No. 816,322. PATENTED MAR. 27, 1906.

J. H. HASKINS.

BOLT THREADING MACHINE.

APPLICATION FILED AUG. 3, 1903.

6 SHEETS—SHEET 1.

Fig. 1.

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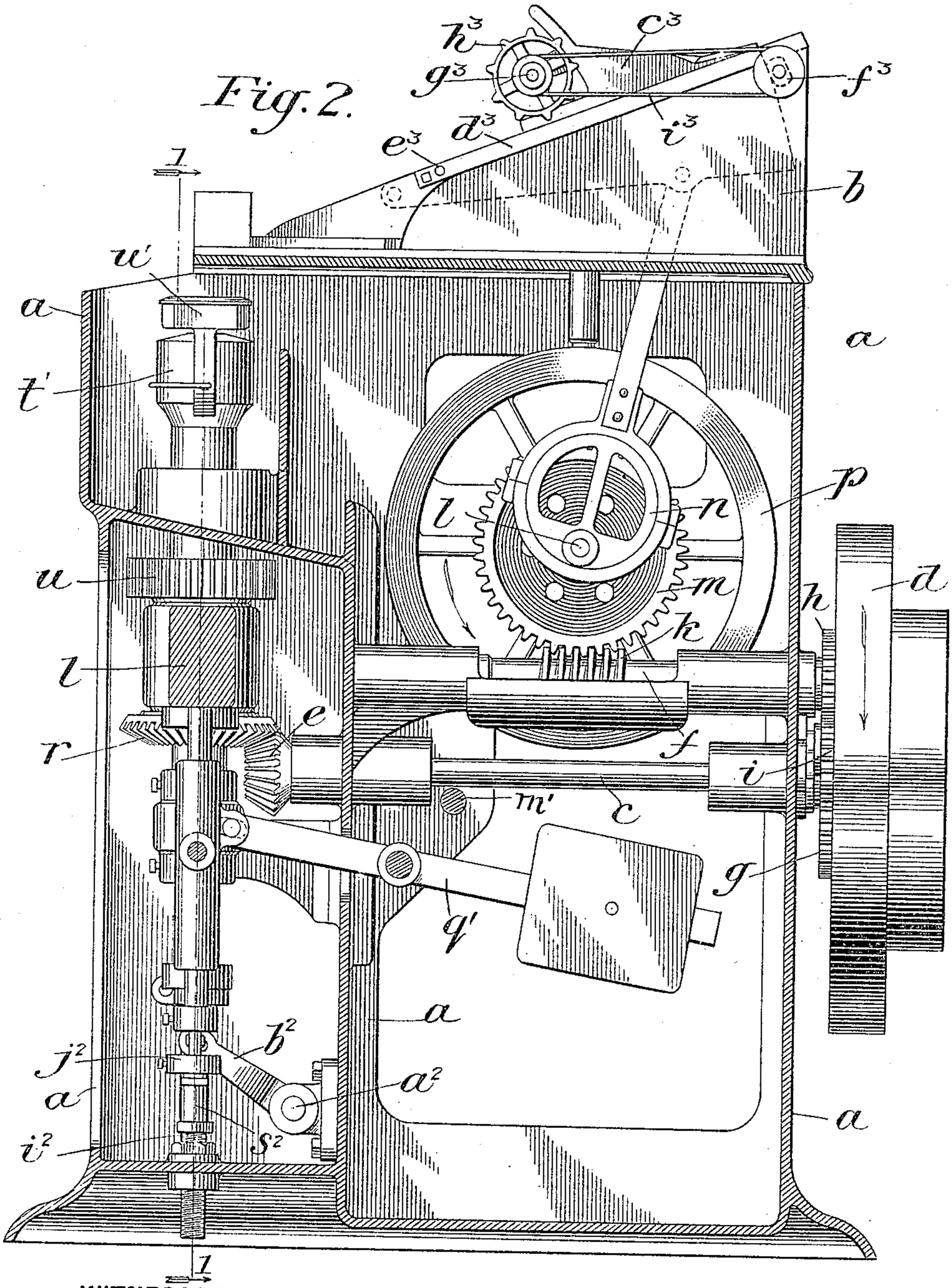
6 SHEETS—SHEET 2.

Fig. 2.



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6 SHEETS—SHEET 3.

Fig. 3.

