(No Model.) 4 Sheets—Sheet 1.

L. T. BOWMAN.

BOLT THREADING MACHINE.

No. 432,972. Patented July 29, 1890.

Fig. 1.

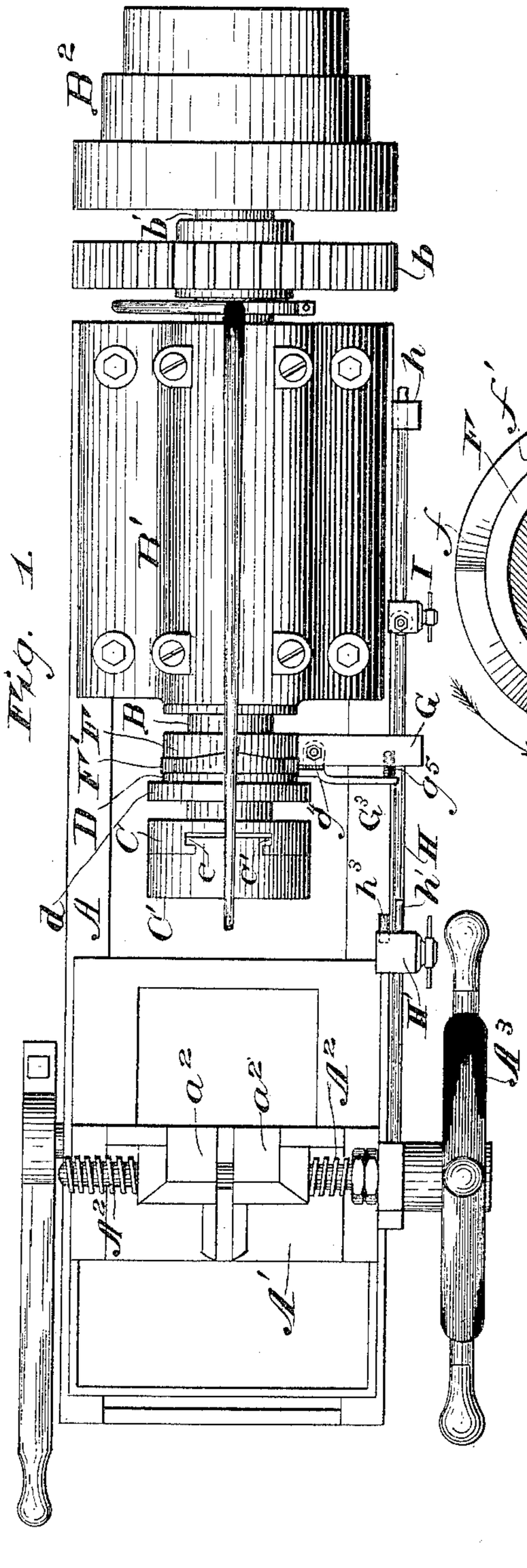

Fig. 3.

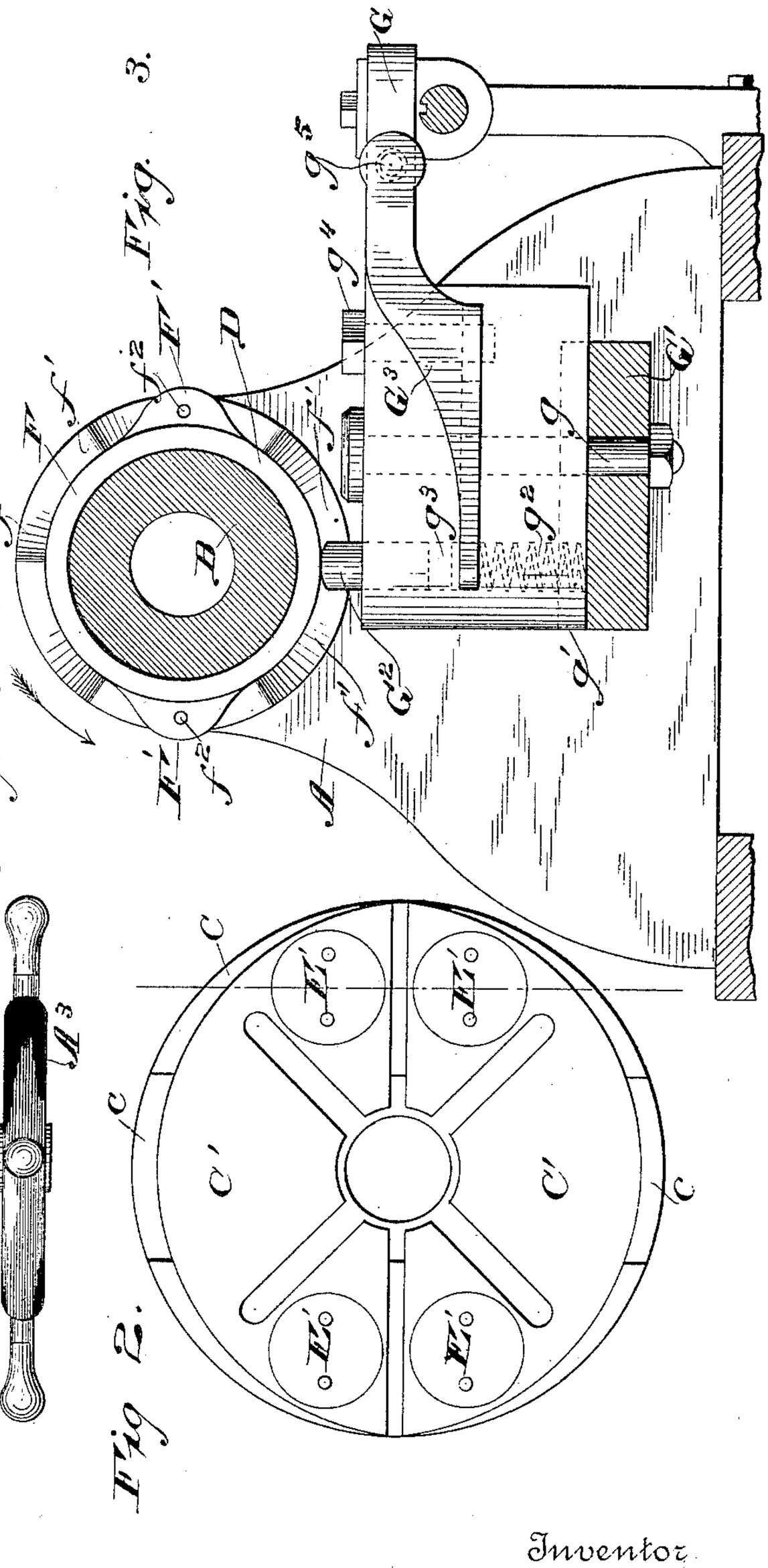

Fig 2.

