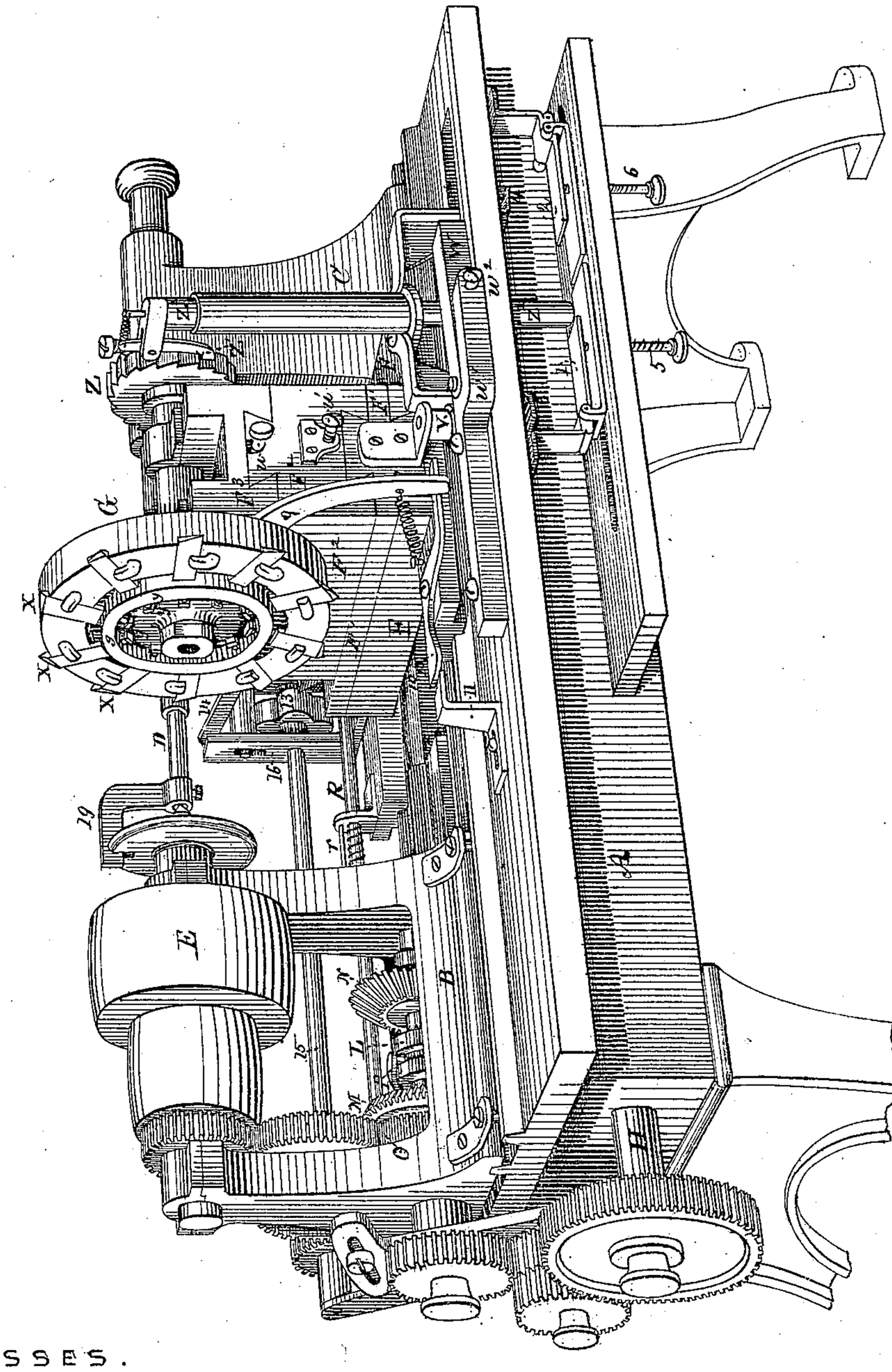
3 Sheets--Sheet 1.

A. GODDARD & A. E. GODDARD.

Machines for Threading Screw-Taps.

No. 133,527. Patented Dec. 3, 1872.

Fig. 1.



WITNESSES.

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3 Sheets--Sheet 2.