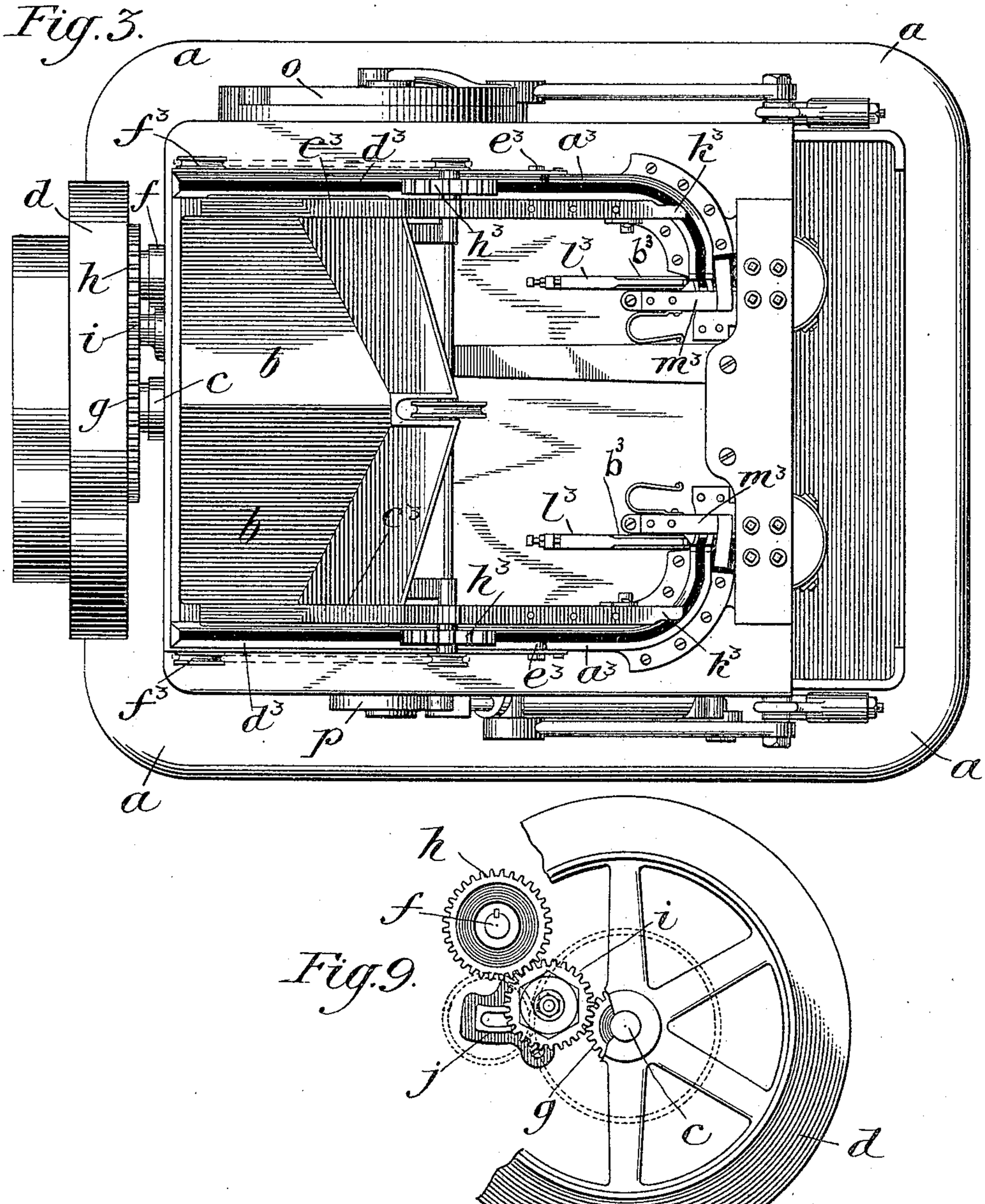

Fig. 9.

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6 SHEETS—SHEET 4.

Fig. 4.

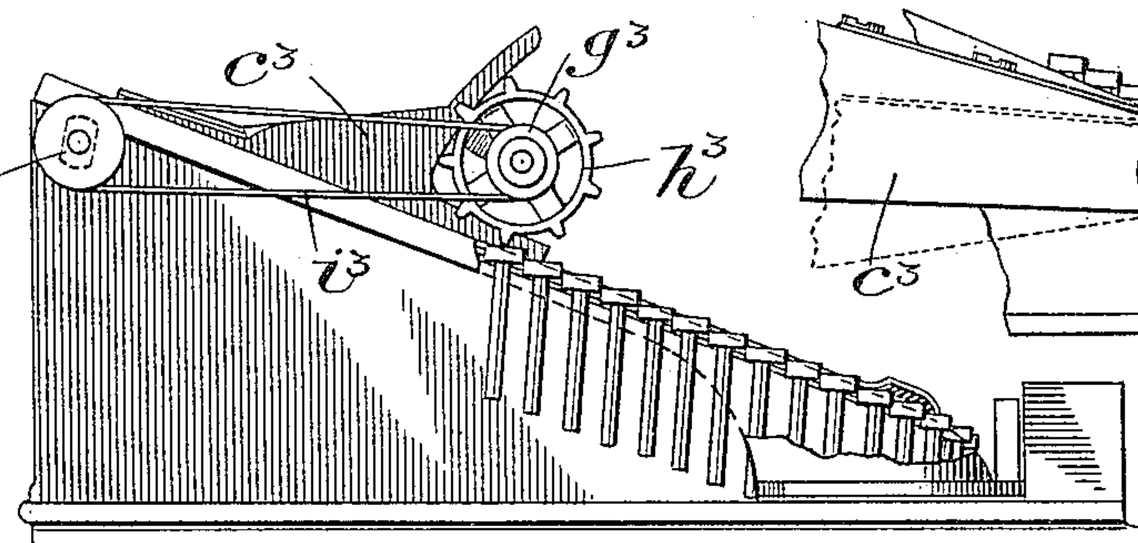
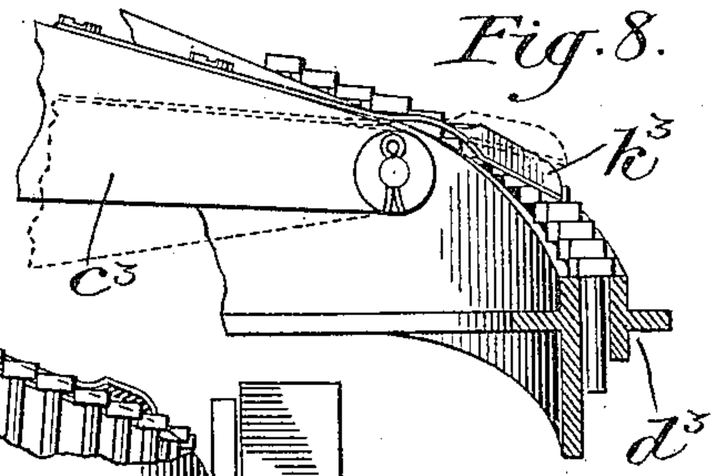
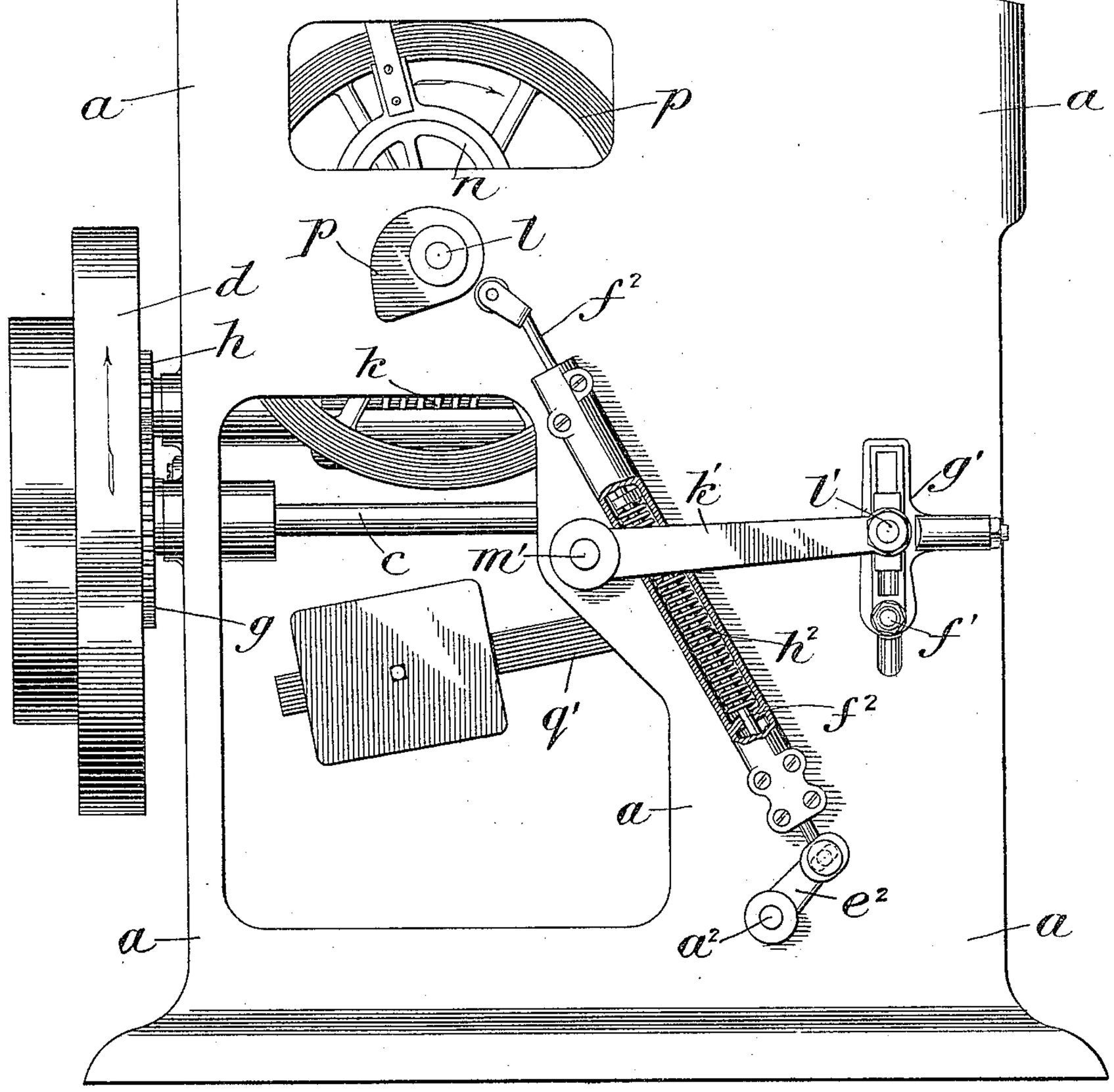