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(No Model.) 4 Sheets—Sheet 2.

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BOLT THREADING MACHINE.

No. 432,972. Patented July 29, 1890.

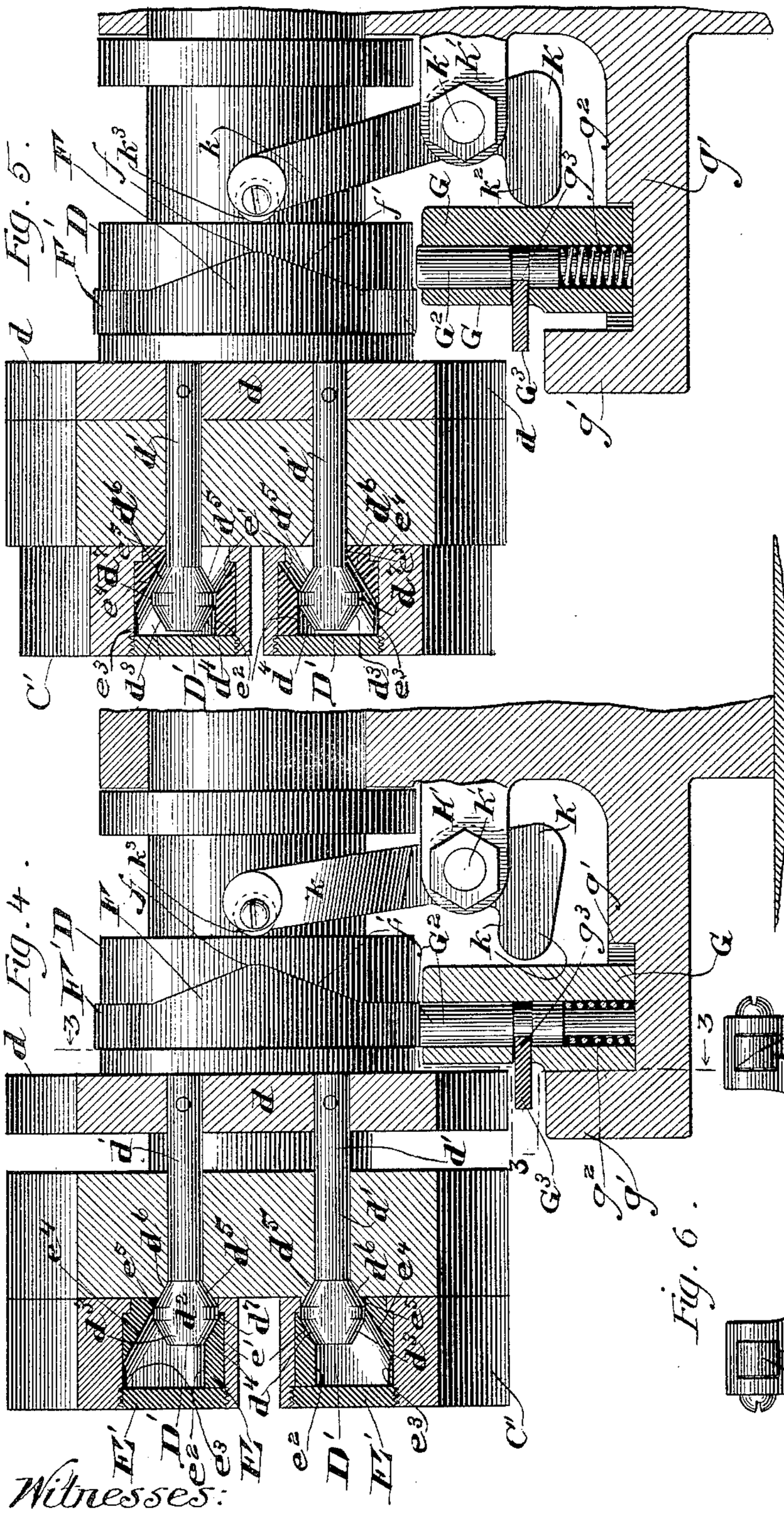

Fig. 5.

Fig. 4.

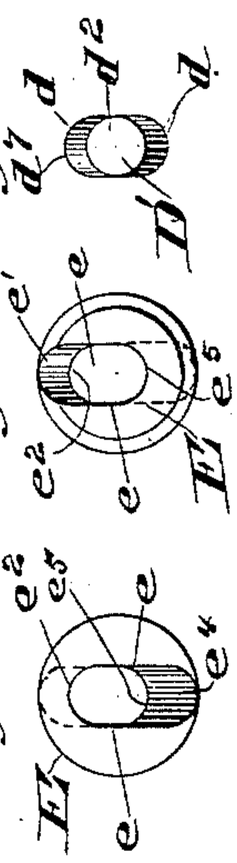

Fig. 8. Fig. 9.

Fig. 7.

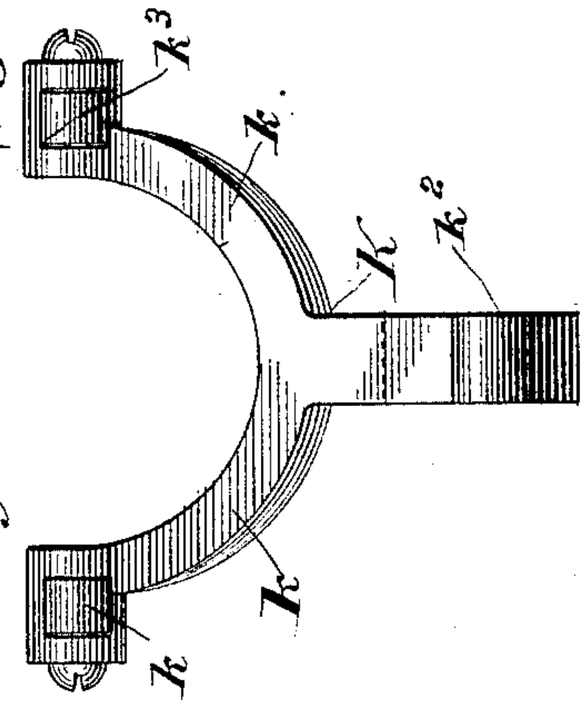

Fig. 6.