A. GODDARD & A. E. GODDARD.

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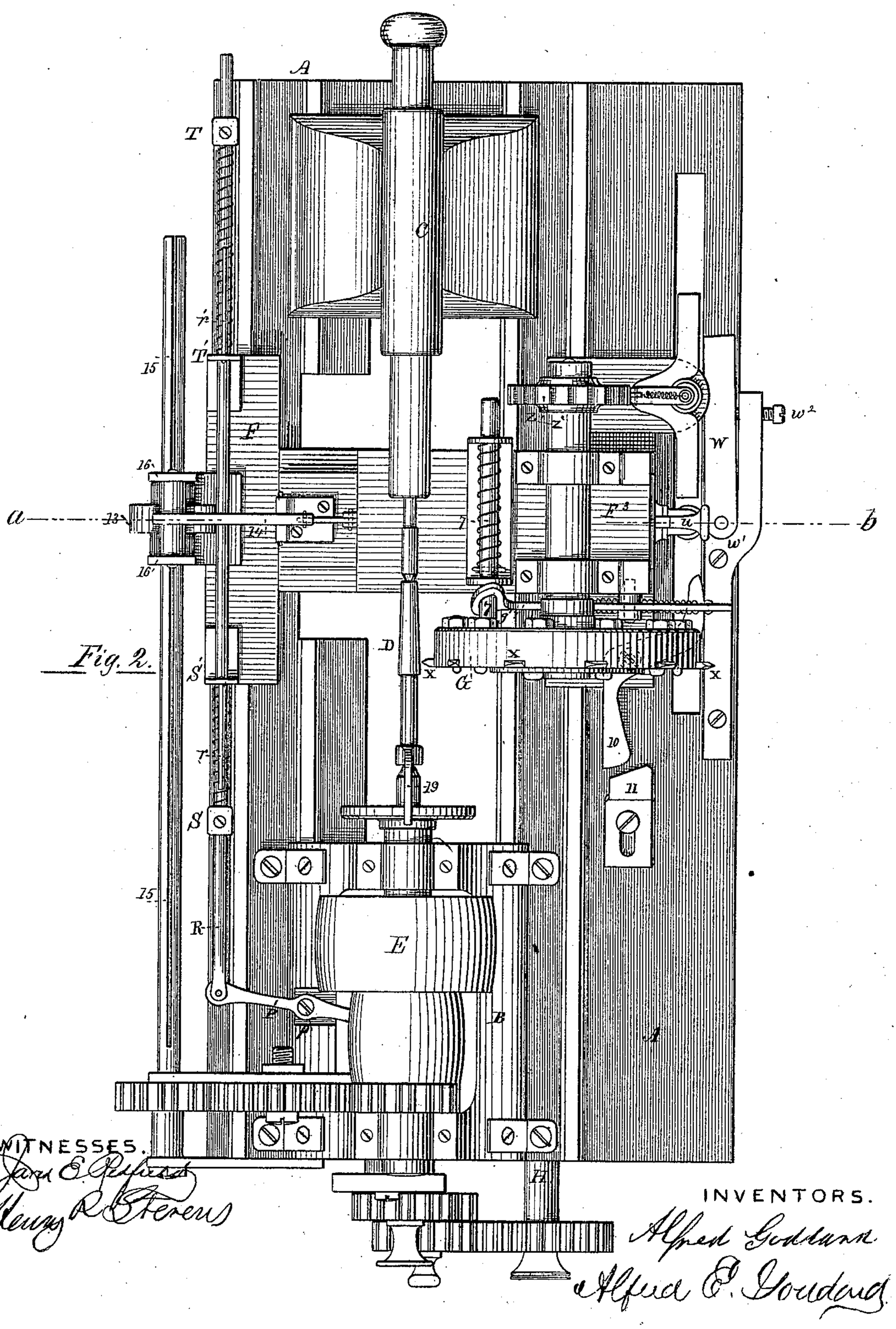
Fig. 2.



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AM PHOTO-LITHOGRAPHIC CO. N.Y. (OSBORNE'S PROCESS.)

3 Sheets--Sheet 3.

A. GODDARD & A. E. GODDARD.

Machines for Threading Screw-Taps.

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Fig. 3.