Fig. 8.





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6 SHEETS—SHEET 5.

Fig. 5.

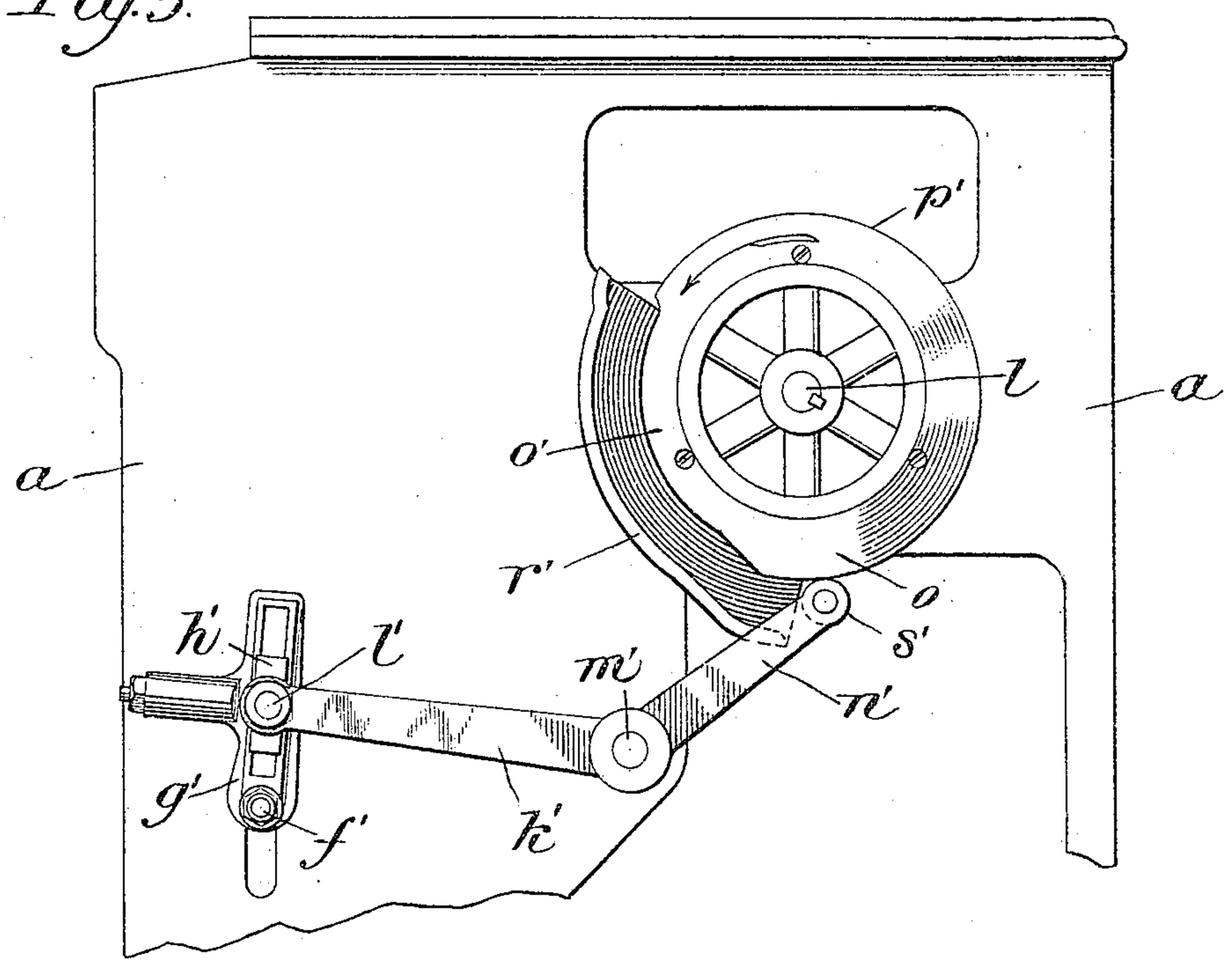


Fig. 11.