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(No Model.) 4 Sheets—Sheet 3.

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BOLT THREADING MACHINE.

No. 432,972. Patented July 29, 1890.

Fig. 10.

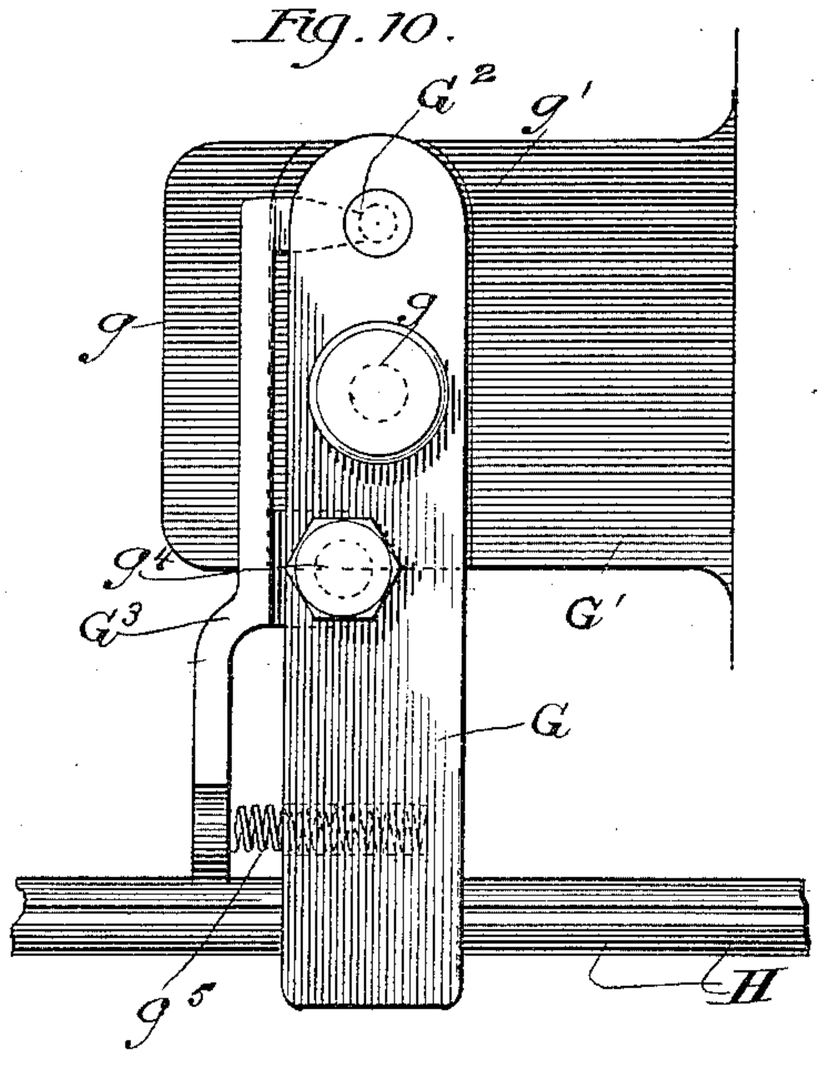


Fig. 11.

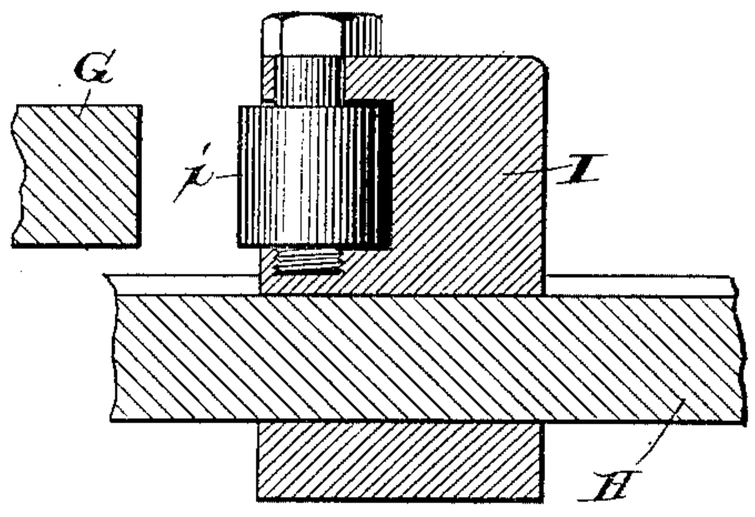
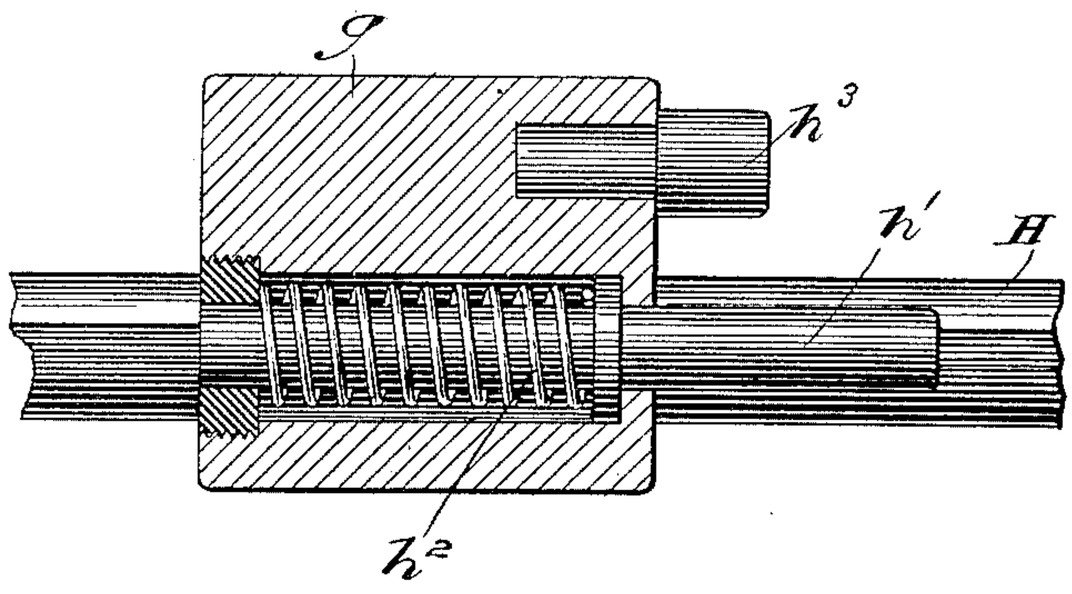


Fig. 12.