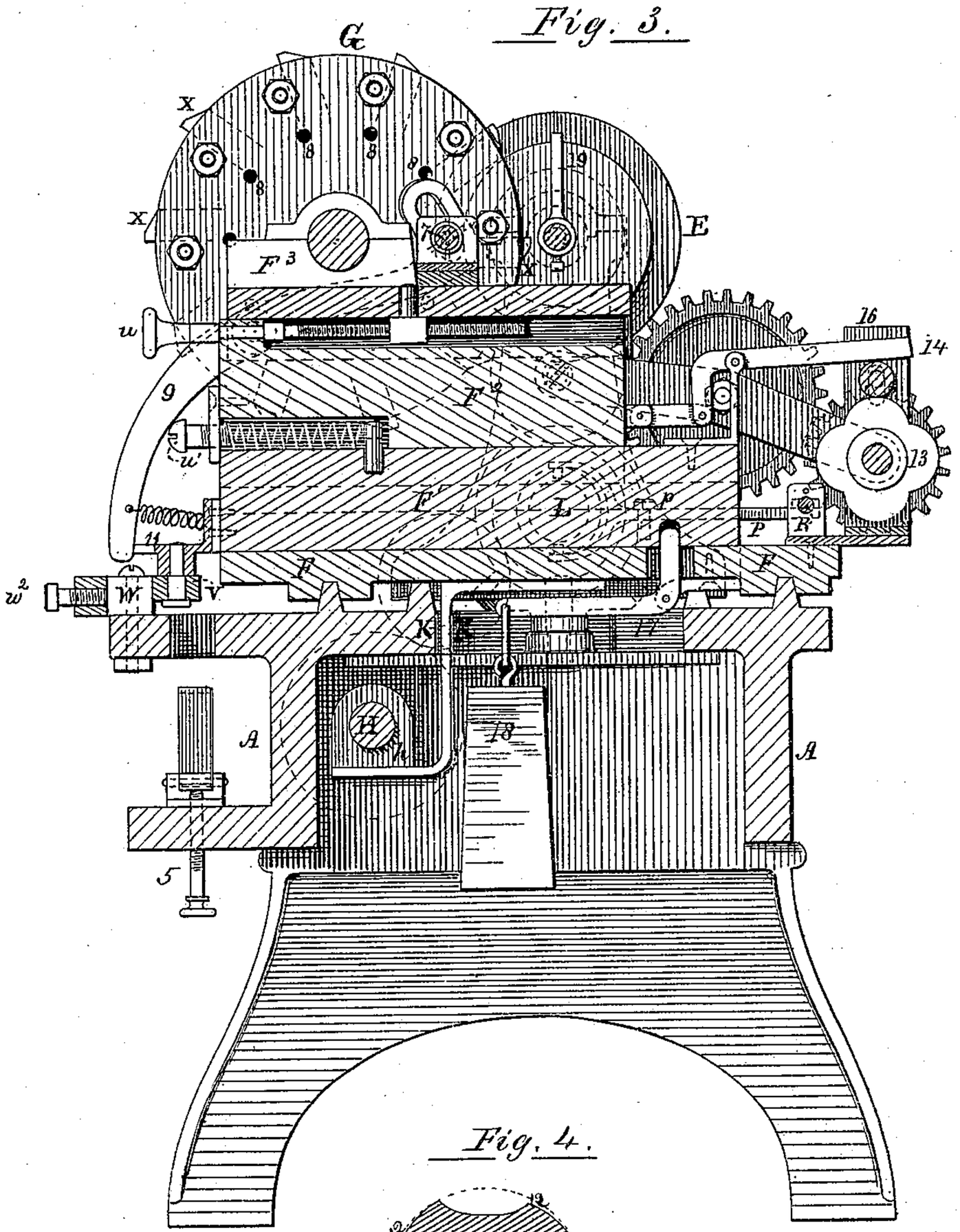
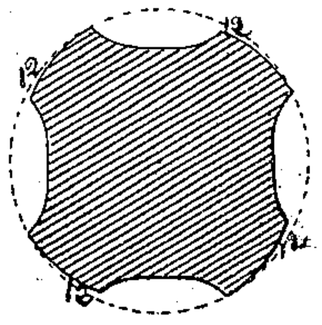


Fig. 4.



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UNITED STATES PATENT OFFICE.

ALFRED GODDARD AND ALFRED E. GODDARD, OF ESSEX, CONNECTICUT.

IMPROVEMENT IN MACHINES FOR THREADING SCREW-TAPS.

Specification forming part of Letters Patent No. **133,527**, dated December 3, 1872.

To all whom it may concern:

Be it known that we, ALFRED GODDARD and ALFRED E. GODDARD, of Essex, in the the county of Middlesex and State of Connecticut, have invented an Improved Screw-Tap-Making Machine, of which the following is a specification:

This invention has for its object the formation of the threads on tools known as screw-taps, in combination with the requisite degree of "relief" necessary in such tools, and is accomplished by cutting the same automatically by a series of cutters successively presented to the blank, as will be hereafter described.

Drawing.

Figure 1 is a perspective view of the machine as seen from the front side. Fig. 2 is a plan of the same as seen from above the machine. Fig. 3 is a sectional view of the same through the plane *a b*. Fig. 4 is a diagram to illustrate the "relief" on a tap.

