3 Sheets—Sheet 1.

S. L. WORSLEY.

Metal-Screw Threading Machine.

No. 197,070. **Patented Nov. 13, 1877.**

Fig. 1.

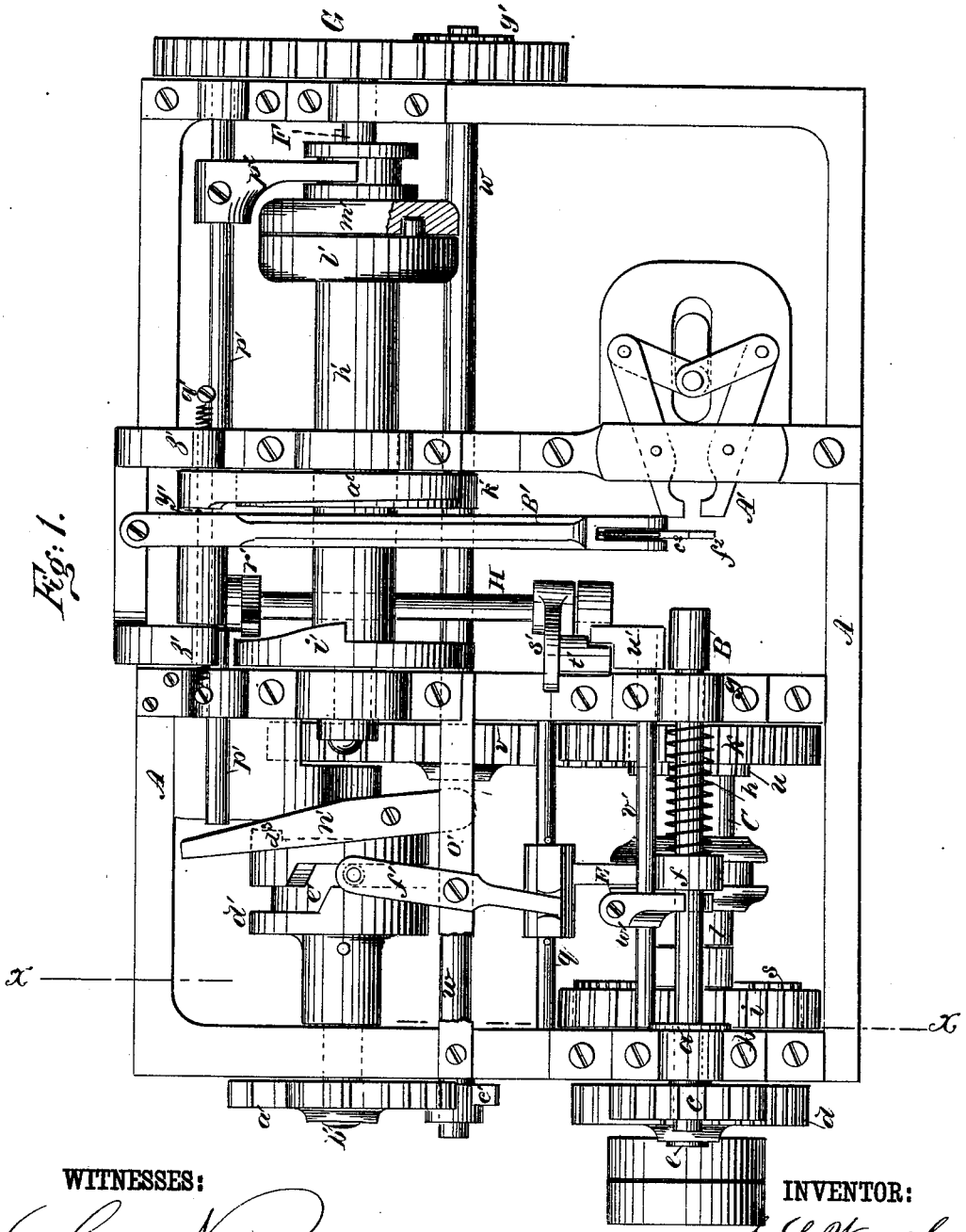

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