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(No Model.) 4 Sheets—Sheet 4.

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BOLT THREADING MACHINE.

No. 432,972. Patented July 29, 1890.

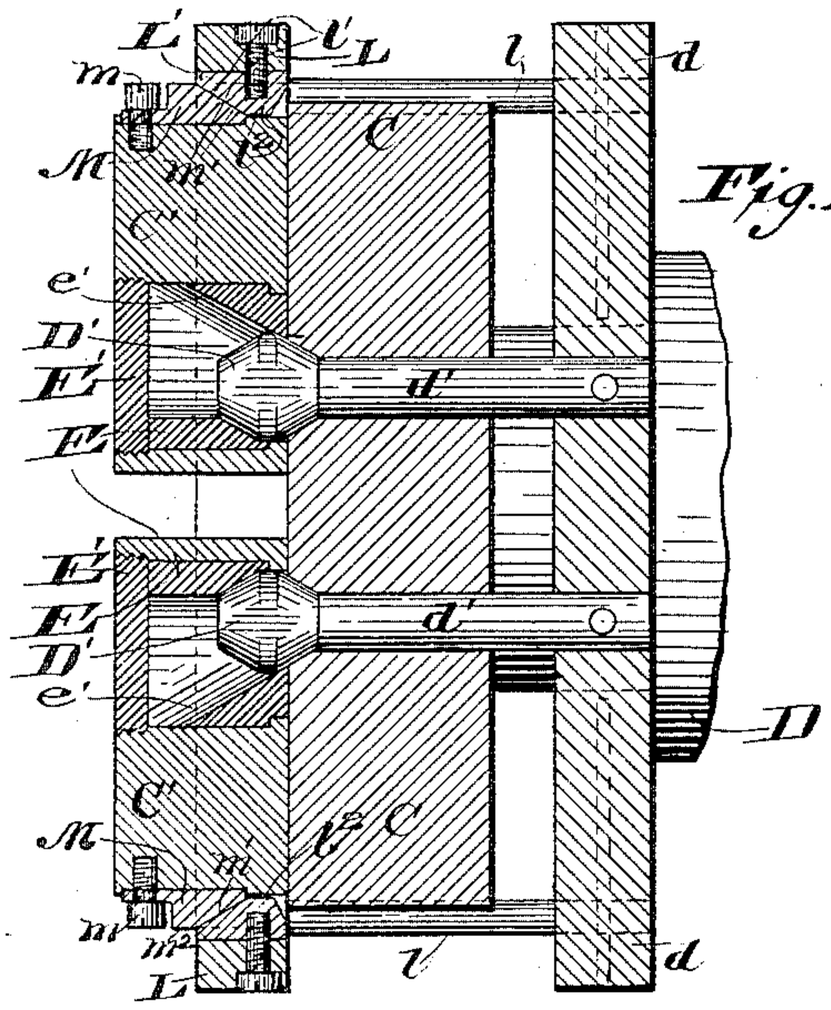


Fig. 13.

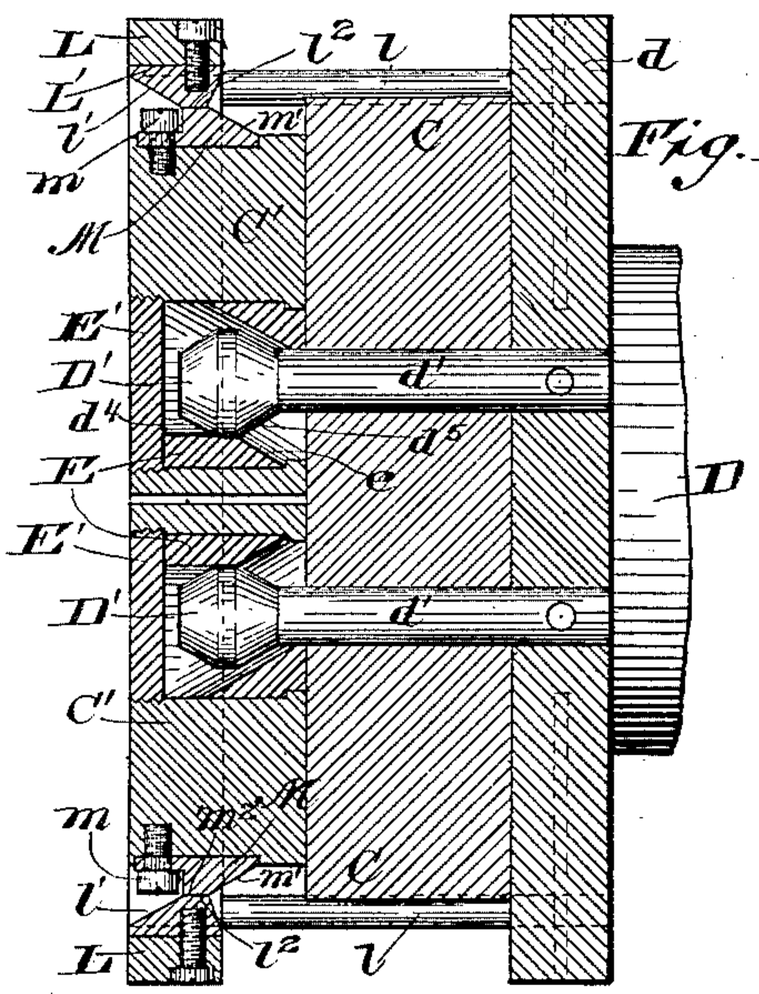


Fig. 14.

Fig. 15.