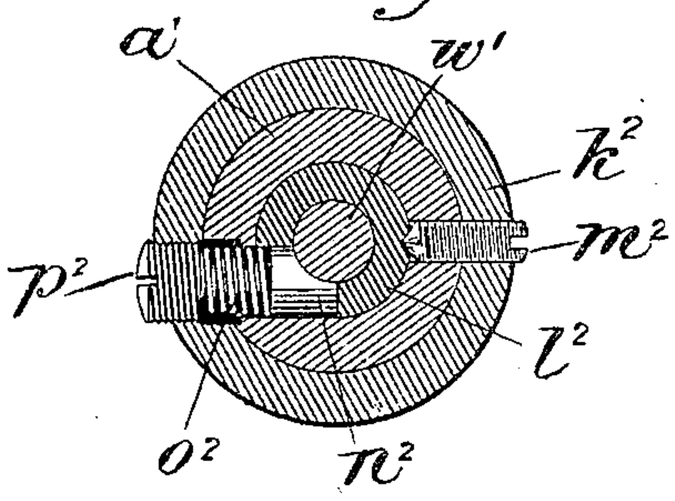
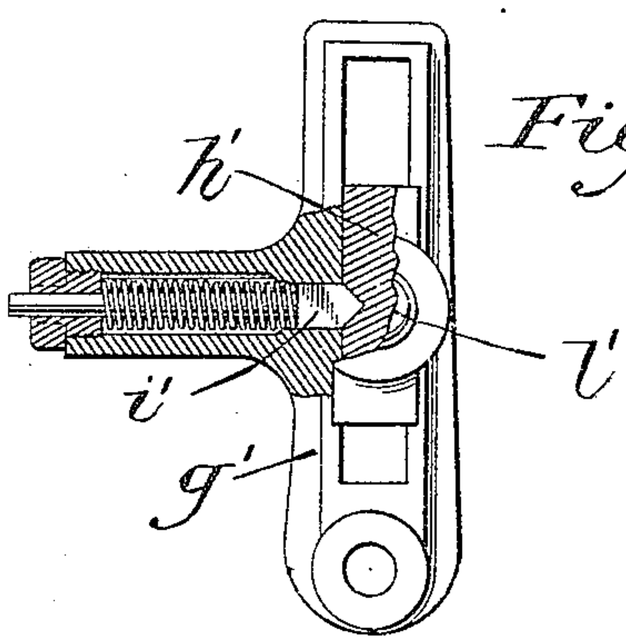


Fig. 10.



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BOLT THREADING MACHINE.

APPLICATION FILED AUG. 3, 1903.

6 SHEETS—SHEET 6.

Fig. 6.