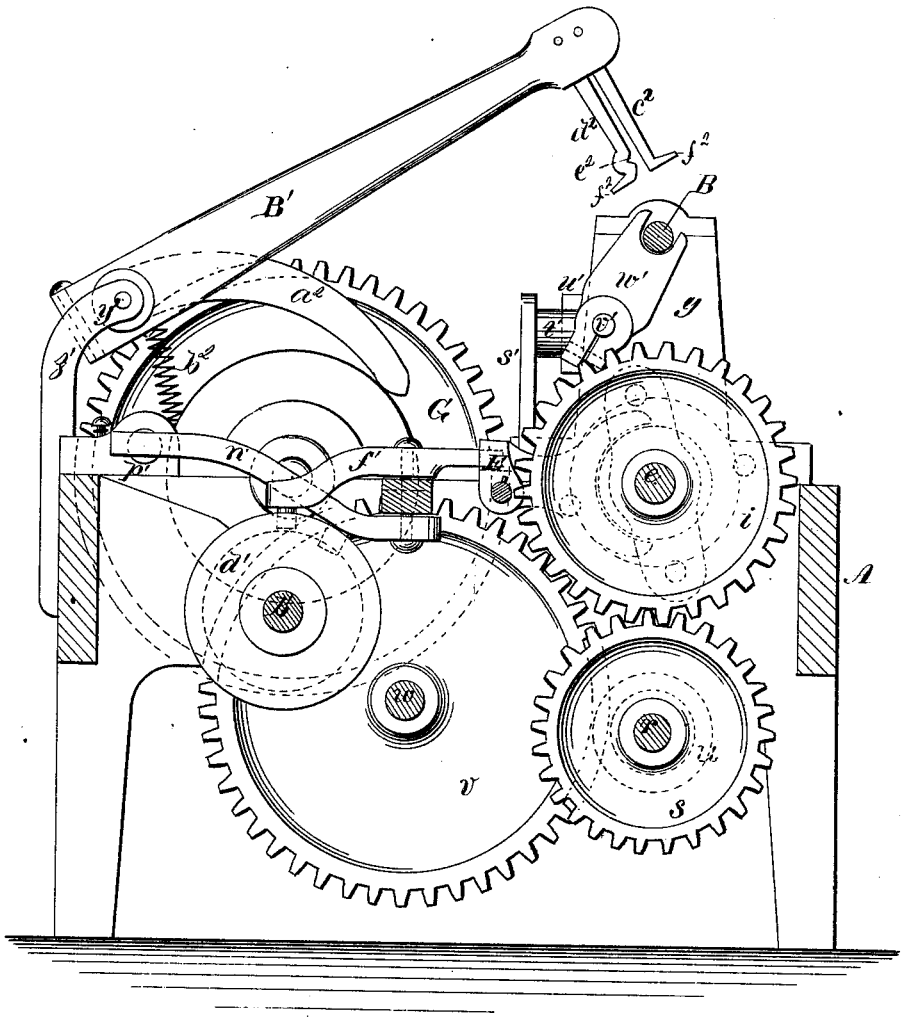
Fig: 2.



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3 Sheets—Sheet 3.

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Metal-Screw Threading Machine.