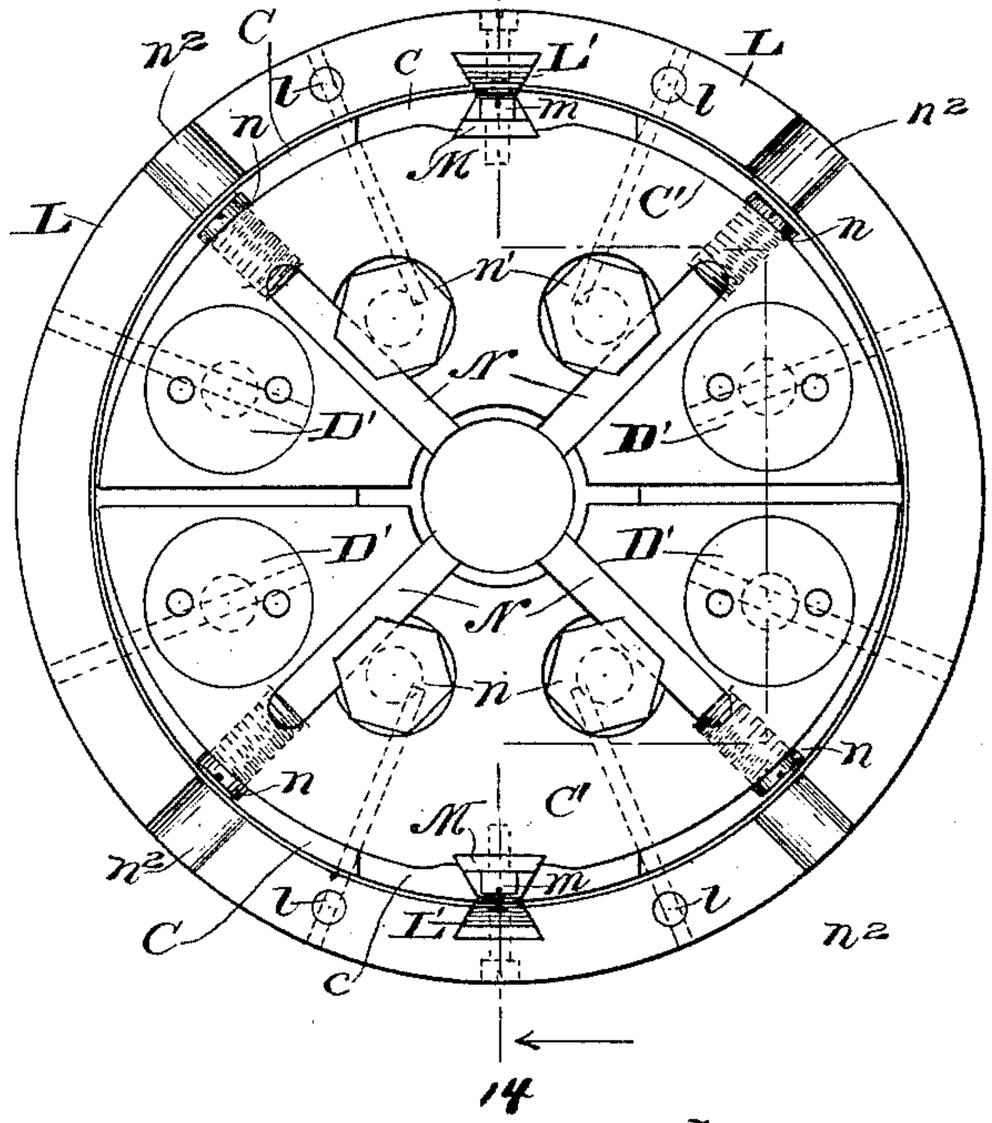
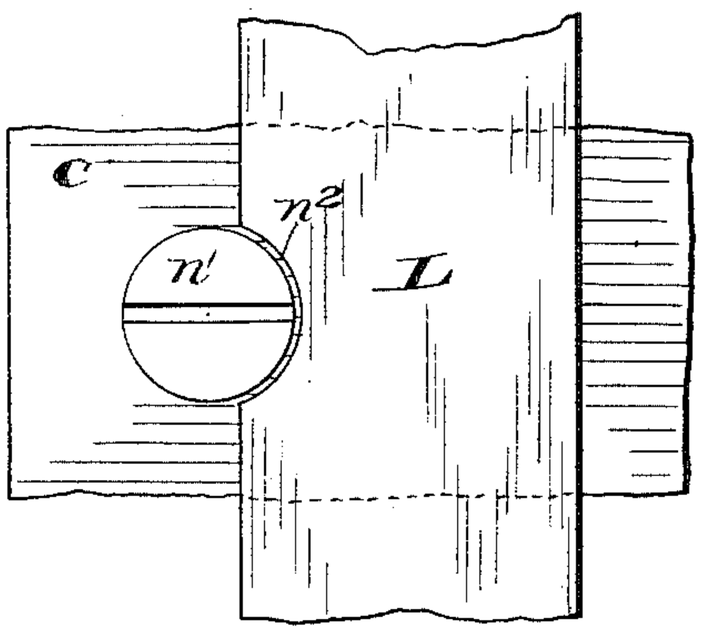


Fig. 16.



Witnesses
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Inventor
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By his Attorney
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UNITED STATES PATENT OFFICE.

LOUIS T. BOWMAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CAPITOL MANUFACTURING COMPANY, OF SAME PLACE.

BOLT-THREADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 432,972, dated July 29, 1890.

Application filed April 3, 1890. Serial No. 346,379. (No model.)

To all whom it may concern:

Be it known that I, LOUIS T. BOWMAN, a subject of the King of Norway and Sweden, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Bolt-Threading Machines, of which the following is a specification.

This invention relates to improvements in that type of bolt-threading machines shown, for instance, in Letters Patent of the United States granted James W. Adams on the 26th day of May, 1885, No. 318,678, and February 8, 1887, No. 357,300, in which a revolving two-part die-carrier is automatically actuated to advance the threading dies or chasers toward or withdraw them from the bolt on a line radial to the axis of rotation of the head end of the dies without stopping or reversing the machine. In the first of said Letters Patent the split or divided die-carrier is held closed by a catch-lever, which is tripped or unlatched by a cam upon a rod or shaft moving with the chuck-carriage, is then pulled back or retracted rapidly by a spring, so as to open the dies, and is returned to position and latched as the chuck-carriage is drawn back to its starting position by a stop on said rod. In the second of said patents the die-carriers are guided, as also in the first, by moving them along radial dovetail or tongue-and-groove connections with the face of the revolving head, and are thrown apart and closed toward each other by angular keys rigidly secured to a collar sliding upon the tubular shaft which supports said head, and this collar is retracted to open said carriers by means of a pin taking into a cam-groove formed in its hub, which pin is forced down by a rise in said cam-groove and caught and held out of action by a spring-latch after terminating its office, while an independent lever operated by a stop on a rod from the chuck-carriage serves to close the die-carrier as the chuck-carriage is drawn back after a bolt has been threaded, and a cam on said rod serves to trip the latch in the next forward movement of the carriage to release the pin for action anew.