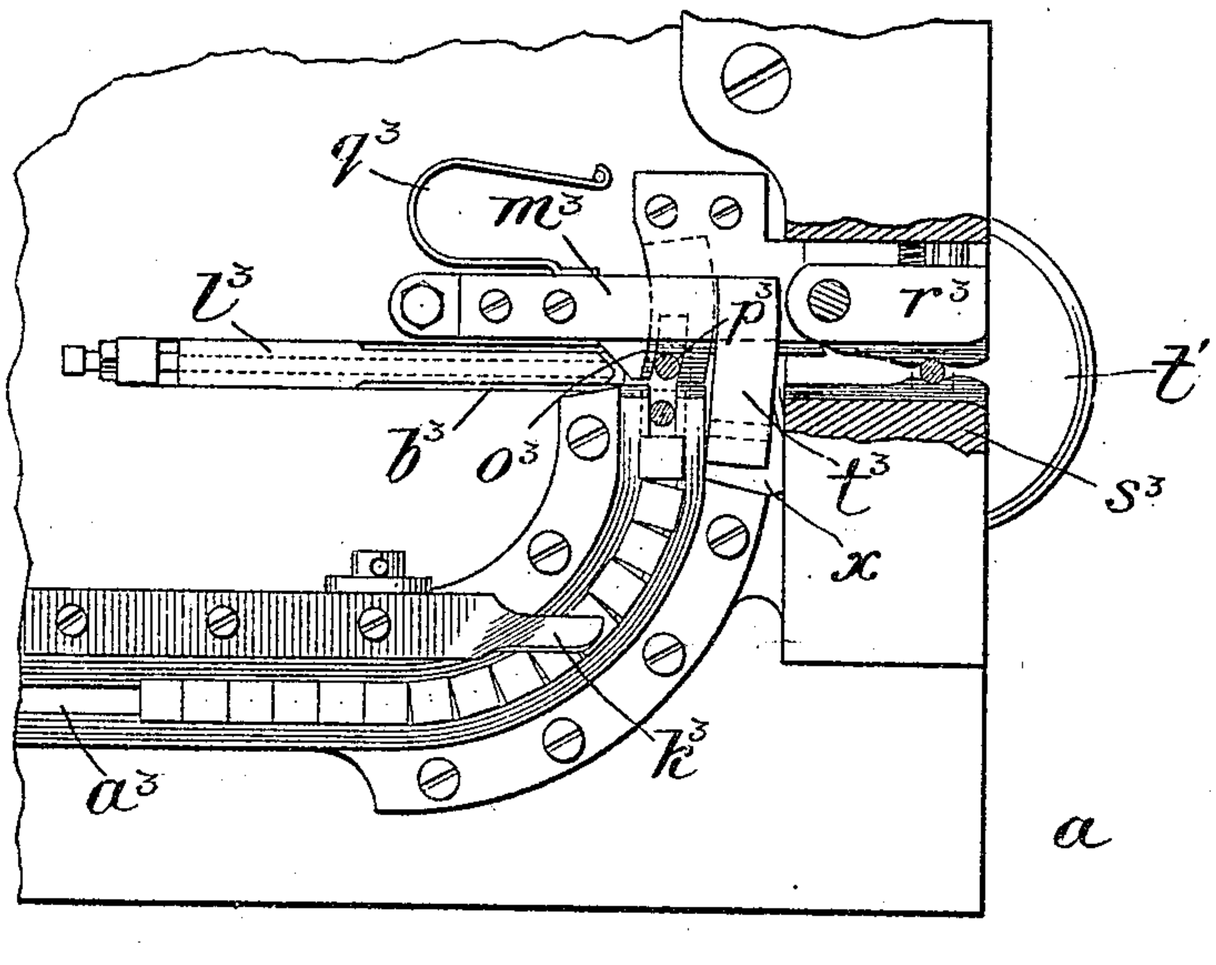
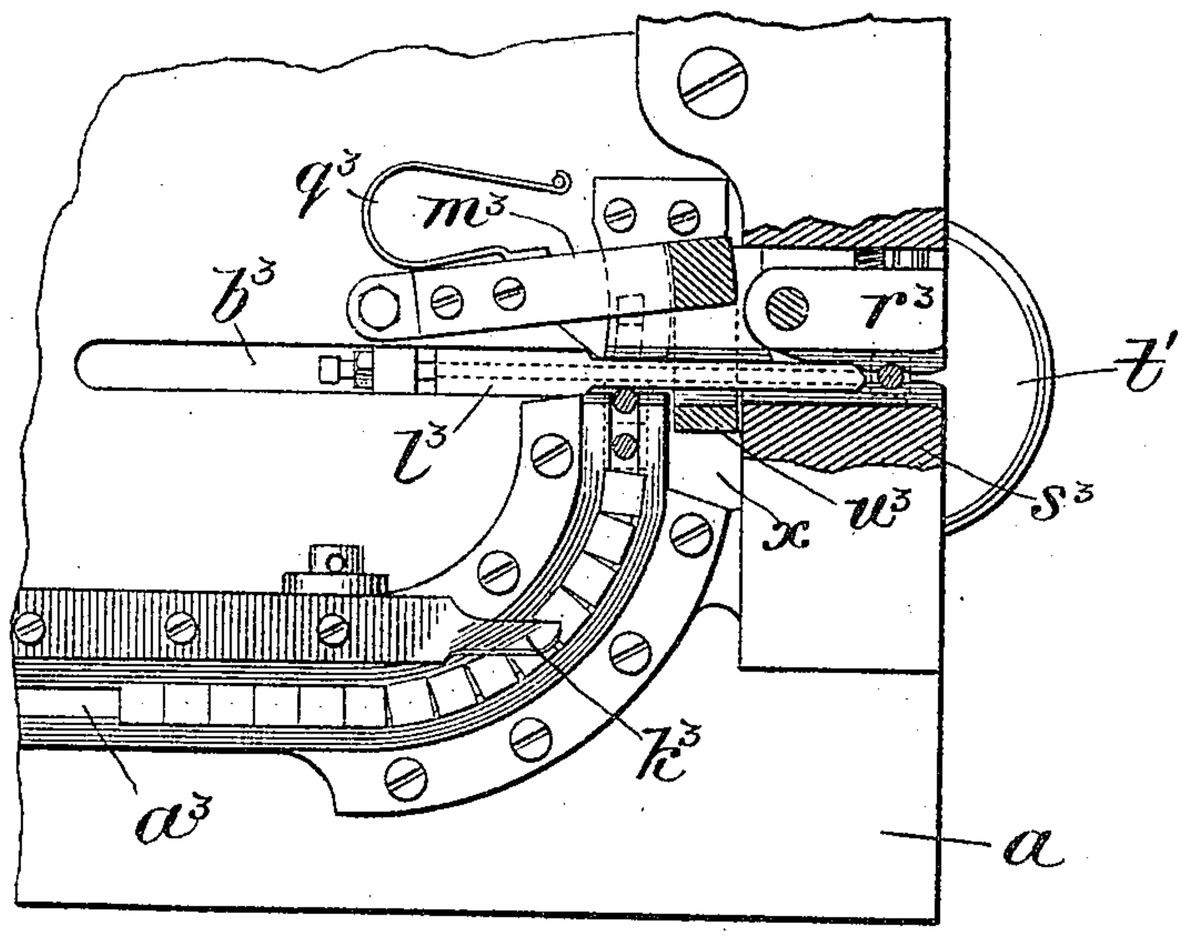


Fig. 7.



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UNITED STATES PATENT OFFICE.

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BOLT-THREADING MACHINE.

No. 816,322. Specification of Letters Patent. Patented March 27, 1906.

Application filed August 3, 1903. Serial No. 167,991.

To all whom it may concern:

Be it known that I, JAMES H. HASKINS, a citizen of the United States, residing at San Diego, county of San Diego, State of California, have invented certain new and useful Improvements in Bolt-Threading Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to machines of the type heretofore invented by me and covered by Patents No. 556,054, March 10, 1896, No. 602,506, April 19, 1898, and No. 722,300, March 10, 1903, and has more particularly in view to reorganize the machine of the patent last above named and adapt it for automatically cutting threads upon bolt-blanks. To this end the tools for cutting and finishing the ends of the blanks have been replaced by thread-cutting tools that are novel in construction and are operated in a manner that is believed to be new in this class of machines. The tools are independent in action, and although they derive their reciprocating motion from the same source they are also independent in this respect, owing to the inclusion of safety devices in the mechanism which operates them. Provision is made for varying the relation between the speed of the tools and the means for reciprocating them, so as to adapt the machine to cut threads of varying lengths, and the tools are also adjustable toward and from the blank-holding vises, whereby the machine is enabled to work on short or long blanks.

The general structure of the present machine, the framing, the gearing, and the manner of feeding the blanks from the hopper to the tools are practically the same as in Patent No. 722,300; but the independent reciprocation of the tools and the arrangement for driving them at different speeds are entirely new, as are also the construction and manner of operating the tools themselves, the means for insuring the accurate feeding of the blanks from the hopper to the tools without clogging, and the arrangement for allowing defective blanks to drop out of the machine without choking the operating parts or stopping the action of the thread-cutting tools.

In my Patents Nos. 556,054 and 602,506 the thread-cutting tools were reversed at the completion of each operation; but in the present invention the tools operate continuously forward and are not backed off. The capacity of the machine is thereby considerably increased, the ease of operation greatly enhanced, and the reversing-gear train is done away with.