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Fig: 3

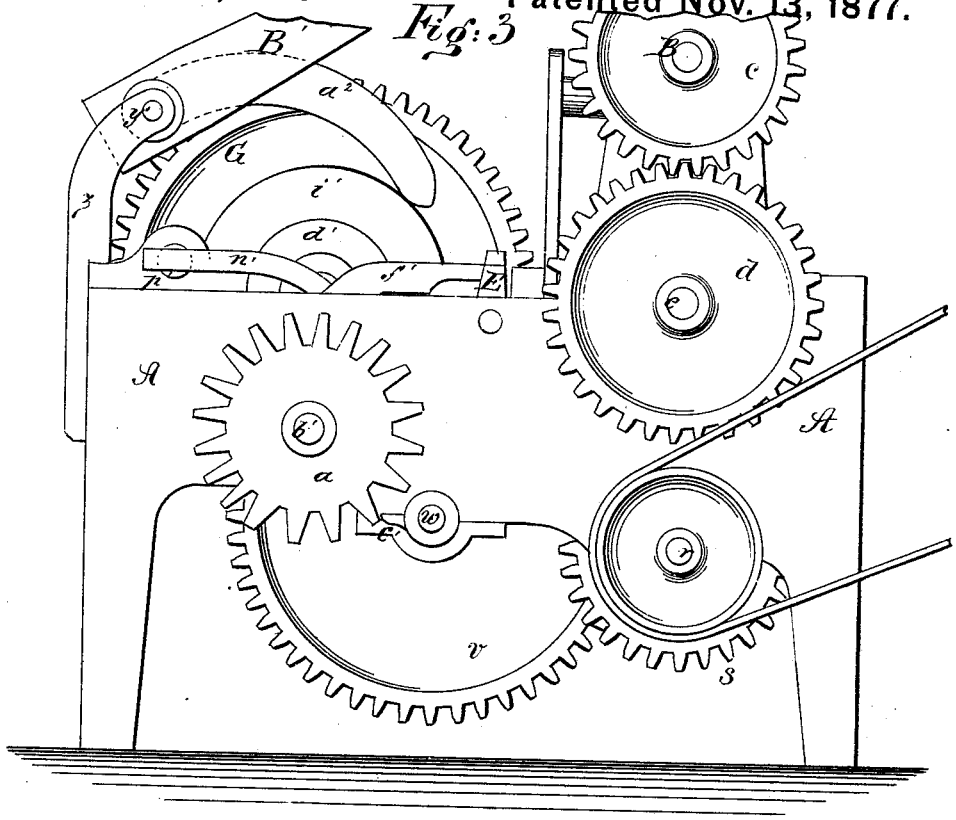
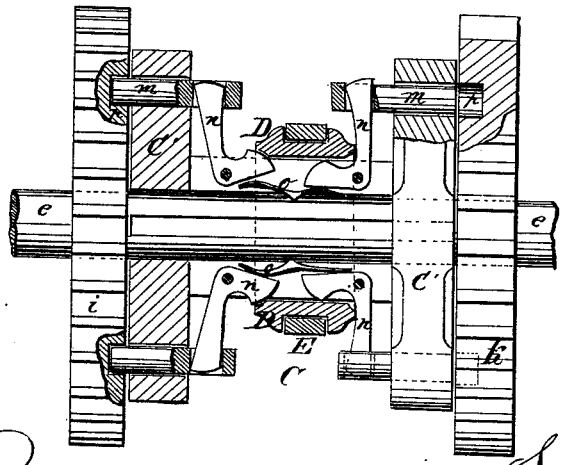


Fig: 4.



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UNITED STATES PATENT OFFICE.

SAMUEL L. WORSLEY, OF TAUNTON, MASSACHUSETTS.

IMPROVEMENT IN METAL-SCREW-THREADING MACHINES.

Specification forming part of Letters Patent No. **197,070**, dated November 13, 1877; application filed June 30, 1877.

To all whom it may concern:

Be it known that I, SAMUEL L. WORSLEY, of Taunton, in the county of Bristol and State of Massachusetts, have invented a new and Improved Screw-Cutting Machine, of which the following is a specification:

Figure 1 is a plan view of my improved screw-cutting machine. Fig. 2 is a transverse section on line *x x*, Fig. 1. Fig. 3 is an end elevation. Fig. 4 is a detail view of the clutch.

Similar letters of reference indicate corresponding parts.

My invention relates to machines for cutting fine-threaded screws, commonly known as "machine-screws;" and it consists in the combination, in a screw-cutting machine, of a mandrel carrying a die for forming the screw-threads, a clutch for reversing the motion of the mandrel, a differential motion for controlling the clutch, a leading device, and a blank-feeder, the various parts being constructed and combined in the manner hereinafter more fully set forth.

Referring to the drawings, A is a frame, which is sufficiently strong and rigid to support the movable parts of the machine, and B is a mandrel journaled in the standards that project upward from the frame. One end of the mandrel is slotted, and works in a sleeve, *a*, journaled in the standard *b*, and is carried by a spline in the said sleeve. A spur-wheel, *c*, is fixed to the sleeve, and takes motion from a wheel, *d*, on the shaft *e*, which shaft is journaled in the frame A, immediately below the mandrel B.

The mandrel B carries the dies that form the threads on the screw-blank, and upon it, between the two standards in which it is journaled, a collar, *f*, is fixed. Between this collar and the standard *g* a spiral spring, *h*, is placed upon the mandrel, which carries the mandrel backward after it is released from the screw being cut. The mandrel is led forward by mechanism hereinafter described.