The frame A of the machine is similar in appearance and construction to an engine-lathe, and is mounted on any suitable supports or feet, as shown in the drawing. There are also mounted upon said frame, and in a similar manner to a lathe, a head-stock, B, and tail-stock C, provided with centers for supporting the blank D, from which the tap is to be formed. In the head-stock B a driving-mandrel, carrying pulleys, as at E, is mounted to receive the driving power, and from which motion is given, by suitable gearing, to all the other parts of the machine. At F, upon suitable guides on the upper surface of the frame, is mounted the tool-rest, for supporting the cutter-head G. This tool-rest receives motion along its guides from the screw H, extending through a nut, *h*, upon a bracket underneath and projecting down from the under side of the rest, as shown at K, Fig. 3, and similar to the tool-rest of an engine-lathe. The screw H also receives motion by intermediate gearing from the driving-mandrel similar to an engine-lathe, and for the same purpose—viz., to be adapted to the various pitches of the thread to be formed upon the tap. But instead of reversing the driving-mandrel, as in such lathes, by shifting the belts, a reversing-clutch, L, is provided on one of the intermediate shafts, between two bevel-wheels, M and N, loose on the same shaft, shown in Fig. 1, and which engage with a horizontal bevel, which connects them in such a manner that the motion is changed by shifting the clutch from one to the other, as from M to N, or both are stopped when the clutch is out of contact with both wheels. The bevel M is attached to the intermediate wheel O, which is also loose on the same shaft; consequently the action of the screw H is determined by the position of the clutch. This clutch is shifted by a forked lever, P, pivoted at *p*, and connected with the shipping-bar R, upon which are adjustable stops S and T, which are arranged to come in contact with springs upon the rod R, and which, when sufficiently compressed by the movement of the tool-rest by the fixed stops S′ T′ upon the rear of the rest, change the shipping-bar from left to right, and vice versa; and by this combination the tool-rest is caused to move to and fro along its guides automatically, while the driving-mandrel continues revolving in the same direction. At $r^{\times}$ r' upon the tool-rest F are arranged studs, to give positive motion to the shipping-bar when not acted upon by the springs, so that the clutch may be shifted to the proper position to engage with the wheels M and N. The tool-rest is properly composed of a series of sliding blocks, as F, F^1, F^2, and F^3, fitted one upon the other, and held in position thereon by the well-known dovetail guides, the ends of which are plainly shown in Fig. 1. Upon the upper one of said blocks suitable bearings are provided for holding the axis of the cutter-head G and said block, as F^3, is moved longitudinally by the set-screw *u*. To the front end of block F^1 a bracket is attached that carries a guide-roller, V, which presses against an adjustable bar, W, which is pivoted at one end to frame at *w*, and is adjusted at the other end, by a set-screw at w^2, to a position parallel with the taper of the blank D, as can be easily seen in Fig. 2.

This is one method of making the cutters conform to the taper of the blank; but the same result may be accomplished by shifting the tail-stock relatively with the guides upon which the tool travels, as is commonly done in turning tapering work upon lathes.

The cutters X X X are mounted in the cutter-head G, which is a disk or circular plate, similar to a face-plate in a lathe, in such a