The present improvements are illustrated in the accompanying drawings, forming part of this specification, wherein—

Figure 1 is a front elevation of the machine, showing one of the tools in section, taken on a vertical plane, as indicated by line 1 1 of Fig. 2. Fig. 2 is a sectional side elevation taken on a plane indicated by the line 2 2 of Fig. 1, showing the driving-gearing and the counterbalance for the tools. Fig. 3 is a plan view. Fig. 4 is an elevation of the opposite side from that shown in Fig. 2. Fig. 5 is a fragmentary side elevation corresponding to Fig. 2, showing the tool-reciprocating cam in the position it assumes when the threading operation is almost completed. Figs. 6 and 7 are fragmentary plan views showing the blank-forwarder and the pivoted locking-finger in two different positions. Fig. 8 is a fragmentary view of the feeding-chute, showing the operation of the retarding-spring. Fig. 9 is a fragmentary elevation of the driving-pulley, showing the gearing by which the relative speeds of the tools and the cam-shaft are varied. Fig. 10 is a partial sectional elevation of one of the safety devices for the tool cross-head. Fig. 11 is a sectional view of the friction device for the die-operating rods, taken on the plane indicated by line 11 11 of Fig. 1.

Referring to these views, *a* wherever occurring denotes the frame of the machine, and *b* the hopper for holding the blanks. The main shaft for driving all the operative parts is shown at *c*. It is mounted at opposite ends in suitable bearings in vertical walls or partitions of the frame and has a band-wheel *d* on its rear end, by means of which it is driven, and a bevel-pinion *e* on its front end, by means of which it rotates the thread-cutting tools to be described later on.

Immediately above this shaft and similarly mounted in the frame is a counter-shaft *f*,

which is parallel with the main shaft and geared thereto by a spur-gear arrangement, (shown in detail in Fig. 9,) where it will be seen that the main shaft has at its rear end a pinion *g* and the counter-shaft a similar pinion *h*. Interposed between and meshing with these pinions and transmitting motion from the main shaft to the counter-shaft is an idler *i*, which is journaled on a stud that is adjustable in a slotted plate *j*, secured to the rear wall of the machine-frame.

The counter-shaft carries a worm *k* and a cross-shaft *l*, that is mounted transversely in the machine-frame above the main and counter shafts and has a gear *m* meshing with the worm, is driven by it, and in turn does the entire work of the machine except the rotation of the threading-tools. For this purpose the cross-shaft has a pair of eccentrics *n*, that are connected to the feed-plates of the hopper and operated in the manner illustrated and described in Patent No. 722,300. It also has a cam-wheel *o* at one end for raising and lowering the threading-tools and a cam *p* at the other end for opening the thread-cutting jaws when the tools have been raised, and in addition to these it has the peripherally-cammed wheel (not shown) for operating the blank-forwarder in a manner forming no part of the present invention, but which is fully illustrated and described in the above-mentioned Patent No. 722,300.

The pinion *e* on the front end of the main shaft meshes with a bevel-gear *r* on a short vertical shaft *s*, that is mounted in a cross bearing or header *t* at the front side of the machine. This shaft is located midway between the spindles of the threading-tools and has a spur-gear *u* at its upper end, which meshes with the pinions *v* of these tools, so as to rotate them continuously in a forward direction.

The threading-tools have elongated tubular spindles *a'*, that are journaled in the cross-bearing *t* independently of each other, each spindle being inclosed by and splined to a sleeve that is fixed to or part of the pinion *v*, so that it may be reciprocated vertically through the sleeve while being rotated by the pinion.

Below the bearing *t* there is secured to each tool-spindle a cross-head *b'*, which is guided in its up-and-down movements by rods *c'*, fixed in and depending from the cross-bearing. These cross-heads are attached to the spindles by means of collars *d' e'*, that are secured by set-screws to the spindles, and the vertical reciprocations of the threading-tools are effected through the intermediacy of these cross-heads in the following manner:

As before stated, the heads are guided by the rods *c'*, and they have pins *f'* projecting laterally from them through openings in the sides of the machine-frame. The outer ends of these pins have stirrups *g'* pivoted on them, and the stirrups carry small pivot-blocks *h'*, sliding in slots that run the length of the stirrups. The blocks *h'* are yieldingly held in place in the slots by means of a spring-bolt *i'* in each stirrup, which is mounted in a sleeve *j'*, projecting laterally from the side of the stirrup, and has its front end pointed and entering a recess in the side of the block.

The cross-heads are reciprocated by the cam *o*, heretofore described, on the cross-shaft *l*, and the connection between the cam and the cross-heads is made by levers *k'*, projecting forwardly from opposite ends of a shaft *m'*, extending crosswise of the machine. The outer ends of these levers are connected to the pivots *l'* of the blocks *h'* just above described, and the shaft to which they are secured is rocked by means of the cam *o* through the intermediacy of an arm *n'* on the opposite end of the shaft, which arm has a roller *s'* running on the cam.

As will be understood from the above description, the levers *k'* are positively and unyieldingly vibrated by the cam, and except for the independent mounting of the spindles and the interposition of some differential device between the levers and the spindles the thread-cutters could not be independent in their up-and-down movements, but would be always reciprocated simultaneously, like the point-finishing tools of Patent No. 722,300. It is very desirable, however, to provide for an independent up-and-down movement of these tools in order that either may yield on encountering a blank of abnormal length without the necessity of both being thrown out of action, and this is provided for in the present invention by mounting the spindles independent of each other and connecting the levers to the cross-heads by means of the yielding safety devices just described, which, as here shown, are composed of the slotted stirrups and the yieldingly-held pivot-blocks, though any suitable form of safety devices may be employed in lieu thereof.

As will be understood from Fig. 5, the upward movement of the thread-cutting tools is caused by the roller on the arm *n'* passing from the smaller arc *o'* of the cam to the larger arc *p'*, and the downward movement is caused by the roller returning to the smaller arc of the cam.

In order to make the work of reciprocating the tools as smooth and easy as possible, they are independently counterbalanced by weighted levers *q'*, that are pivotally connected at their front ends to the cross-heads, and to insure the prompt and certain descent of the tools and prevent them from failing to drop to their lowest position and closing the cutting-dies (to be hereinafter described) that portion of the cam *o* which effects or permits the falling movement is provided with an outer rim *r'*, corresponding in outline and position to the smaller arc of the cam and oper-

ating to catch the roller s' of the lever n' and positively cause it to pass onto the smaller arc, and thus rock the arms k' downward.