The shaft *e* has upon it two loose spur-wheels, *i k*, and between them a clutch, C, is secured to the shaft. The clutch consists of a hub, *l*, upon each end of which there are two oppositely-arranged arms, C′. In the ends of these arms there are sliding bolts, *m*, which are parallel to the shaft *e*, and are mortised to receive the ends of right-angled levers *n*, that are pivoted in slots in the hub *l*. Under the arms of these levers that lie in the slots in the hub there are springs *o*, that press them upward and tend to project the bolts into holes *p*, in the faces of the wheels *i k*, but are prevented from so doing by a sliding sleeve, D, that is fitted to the hub *l*, and is capable of engaging the levers *n* at either end of the hub.

The sleeve D has in it a circumferential groove that receives a forked arm, E, placed on a sliding bar, *q*, which is moved by mechanism which will be presently described.

The wheel *i* on the shaft *e* is driven directly from the shaft *r* by the wheel *s*.

The wheel *k* is driven by the pinion *u* on the shaft *r*, through the intermediate wheel *v* on the shaft *w*.

It will be seen that this arrangement of gearing causes the wheels *i k* to revolve in opposite directions and at different velocities, the wheel *i*, which retracts the mandrel B, moving at the greatest speed.

The shaft *w* extends beyond the ends of the frame, and upon one end is placed a hub carrying a single tooth or finger, c^1, that engages the teeth of the star-wheel a^1 on the end of the shaft b^1. This star-wheel is provided with teeth of different pitch, a portion of the teeth being much coarser than the others. By means of this device the star-wheel and its shaft are made to revolve with a variable intermittent motion, while the motion of the shaft *w* and finger c^1 is uniform and continuous.

Upon the shaft b^1 there is a cam, d^1, having the slot e^1. A stud or roller projects from the lever f^1 into the slot e^1, and the opposite end of the lever engages the forked arm E.

The clutch C, as will be seen, is operated by the cam d^1, and the time consumed in retracting the mandrel is governed entirely by the star-wheel a^1, it being made with a greater or less number of coarse teeth, according to the length of the screw being made.

F is a shaft, that is journaled in the upper rear portion of the frame A, upon the end of which a spur-wheel, G, is fixed. This spur-wheel is rotated by a pinion, *g′*, on the shaft *w*.

A sleeve, *h′*, is placed loosely on the shaft F, and upon it the cams *i′ k′* and the flange *l′*

are fixed. From the latter two pins project, which are received by holes in the clutch-collar m'. The said collar is capable of being moved lengthwise on the shaft F, and is carried around by a feather, so that when the collar engages the pins projecting from the flange l' the sleeve h' and its cams are carried with the shaft F.

The sliding of the clutch-collar m' is effected by a projection, d^3, on the side of the cam d^1, which engages a lug projecting from the lever n', which lever is fulcrumed on the bar o' of the frame A.

The lever n' moves a sliding bar, p^1, which carries a forked arm, p^2, that engages the grooved boss of the collar m'. A spring, q', is attached to the bar p^1 and to the frame A, and moves the bar when it is released by the cam.

H is a shaft, which is journaled in the frame A at right angles to the other shafts, and is provided with an arm, r', that is clamped to it and held in position by friction. The arm r' is moved by the cam i', and upon the shaft H there is an arm, s', which is slotted to render the pin t', which projects from it, adjustable.

The pin t' engages a head, u', on the bar v', that slides in ways formed in the standards b g. The bar v' carries an arm, w', that engages the collar f on the mandrel B.

The clamping-jaws A′, that hold the blank while the thread is cut, are of the ordinary form, and, therefore, will not be described.

The feeding-arm B′ is attached to a shaft, y', that is journaled in the standards z', that project upward from the frame A. To the same shaft a curved arm, a^2, is secured, which rests upon the periphery of the cam k', and a spring, b^2, is attached to the arm a^2, for drawing it down upon the cam. At the free end of the arm B′ there are fingers c^2 d^2.

The finger c^2 is fixed and the finger d^2 is pivoted in the end of the arm, and is thrown against the fixed finger c^2 by a spring. The finger d^2 is provided with a notch, e^2, for receiving the screw-blank from the hopper, and is beveled from its lower end to the said notch, to facilitate the entrance of the blank to the notch.