In the present invention, which is, in general, an improvement upon the structures set forth in said Letters Patent, the spring-pin for throwing the die-carriers apart is mounted in a swinging lever swung in one direction to bring the pin into position for effective action, and in the other to carry it out of the range of such action and to operate further mechanism, and the pin is held down in its socket, when depressed by the cam on the hub of the sliding collar, by means of a latch pivoted upon and moving with said lever. The lever itself is pushed slightly before the chuck-carriage to bring the spring-pin into effective position by means of a spring-stop carried on a sliding trip-rod moving with said carriage, and the latch is tripped by means of a rigid stop on said rod succeeding the meeting of the spring-stop with the lever and unmasked for contact by the yielding of said spring-stop, after which the lever is swung still further and away from the two stops by cam-action upon the pin, and finally restored to normal position when the chuck-carriage is retracted by means of a second fixed stop on said trip-rod, which rod corresponds or may correspond to the rod shown in the Adams patents above referred to, in the latter movement actuating a yoke-lever, which returns the sliding collar to close the die-carriers. The keys which connect the sliding collar with the die-carriers are provided with cam-shaped heads instead of being bent at an angle to open and close said carriers, and are of a novel shape, having double bevels with an intermediate straight zone, and the bushings in which they move are correspondingly altered in outline, whereby the bearing of such heads upon the carriers is brought close to the throat of the cutters to counteract strain. In heavy work, also, a re-enforcing or lock ring is provided surrounding the periphery presented by the conjoined die-carriers acting upon them by cams or inclines, and retracted and projected concurrently with the movement of the key-heads to positively block the die-carriers from springing under unusual strains.

Other incidental features and details of construction will appear from the ensuing description.

In the drawings, Figure 1 is a plan view of a machine embodying my invention. Fig. 2

is a front elevation of the revolving head and die-carriers thereon. Fig. 3 is a section taken on the correspondingly-numbered line in the succeeding figure. Fig. 4 is a vertical section, the die-carrier and head being sectioned upon the line 4 4 in Fig. 2, the remainder of the figure being partly in central section and partly in elevation, and the die-carrier being shown in its open position. Fig. 5 is the same as Fig. 4, except that the die-carrier is in its closed position. Fig. 6 is an enlarged detail of the yoke by which the sliding collar is projected and the die-carriers closed. Fig. 7 is a detail, being a front view of one of the bushings in the die-carrier. Fig. 8 is a rear view of the same bushing. Fig. 9 is an end view of one of the cam-shaped key-heads by which the die-carrier is operated. Fig. 10 is an enlarged plan showing the lever and some parts connected therewith by which the sliding pins or keys which operate the two parts of the die-carrier are actuated. Fig. 11 is an enlarged detail, in vertical section, of the stop or block for returning the tripping-lever to its normal position. Fig. 12 is a horizontal section through the block carrying the yielding stop for said tripping-lever and fixed stop by which the latch is opened. Figs. 13 and 14 are sections through the revolving head and its accessories, including the lock-ring on the line 13 14 of Fig. 15, and showing, respectively, the die-carriers open and closed. Fig. 15 is a front elevation of die-carriers, revolving head, and lock-ring; and Fig. 16, an enlarged detail relating to said lock-ring and die-carriers.

A represents the upper part of a main frame—such, for instance, as in the above-mentioned patents—having planed ways or cheeks *a*, upon which travels the chuck-carriage A′, moved back and forth by any suitable means—as, for example, by means of a lever, a pinion on the shaft of said lever, and a rack upon the carriage, as in the first of the patents hereinbefore recited. This carriage is provided with the usual jaws or chucks a^2, operated by a right and left hand screw A^2, rotated by the hand-wheel A^3, as shown; but as it in itself with its intermediate accessories forms no part of the present invention it demands no further or extended description and may be taken merely as an illustration or exponent of any suitable chuck-carriage for presenting the bolt to the dies or chasers.

B is a hollow shaft supported in a long bearing B′ at the rear end of the main frame and having fast keyed to it beyond said bearing and at the extreme rear a gear-wheel *b*, which is driven by an underlying and intermeshing pinion mounted on a shaft *b′*, carrying stepped change-speed pulley B^2, by means of which the hollow shaft, and with it the dies or chasers which it ultimately carries, can be driven at varying speeds.

At the inner or forward end of the hollow shaft is keyed or otherwise secured a head-block C, having radial dovetailed or undercut grooves or guideways *c* for the reception of conversely-shaped tongues *c′* from the die-carriers C′, so that the latter may be moved toward or away from each other along the guideways. These die-carriers have the usual radial slots to receive the threaded chasers, hereinafter referred to.

Upon the hollow shaft in rear of the head-block is mounted a loose sleeve or collar D, capable of sliding back and forth and having a discoidal flange *d* on its forward face. In this flange are pinned the rods or keys *d′*, having cam-headed keys D′, by which the die-carriers are opened and closed, and from the flange they extend forward through straight bores in the head-block until the arms at their ends enter bushings set in recesses in the die-carriers. These cam-heads are flattened at the sides to about the diameter of the spindles, as at d^2, but otherwise have double bevels d^3 d^4 d^5 d^6 from a central zone or straight portion d^7, of which, however, the bevels d^4 and d^6 only are operative, the former for the purpose of closing the die-carriers and the latter for the purpose of opening them, while the central zone operates at both ends of the stroke movement of the cams either to lock the die-carriers closed or lock them open. The bushings E, in which these cam-heads move, are sunk into sockets in the die-carriers, the outer ends of which are closed by caps E′, screwed into the face of the carriers, and they have straight or flattened sides *e* to fit the flattened sides of the cam, and adjacent to the meeting edges of the die-carrier are formed, first, with a bevel or incline *e′* contiguous to the head-block, against which the bevel-face d^4 of the cam-heads works to close the carriers as the keys are projected, and then have a straight reach e^2 to the outer end, in which reach the central zone of the cam-head rests when the die-carriers are closed to lock them. Opposite this incline and straight reach they are or may be open to the outer wall of their sockets to form a straight reach e^3, extending toward the inner end, but with no particular function, then an incline e^4 parallel with the first incline, but of greater length, and against which the face d^6 of the cam-heads acts to open the carriers as the keys are retracted, and finally a short straight reach e^5, which terminates at the rear face of the head-block, and with which the central zone of the cam-head comes in contact when the die-carrier is open, thus locking it, in connection with the opposite straight reach, against movement in either direction. Now, when the flange-sleeve is drawn back, as represented in Fig. 4, the cam-shaped key-heads will be at the bottom or inner ends of the bushings in the die-carriers, with their inside bevel drawn into countersinks d^6 in the head-block, and their central zones resting in the adjacent straight