The upward movement of the spindles is merely for the purpose of causing the tools to properly engage the blanks. After the cutting-dies engage the blanks the tools become self-feeding, and the cam o is practically out of operation until it has revolved to the point where the roller s' again enters between the rim r' and the smaller arc, and the entrance to the space between this arc and the rim should be made sufficiently wide to provide enough movement of the tools to cut the longest thread possible with the machine.

The arrangement of gearing illustrated in Fig. 9 and heretofore described has for its object to provide for changing the ratio between the rotation of the tools and their reciprocating movement in order that a longer or shorter thread may be cut on blanks of a given length by temporarily disconnecting the idler i and changing the size of either of the gears g and h on the main and counter shafts, respectively, and in this connection it is to be noted that the adjustability of the collars d' and e' on the tool-spindles provides for adjusting the range of up-and-down movement of the tools, so as to enable them to cut the same length of threads on longer or shorter blanks.

The upper ends of the tool-spindles are provided with heads t', in which are pivoted cutting-dies u', that are normally open, but are closed just before the blanks are presented to them. These dies are closed by pins v' sliding loosely in the heads and bearing on the inner sides of the tail ends of the dies. The pins have their inner ends beveled, as best shown in Fig. 1, and are operated by means of rods w', extending up through the spindles and also having a beveled upper end engaging the beveled inner ends of the pins v' and acting to thrust them outward, so as to close the dies.

Assuming the tools to be in operation and the dies closed, when the tools have been raised sufficiently to form the desired length of thread the rods w' are withdrawn, so as to allow the dies to open and the threaded bolts to be discharged. This withdrawal of the die-operating rods w' is effected by the following means from the cam p on the end of the shaft l opposite to the cam which raises and lowers the spindles. In the lower part of the machine-frame a rock-shaft a^2 is mounted. On the inner end of this shaft there is a yoke-shaped crank b^2, the arms of which are pivotally connected to a sleeve c^2, to which is adjustably secured a cross-head d^2, the arms of which reach outwardly and are perforated for the free passage through them of the rods. The sleeve is guided in its vertical movements by a pin s^2, rising from the base of the machine-frame. The outer end of the rock-shaft has a crank e^2, and to this crank is pivotally connected the lower end of a push-rod f^2, that slides in a housing g^2, secured to the side of the machine, and has a roller on its upper end that contacts with the cam p on shaft l. The weight of the cross-head, the sleeve, &c., is counterbalanced by a spring h^2, that is inclosed in the housing and reacts against a collar i^2 on the rod, so as to hold the upper end of the rod up to the cam and the cross-head in the elevated position shown in Fig. 1. When the cross-head is depressed, its arms strike collars j^2 on the die-operating rods and withdraw them, so as to release the pins in the head of the tools and allow the dies to open.

The cam p acts immediately that the cutting-dies complete the formation of the thread, whereupon the completed bolt drops out of the machine. The roller s' on the lever n' then passes onto the smaller arc of the cam o, and the threading-tools descend, carrying the rods w' with them till the ends of the rods bring up against fixed but adjustable stops i^2 in the base of the frame. This causes the rods to be thrust upwardly in the spindles again and closes the cutting-dies ready for a new blank.

In order to hold the rods in proper position in the spindles and prevent their accidental or premature disengagement from the pins that close the cutting-dies, the lower end of each spindle has a friction device constituting a brake for its rod. This device consists of an exterior collar k^2, surrounding the spindle, and a similar interior collar l^2, surrounding the rod between it and the inner wall of the spindle. Both collars are secured to the spindle, a single set-screw m^2 being employed for this purpose that passes through the outer collar, the wall of the spindle, and impinges against the inner collar, as clearly shown in Fig. 11. This inner collar serves to centralize the rod in the bore of the spindle and prevent the access of dirt or other foreign substances which might collect there and interfere with the action of the friction device. The brake proper consists of a friction-block n^2, which is seated in a recess passing through both collars l^2 and m^2 and the spindle and has its inner end concaved to bear on the die-actuating rod, and the block is held elastically against the rod by a spring o^2, which is made adjustable by the screw p^2 in order to regulate the amount of friction exerted by the brake on the rod.

The devices for forwarding the blanks from the hoppers through the chutes to the vises which seize and hold them while the tools are cutting the threads are practically the same as in Patent No. 722,300, as are also the vises themselves and their operating mechanism; but the present invention includes new devices for insuring the proper positioning of the blanks in the feed-chutes, preventing

them from crowding down the chutes and blocking the passage-way leading directly to the vises and for insuring the delivery of only one blank at a time from the main part of the chute into said passage-way. It also provides for the dropping out of the machine any imperfect or abnormally long blanks that cannot pass over the cutting-dies, thus allowing the operation to continue without interruption, all as will now be described in detail.

The hopper b for holding the blanks is constructed like that of Patent No. 722,300, having its bottom sloping from the center toward the sides, where the feed-chutes a^3 communicate with it. The chutes extend along the sides of the machine to the front corners, where they curve inward and communicate with passage-ways b^3, extending in a straight line toward the front of the machine in line with the thread-cutting dies. The feed-plates c^3 for agitating the blanks and causing them to enter the chutes properly are the same as in the former patent and are operated in the same way. In the present improvement the outer wall d^3 of each chute is pivoted at e^3 at its lower end, and its upper free end engages with a cam f^3, journaled at the rear corner of the hopper and rotated constantly by any suitable means, being operated, as here shown, by a belt i^3, running from pulleys g^3 on the shaft of the retarding-wheels h^3, which latter are substantially like those of my Patent No. 602,506. The movement of the wall d^3 produced by the cam is very slight, but is continuous during the operation of the machine and is sufficient to prevent the blanks from clinging to the sides of the chute and insures their sliding freely down toward the passage-way leading to the vises.

In order to prevent the too rapid movement of the blanks down the inclined chutes when the blank-forwarder (to be presently described) is withdrawn, a flat spring K^3 is secured to the front lower end of each feed-plate and projects over the chute, so as to engage the blanks therein when the plate is raised and act as a brake to momentarily retard their movement until the feed-plate moves down again, when the spring is lifted clear of the blanks, as best illustrated in Fig. 8, allowing them to continue their movement unrestrained.