manner as to stand radially upon its outer face; and as many cutters are used as the number of times required to run over the blank to complete the thread—as, for example, if ten cuts will be required to finish the thread then ten cutters may be used, so that each successive cut is made with a special tool for it; and the tools are set out to the proper distances from the center of the cutter-head to give to each its required depth of cut, though it is obvious that the cutter-head may be set forward as each cutter comes into working position. These cutters are partially inserted in recesses in the face of the head G, and held therein by clamping-screw bolts passing through the disk of the cutter-head, and they are set and held out radially by the set-screws through a flange near the center of the disk or head, as shown at *y y*, Fig. 1. The cutting-point of each cutter or tool is made to correspond with the spaces between the threads to be formed, as V-shaped for V-threads, or square for a square thread, or according to the form required. On the opposite end of the cutter-head axis, at Z, is a ratchet-wheel, provided with teeth or notches corresponding to the number of the cutters—that is, the same number or multiples of the same—so that, as the pawl, as at Z^1, acts upon the ratchet-wheel, it will bring each successive tool into its proper place for work upon the blank D. The pawl Z^1 is pivoted to a bracket projecting from the upper end of a vertical stud, Z^2, which projects down through a tubular support attached to the base of the tool-rest F, as shown in Fig. 1, and the lower end of the stud is rounded slightly, so as to rise easily upon its lifting-levers 1 and 2. Said levers 1 and 2 are pivoted to adjustable supports, which are fastened in a slotted projection from the side of the frame, and are so made adjustable to correspond with the various lengths of the taps. The short arms of said levers are bent upward at right angles to their lifting-arms, to come in contact with their actuating-brackets 3 and 4, which are attached to one corner of the tool-rest F; consequently, as the tool-rest moves to and fro along its guides on the frame the levers 1 and 2 will be tilted so as to raise the stud which carries the pawl, and will thereby rotate the cutter-head G. Regulating-screws 5 and 6 are arranged under the levers 1 and 2 to determine the distance to which the pawl may drop in its action upon the ratchet Z. When the cutter-head G is brought to the proper working position it is held firmly there by a spring-bolt, 7, shown in Fig. 2, which is mounted upon the top of the tool-rest F^3, and one end of said bolt enters a hole in the back of the cutter-head, said holes corresponding to the tools X X X, and shown at 8, Fig. 3. Said spring-bolt 7 is forced back from contact with the cutter-head by a lever at 9, at one end of which is a cam which presses against a pin through the bolt, the middle of the lever being attached to the tool-rest at F^3, and the free arm reaching down to and in contact with a bell-crank lever, 10, also attached to the lower portions of the tool-rest near F, and operated by contact with a bracket or stop at 11 on the frame in such a manner that, as the tool ceases its work upon the blank, the spring-bolt is forced back out of the hole 8 in the back of the cutter-head G, and the cutter-head is left free to be revolved by the pawl at Z^1, a partial movement of which is produced by the same forward movement of the tool-rest that brings the lever 10 in contact with the stop 11. The combination of these several elements will perform the operation, automatically, of forming the thread upon the tap, and by a succession or series of cutters; but to produce the desired "relief" or clearance necessary in a perfect tap a secondary movement must be given to the cutters, whereby the thread is cut deeper at the points to be relieved, as shown at 12 in the section of a tap at Fig. 4, Sheet 3. This part of the operation is effected by a cam, shown at 13, which operates a lever, 14, connected with one of the sliding blocks in the tool-rest, and which gives the cutter-head and its tools a motion to and from the blank D, and causes it to be cut deeper at the points required for the "relief." The relieving-cam at 13 is mounted on a shaft, 15, which receives motion from the gearing in the head B, and it extends through supports and guides on the rear of the tool-rest F, as at 16, these guides embracing the cam between them, and is forced to and fro along the shaft as the tool-rest moves. The cam is provided with a spline, which works in a groove in the shaft to connect its rotating motion with the shaft, and said cam is provided with as many lifting-points on its perimeter as there are grooves required in the tap, provided the shaft 15 has precisely as many revolutions as the tap—as, for example, four projections will be required on the cam if four grooves for "relief" are to be produced on the tap, as shown in the drawing; but it is evident that the same result would be produced with only one projection on the cam if the shaft 15 had four revolutions to one of the tap or blank. It will be found, however, easier in practice to give the shaft 15 the same speed as the blank D, and to change the cam 13 to correspond to whatever grooves are desired for the "relief." A friction-roller is introduced between the cam and the lever 14 to prevent wear and loss of power; but this may be arranged for in various ways. The lever 14 is pivoted to a bracket on one of the blocks of the tool-rest, and is bent at a right angle to the free end, and then attached to the block to be moved backward and forward, and the free end of the lever may be weighted to such a degree as to retain the block to the position whence the cam moved; or a second bell-crank lever may be introduced underneath the tool-rest, as shown at 17 in Fig. 3, Sheet 3, to one end of which a weight, 18, is attached to perform the same effect, and which will be found, in practice, to be preferable, as the cam will have less to do, and the weight will be completely

out of the way of the operator. The blank D is introduced between the centers and connected with the rotating mandrel by a dog, as at 19; or the end may be squared and enter a socket; or it may be connected in any convenient manner to receive motion; therefore the cutter-head is revolved to the proper point to bring the first tool in working position, and the various stops are properly adjusted to perform their various operations. It is evident that the entire operation of cutting the thread and giving the requisite relief will be effected automatically by the successive series of cutters until the work is completed; and

We therefore claim—

1. The combination of the cutter-head and the series of chasing-tools arranged thereon, as described, mechanism to intermittingly rotate said cutter-head, the slide or tool-rest, and the cam 13 to reciprocate said slide so as to produce the desired "relief," as described.

2. The combination of the ratchet-wheel and pawl, the stud Z^2, hinged levers 1 and 2, brackets 3 and 4, and the tool-rest, substantially as described.

3. The combination of the spring locking-bolt, cam-headed lever 9, lever 10, the springs and the stop 11, substantially as described.

4. The combination of the clutch and its lever, the shipping-bar, the adjustable and fixed stops and springs thereon, and the studs *r r*, substantially as described.

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