reaches, which are of just sufficient length to come into these zones, and so spaced as to sit snugly thereagainst diametrically opposite each other, thus locking the die-carriers open and against movement in either direction; but when the flange-collar is moved forward against the head-block, as in Fig. 5, key-heads will be projected, traveling along the inside inclines of the bushings and forcing the die-carriers toward each other until they are in the closed position presented in Fig. 5, when the central zones will be in contact with the long straight reaches of the bushings adjacent to the meeting edges of the die-carriers and will lock them against retraction.

The next object is to produce these last-described movements of retraction and advance intermittently and at the proper time, thus closing the die-carriers when a fresh bolt is introduced, and opening them the instant this bolt has been cut or threaded, and I will now proceed to describe the apparatus which I have designed to that end.

In the hub of the sliding collar is formed a cam-groove F, having one or more lateral jogs *f*, with inclined return-tracks *f'*, and at the end of such inclines, or slightly beyond the end, a bulge or rise F', which, as it will be greatly exposed to wear, will be made of steel or case-hardened metal and separate from the track proper, and secured in place by a pin f^2, passing longitudinally through the hub. This bulge or rise extends flush or slightly more than flush with the cylindrical surface of the hub. Underneath the flanged collar is what may be termed a "tripping-lever" G, pivoted by pin *g* to a bracket or offset G' from the frame, and at its extreme inner end limited in vibration by shoulders *g'* on said offset. This inner end, diametrically beneath the hub of the flanged collar, has a vertical bore, which may extend clear through the lever, and which receives first a coiled spring g^2, which rests or may rest upon the plane surface of the supporting-bracket and next a pin G^2, resting upon said spring, and hereinafter termed the "trip-pin." This pin near its lower end has an annular groove g^3, to receive the nose of the spring-pressed trip-latch G^3, pivoted by pin g^4 to the just-mentioned lever, and pressed normally into engagement with the groove by means of a coiled spring g^5, seated in the side of said lever and acting against the outer arm of the latch.

The power-arm of the trip-lever projects laterally of the machine over a horizontal trip-rod H, attached to the chuck-carriage, moving therewith and guided, if necessary, by suitable bearings *h* from the frame. Upon this rod adjacent to the chuck-carriage is mounted an adjustable block H', which carries a stop-pin *h'* of considerable length, seated against the spring h^2 in a socket in the block and arranged to come in contact with the end of the trip-lever as the chuck-carriage advances or is drawn forward by the action of the chasers which it carries upon the bolt and past this lever, which in its normal position is at right angles to the line of advance of the carriage, slightly back, to bring the trip-pin in peripheral register with the jog of the cam-groove in the sliding collar.

A second stop-pin h^3 is carried by an adjustable block and is arranged inside of the spring-seated pin, so as to be unmasked by the yielding of the latter and come in contact with the end of the trip-latch after the trip-lever has swung the trip-pin sufficiently to register it with the jog as the collar revolves. At the moment the trip-pin has been brought into proper register with the cam-jog the movement of the trip-lever is positively barred by the outside shoulder on its supporting-bracket, as shown in Fig. 4, and any further advance of the chuck-carriage will be compensated for by the yielding of the spring-seated pin, which presses against said lever until the rigid pin strikes and releases the trip-latch, thus letting loose the trip-pin, and this is urged at once by its spring against the periphery of the hub of the sliding collar, which, it will be understood, is constantly revolving, being carried around by the head-block and the key-rods passing through said block and secured to the discoidal flange of the collar. Such revolution brings the pin directly into the lateral jog of the cam-groove, when it strikes the incline leading out from said jog, and being unable to move before it, since the trip-lever is barred against yielding, as just stated, forces the collar to move away from the head-block, thus retracting the keys and opening the die-carriers. This action will take place at the moment that the threading of the bolt is completed and will remove the chasers from all contact with it. As soon as the pin has traveled out of the incline it is struck by the bulge or rise in the cam-track and is forced down, and if the latch by that moment has been released by the withdrawal of the chuck-carriage it will spring into engagement with the pin and hold it down, as in Fig. 4; but if the chuck-carriage has not as yet been withdrawn the latch will still be held out of engagement and the pin will simply reciprocate to and fro, following the peripheral outline of the cam-track until the latch is released, when the next bulge that strikes the pin will force it down to be locked in its depressed position by the snapping in of the latch. As the chuck-carriage is retracted to withdraw the threaded bolt, a second adjustable block or stop I upon the trip-rod, carrying an anti-friction roll *i*, strikes the end of the trip-lever and restores it to its normal position at right angles to the line of movement of said chuck-carriage, where it is stayed by the inner shoulder on its supporting-bracket, as shown in Fig. 5. In this return swing the trip-lever is caused to close

the die-carrier, as follows: The tubular shaft is embraced beneath by the arms k of the yoke-lever K, pivoted at k' to an offset K' from the frame. The lower end or power-arm of this yoke-lever is bent, as shown at k^2, to bring its end adjacent to and almost in contact with the side of the trip-lever at the inner end of the latter when it is in position for the opening of the die-carriers, as in Fig. 4. The yoke-arms of this lever, which may be termed the "closing-lever," carry anti-friction rolls k^3, which bear against the rear end or hub of the flanged collar. Thus, whenever the chuck-carriage is drawn back and the stop on the trip-rod strikes the trip-lever and restores it to the normal its inner arm acts against this yoke-lever or closing-lever and forces the arms of the latter against the sliding collar, moving said collar toward the head-block, thus projecting the cam-shaped key-heads and closing the die-carriers.

