves the bar B to bring the rod carried by the chuck against the said cutting-off tool, and thereafter the cam b^4, which is of spiral shape, acts to force the rod against the cutting-off tool and effect the separation of the threaded blank from the rod and its reduction for the next blank. The threading and the feeding tools are shown as carried by a slide, h, fitted in guideways h', and provided with a roller-stud, h^2, (see dotted lines, Fig. 1,) which is acted upon by the cams h^3 h^4 h^5 h^6 h^7. As represented in Fig. 1, the cam h^3 is shown as moving the tool slide or carrier h in the direction to force the threading-tool upon the rod to thread the end of the same as the rod is rotated, and as soon as the rod has been threaded for the proper distance the threading-tool is opened automatically, as will be described. The threading-tool having been opened, the cam h^4, in the further rotation of the cam-disk A^3, acts upon the said roller-stud h^2, and withdraws the tool-carrier and the threading-tool rapidly from the threaded end of the rod. The tool-carrier remains in its backward position until the bar B is moved, as described, by cam b' to place the rod held by the chuck in line with the feeding device f^4, at which time the cam h^5 acts against the roller-stud h^2 to again move the carrier and its attached threading-tool and feeding device f^4 forward, the latter passing upon or over the end of the said rod. The cam h^5 acts to move the carrier and the feeding device upon the rod always for a like distance; but the backward movement of the said carrier, while the feeding device grasps the rod to feed it through the chuck, the spring-jaws of which are at such time opened to release the rod, is for a greater or less distance, according to the position of the feeding-cam h^6, which acts upon the roller-stud h^2, while the feeding device grasps the rod. The feeding-cam, pivoted at 4 on the cam-disk A^3, is slotted and made adjustable by the screw 5, and by adjusting the said cam nearer the periphery of the cam-disk the extent of the movement of the carriage away from the chuck may be more or less—the greater the said movement the greater the feed of the rod and the longer the screw, and vice versa. The cam-disk A^3

has another cam projection, h^7, which, after the spring-jaws of the rod holding and rotating chuck are again made to clamp the rod, acts against the roller-stud h^2, and moves the carriage and its attached parts into their farthest position away from the chuck, to permit the threaded blank to be cut off.

The threading-tool *f*, as herein shown, is composed of two spring-jaws, 6 7, secured to a hollow stem, 8, placed loosely in a holder, 9, and held therein against longitudinal motion by suitable set-nuts, as in Fig. 4. The jaw 6 has a pin or projection, 13, which is placed between suitable pins or projections, 14, of the holder, so that the stem of the said tool and the connected jaws may be free to move laterally in any direction for such slight distance as may be requisite to enable the said tool to adapt itself to the center of rotation of the rod, the pin 13 and projections 14 restraining, however, the said tool from rotation with the rod. Each jaw 6 7 has suitable threaded blocks or dies, 10 12, of steel, which will be firmly attached thereto in suitable manner. The jaws 6 7 are extended through an opening in a clamping-guide, M, provided at one end with an adjusting-screw, m', the end of which enters an oscillating block, m^2, which is adapted to move or oscillate in a seat in the jaw 7, as shown in Fig. 4. The guide M, next the jaw 6, is provided with an inclined or cam surface, m^3, and the jaw 6 has a co-operating cam-surface, 15. The end 16 of the guide M enters a recess in an adjustable tappet, *n*, attached to the frame A by a screw, 17, and as the carriage *h* is reciprocated the end 16 of the guide M strikes against first one and then the other of the prongs of the said tappet, which causes the guide M to be moved about the block m^2 as its fulcrum. When the carriage *h* is moved into its position farthest from the rod-rotating chuck, the guide M strikes one of the projections of the said tappet, and is moved from its dotted into its full line position, Fig. 4, which movement causes the cam-surface m^3 to act upon the cam-surface 15 and close the jaws, so that the rotating rod held by the chuck will enter between the dies 10 12, enabling the latter, as the carriage *h* is moved toward the chuck, to pass upon the end of the said rod. As soon as the end of the rod has been threaded for the desired distance, the end of the guide M will strike that one of the projections of the tappet *n* which is nearest the chuck, and will arrest the farthest forward movement of the said guide with the carriage, which will cause the said guide to be moved into its dotted-line position, Fig. 4, thus releasing the jaws of the threading-tool, and enabling it to spring open or separate and remove the dies 10 12 from contact with the rod carried by the chuck, after which, as before stated, the carriage or tool-carrier *h* will be suddenly drawn back by the cam h^4 to withdraw the threading-tool from the threaded blank.

The tappet *n* may be turned about the screw 17 to place its projections more or less distant from the chuck, to thus regulate the length of the thread to be cut upon the end of the rod.

As herein shown, the cutting-off tool is also adapted by its edge 20 to reduce the rod just beyond the point where the said rod is being severed to separate from it the threaded blank; but instead of reducing the rod by the cutting-off tool, we desire it to be understood that the machine may be provided with another tool-carrier, or one or more extra tool-carriers, which will be operated by suitable cams and cause the tools thereon to be moved into operative position in the proper order for metal-screw-making. This self-opening or automatically-operated threading-tool added to a metal-screw-making machine enables the speed of the same to be materially increased, which lessens the cost of the production of screws; and a tool of the kind herein shown (it not being acted upon by the threaded end of the rod or blank as the threading-tool is being removed from the end of the same preparatory to commencing to cut a second blank) is saved from wear, and the tool is thus made more lasting. The oil and metal turnings fall into the pan *t*.

We claim—

1. The rod-rotating spindle and a chuck to grasp and rotate the rod, combined with the reciprocating die-jaws 6 7, the guide M, co-operating therewith, and the tappet, substantially as shown and described.

2. In a metal-screw-making machine, the rotating rod-receiving spindle C, provided with the detachable spring-jaws, and the surrounding sleeve provided with a head, combined with struts held between the said head and jaws, and with the means, substantially as described, to move the said sleeve and head longitudinally to operate the jaws, as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

SYLVESTER H. ROPER.
CHARLES F. ROPER.

Witnesses:
W. R. WILLIAMS,
LEONARD WILSON.