Upon the end of each finger there is a short right-angled arm, f^2. These arms project in opposite directions, and are designed to loosen the screws from the clamping-jaws A′, in case they should not readily fall out after being cut.

The operation of my improved machine is as follows: Motion being imparted to the shaft r, in any convenient manner, the wheel i is rotated by the wheel s, on the shaft r, and the wheel k is rotated in the opposite direction by the pinion u on the shaft r, through the wheel v on the shaft w.

The clutch engages one of the wheels i k, and causes the shaft e to rotate with the wheel. This motion is imparted to the mandrel B by the spur-wheel d, which engages the wheel c that carries the mandrel. When the mandrel is moved forward in cutting a screw, the clutch C engages the wheel k, and the shaft e is moved so as to carry the mandrel in the direction required to form the thread on the screw-blank held by the jaws A′.

When the thread is formed the cam d^1 shifts the clutch C, and the motion of the mandrel B is reversed, and the die releases itself from the screw. In the meantime the motion of the cam is accelerated by the engagement of the finger c^1 with the coarser teeth of the star-wheel a^1. When the finger c^1 reaches the last but one of the coarser teeth of the star-wheel, the lever n' is released by the projection d^3 on the side of the cam d^1, and the spring q^1, by drawing the bar p^1, brings the clutch-collar m' into engagement with the pins that project from the flange l' on the sleeve h'; the sleeve being rotated, the arm B′, which until now has been supported out of the way of the mandrel B by the cam k', is permitted to drop, taking with it a screw-blank in the notch e^2 of the finger d^2. The jaws A′, having been previously opened to release the screw already threaded, are in position to receive the blank from the fingers e^2 d^2, which blank is clamped by the said jaws when it comes to rest opposite the center of the mandrel. The arm B′ is now carried upward by the cam k' and supported by it until the blank is threaded, and it is required to feed another to the jaws A′. The cam i' now moves the arm r', which carries the arm s', forward, moving the bar v', and bringing the dies carried by the mandrel into contact with the blank held by the jaws A′. The projection d^3, by engaging the lever n', moves the bar p^1, and disengages the clutch-collar m' from the pins of the flange l'. The motion of the cams i' k' is thus stopped, and they are not moved again until the lever n' is released by the projection d^3 on the cam d^1.

There are several advantages secured by my improvement which are valuable: The clutches being thrown into engagement by springs, and not by a positive motion, avoids breaking and straining the clutch and other parts of the machine. The differential motion of the shaft b^1, secured by teeth of different sizes in the same star-wheel, simplifies the mechanism and enables me to adapt the machine to screws of different lengths by simply changing the star-wheels. By clamping the arm r' to the shaft H, so that the latter is moved by the friction of the arm on the shaft, I avoid breakage in the machine in case the dies should become clogged, as the said arm r' slips on the shaft H when the mandrel B meets with unusual resistance.

The leading mechanism is adapted to screw-threads of different leads by moving the stud t' in the slotted arms s'.

The various parts of the machine are contrived with a view to simplicity and regularity and accuracy in operation.

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

1. The clutch C, consisting of the hub l, having arms C′, the bolts m, right-angled

levers n, springs o, sliding sleeve D, combined and adapted to engage with the wheels i k, having holes or slots p, substantially as shown and described.

2. The finger c^1 and star-wheel a^1, having teeth differing in pitch, for giving a differential motion to the clutch-actuating cams, substantially as shown and described.

3. The combination, in a screw-cutting machine, of the cam d^1, lever f^1, sliding bar q, forked arm E, and clutch C, with the rotating and sliding mandrel B, shaft e, having loose spur-wheels i k and fixed spur-wheel d, and the sleeve a, having spur-wheel c, substantially as and for the purpose set forth.

4. The cam i', arms r' s', shaft H, and bar v', having the head u', and arm w', in combination with the mandrel B, having the collar f, substantially as shown and described.

5. In a screw-cutting machine, the combination of the cam d^1, having projection d^3, lever n', bar p^1, forked arm p^2, spring q', clutch-collar m', shaft F, sleeve h', cams i' k', with the sliding mandrel B, feeding-arm B′, and devices, substantially as herein shown, for communicating motion to said mandrel and feeding-arm, as herein set forth.

6. The arms f^2, projecting from the fingers c^2 d^2, for disengaging the finished screws from the jaws A′, as shown and described.

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