The forwarder l^3 for pushing the blanks out of the chute into the passage-way b^3 is the same as in Patent No. 722,300 and is operated in the same way and by the same means.

The locking-finger m^3 also, so far as its general construction and operation are concerned, is the same and is provided with the same inclined cam n^3, which the forwarder strikes to move the finger out of the way to permit a blank to be passed on from the chute to the vise. The finger is in the present instance, however, provided on the side next the chute with two lateral projections o^3 p^3 in line with the chute-walls, and the space between the projections corresponds to the chute in width and actually forms a continuation thereof when the forwarder is withdrawn and the finger is in normal position.

As will be understood from Figs. 6 and 7 herein and from the former patent, the finger normally locks the passage-way b^3 against the entrance of the blanks and is deflected to one side by the end of the blank-forwarder striking the cam on the finger and overcoming the stress of the spring q^3, thus opening the passage-way and permitting the single blank held between the projections of the finger to be thrust forward to the vise by the front end of the forwarder l^3, the side of the same meanwhile closing the chute a^3 and preventing the blanks from descending. The length of the projections on the locking-finger and the width and depth of the space between the same are only sufficient to receive one blank at a time, and this blank cannot be forwarded to the vise until the forwarder closes the end of the chute a^3, so that there is no liability of more than one bolt finding its way into the passage b^3 ahead of the forwarder.

The jaws r^3 s^3 of the vises are the same in construction and operation as in Patent No. 722,300; but the passage-way between the chute and the vises is herein formed so that in case an imperfect blank or one of a length too long to pass over the top of the tools should be among the others it would be free to drop out of the machine on the return of the forwarder. Should such a blank be encountered, it would of course be pushed along the way b^3 by the forwarder until it struck the threading-dies, when it could go no farther. The safety devices in the forwarder-operating mechanism (see Fig. 10, Patent No. 722,300) would then yield and the forwarder would stop, but would be withdrawn as usual on the return of its operating devices, and in order to permit the unthreaded blank to drop out of the passage when released by the forwarder the side wall of the way nearest the chute is cut away, as shown at x in Figs. 6 and 7, and the locking-finger has an arm t^3 overhanging the way and provided with a depending flange n^3, which fits into the cut-out portion of the wall of the passage-way. When the finger is in position to permit the blank to be forwarded—that is to say, when it is pushed to one side—the flange u^3 is brought up into the position indicated in Fig. 7 and the side wall of the passage is continuous; but when the forwarder has been drawn back and the finger returns to normal position the flange moves away, as indicated in Fig. 6, thereby opening the cut-

away portion of the wall of the passage, freeing the blank and allowing it to drop out of the machine.

Having thus described my invention, what I claim is—

1. In a blank-threading machine, the combination of a rotating and reciprocating threading-tool having a tubular spindle and an interior rod w' for operating the cutting-jaws, cutting-dies u', sliding pins v' mounted transversely in the head of the tool and acting to close the dies, the inner ends of the pins and the upper end of the rod w' being beveled so that the endwise movement of the rod causes the pins to close the dies.

2. In a blank-threading machine, the combination of a rotating and reciprocating tool having a tubular spindle a' and an interior rod w' for operating the cutting-dies, a cross-head d^2 through which the rod slides, means for reciprocating the tool, means for operating the cross-head to withdraw the rod when the tool reaches its uppermost position, and a stop i^2 against which the rod strikes when the tool is lowered and by which the rod is thrust upward again into the spindle.

3. In a blank-threading machine, the combination of a rotating and reciprocating tool having a tubular spindle a' and an interior rod w' for operating the cutting-dies, said rod having a collar j^2, a cross-head d^2 through which the end of the rod below the spindle slides, a shaft a^2 having a crank b^2 for operating the cross-head, a crank-arm e^2 on the shaft, a cam p for operating the shaft a^2, a rod f^2 connected to the arm e^2 and operated by the cam, and a spring h^2 for counterbalancing the weight of the cross-head and its operating devices.

4. In a blank-threading machine, the combination of a rotating and reciprocating tool having a tubular spindle a' and an interior rod w' for operating the cutting-dies, said rod having a collar j^2 at its lower end, a cross-head d^2 through which the end of the rod below the spindle slides, a sliding sleeve c^2 connected to the cross-head and guided on a fixed pin s^2, a shaft a^2 having a yoke-shaped crank b^2 on one end of the shaft and connected to the sleeve, a crank-arm e^2 on the other end of the shaft, a cam p on the shaft l, a rod f^2 operated by the cam and connected to the arm e^2, a housing inclosing the rod, and a spring h^2 reacting between the rod and the housing to counterbalance the cross-head and its operating devices.

5. In a blank-threading machine, the combination of the tubular spindle of the tool, the cutting-dies pivoted in the head of the tool, transverse pins v' working in said head serving to close the dies, the rod w' for operating the pins, and a brake between the spindle and the rod.

6. In a blank-threading machine, the combination of the tubular spindle of the tool, the cutting-dies pivoted in the head of the tool, transverse pins having beveled inner ends and their outer ends bearing against the tail ends of the dies, a reciprocating rod w' working in the spindle for operating the pins, and an elastic friction-brake between the spindle and rod.

7. In a blank-threading machine, the combination of the tubular spindle of the tool, the cutting-dies pivoted in the head of the tool, transverse pins having beveled inner ends and their outer ends bearing against the tail ends of the dies, a reciprocating rod w' having a beveled upper end and working in the spindle so as to thrust the pins outward to close the dies, a collar k^2 on the lower end of the spindle, and a spring-pressed friction-block n^2 passing through the collar and spindle and bearing on the rod.

8. In a blank-threading machine, the combination of the tubular spindle of the tool, the cutting-dies pivoted in the head of the tool, transverse pins having beveled inner ends and their outer ends bearing against the tail ends of the dies, a reciprocating rod w' having a beveled upper end and working in the spindle so as to thrust the pins outward to close the dies, a collar k^2 on the lower end of the spindle, a centering-collar l^2 between the rod and spindle, a friction-block n^2 bearing against the rod, and an adjustable spring o^2 to vary the braking power of the block.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES H. HASKINS.

Witnesses:
C. W. AIKEN,
P. W. HAZELTON.