The mechanism as thus far shown and described is sufficient for light work or for the smaller sizes of machines; but when designed for heavy work there is, as suggested in the preamble, danger that the die-carriers will spring and bend the keys. Therefore a lock-ring L is employed, as shown in the thirteenth and succeeding figures. For this purpose the radial flanges on the sliding collar are enlarged to project beyond the periphery of the revolving head, and has pinned to it rods l, which project over and past said head to practically the front arris of the die-carriers, parallel with the hereinbefore described key-rods, which are also pinned to said flange. At their front or outer ends these exterior rods are united to the lock-ring, which may be of slightly greater internal diameter than the external diameter of the revolving head, so as to fit thereover, and which has attached to it at points diametrically opposite each other and upon a perpendicular let fall from the meeting line of the die-carriers, if there are but two, case-hardened face blocks or cams L', having an inclined outer face l', succeeded by a plane surface l^2, from which they may be beveled to the rear to save metal and weight. Underneath these and attached to the periphery of the die-carriers in any suitable manner, as by dovetail tongues and grooves and fastening-screws m, are opposing steel or case-hardened blocks or cams M, having an inclined inner face m', corresponding in angle with the inclined face upon the ring-cam and terminating in a plane surface m^2, to meet the plane surface upon the other and engaging therewith at the moment that the die-carriers have been fully closed. The inclined opposing faces l' and m' of the cams are both described on the line of resultant movement between the opening of the die-carriers and the withdrawal of the sliding sleeve or its flange. Now, as the exterior rods, as well as the cam-headed key-rods, are attached to the flange on the sliding collar, it is evident that the lock-ring must move simultaneously with the key-rods and their heads, and that when the key-heads are retracted to open the die-carriers the lock-ring, with its cam-blocks, will slide off the plane surface of the underlying blocks, and the inclined faces of the opposing cams will slip down past each other and assume the position represented in Fig. 13; but when the sliding ring is moved forward to close the die-carriers the inclines on the ring-cams will travel up those on the underlying blocks until the carriers are fully closed, at which moment the plane surfaces will again engage with each other, as in Fig. 14, and the carriers be held positively against opening, both by the lock-ring and by the key-heads. This lock-ring also serves another purpose—that is, the cutter dies or chasers N are adjusted as usual by means of set-screws n, and held in position by the heads of clamping-screws n'—and it is desirable that the set-screws shall not be meddled with so long as the dies are closed and holding work between them. Therefore said set-screws are so arranged that their heads are covered and protected from interference by the lock-ring so long as the latter is projected, with its front face practically in line with the front face of the die-carriers, as in Fig. 14; but when withdrawn and with the die-carriers consequently open the heads of these screws are exposed, and can be reached for adjustment through a radial channel or groove n^2, cut in the lock-ring, or even in the absence of such channel depending upon the breadth of the ring or upon the distance of the set-screws from the edge or arris of the die-carriers or the proximity of the lock-ring to such edge when projected.

It is evident that the lock-ring may be employed with other mechanism for opening and closing the divided die-carriers than that specifically herein desecribed; that it may itself be made to perform the office of closing the carriers while the keys or other instrumentalities are confined to the function of opening them; that it may act upon the carriers by other means than the inclines and locking-surface; that the locking-surfaces and inclines on the periphery of the carriers and the reverse inclines and locking-surfaces on the circumjacent ring may be integral with said respective bodies instead of upon separate blocks; that the bushings for the keys are separate from the carriers instead of integral therewith only to save expense and for convenience in shaping and hardening them, and that the tripping agencies are not necessarily used with all the other novel features of the machine.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of the revolving head, the divided die-carriers, the keys provided with

double bevel-heads, the bushings having inclines and straight reaches, and the sliding collar.

2. The combination, substantially as hereinbefore set forth, of the revolving head, the divided die-carriers, the keys having double bevel-heads with intermediate straight zones, the bushings having inclines and straight reaches, and the sliding collar.

3. The combination, substantially as hereinbefore set forth, of the revolving head, the divided die-carriers, the keys having double bevel-heads flattened at their centers and with intermediate straight zones, the bushings having inclines and straight reaches and flattened sides to fit such heads, and the sliding collar.

4. The combination, substantially as hereinbefore set forth, of the revolving head, the divided die-carriers, and the peripheral lock-ring.

5. The combination, substantially as hereinbefore set forth, of the revolving head, the divided die-carriers, means for opening said carriers, and the peripheral lock-ring adapted to close and confine the carriers.

6. The combination, substantially as hereinbefore set forth, of the revolving head, the divided die-carriers, means for opening and closing said carriers, and a supplemental or re-enforcing lock to hold the carriers positively closed.

7. The combination, substantially as hereinbefore set forth, of the revolving head, divided die-carriers, the insetting inclines, fixed and locking surfaces on the periphery of said carriers, and the peripheral ring having reverse inclines and locking-surfaces.

8. The combination, substantially as hereinbefore set forth, of the revolving head, the divided die-carriers, the sliding collar, rods or keys carried by said collar and having cam-heads entering cam-shaped recesses in the divided carriers to open and close them, the peripheral lock-ring, and rods connecting said ring with the sliding collar.

9. The combination, substantially as hereinbefore set forth, of the revolving head, the sliding collar, the divided die-carriers, the bushings having inclines and straight reaches, the key-heads connected with said collar and having inclines and straight reaches to engage with the bushings, a lock-ring connected with the collar, and the inclines and straight reaches on said lock-ring on the periphery of the die-carriers.

10. The combination, substantially as hereinbefore set forth, of the divided die-carriers, the chasers, their set-screws, and the lock-ring.

11. The combination, substantially as hereinbefore set forth, of the sliding collar, the swinging trip-lever, the trip-latch and trip-pin, the chuck-carriage and the trip-rod attached thereto, and the cam-groove with its lateral jogs and peripheral rises.

12. The combination, substantially as hereinbefore set forth, with the trip-pin and trip-latch, of the sliding collar having a cam-groove with lateral jogs and separate peripheral rises of hard metal affixed thereto.

13. The combination, substantially as hereinbefore set forth, with the trip-lever and trip-latch, of the chuck-carriage, the trip-rod carried thereby, a block on said trip-rod, a spring-seated pin carried by said block to engage with the trip-lever and push it back, and a fixed pin carried by the block to engage with the trip-latch and open it.

14. The combination, substantially as hereinbefore set forth, with the trip-lever and trip-latch, of the clutch-carriage, the trip-rod carried thereby, a block upon said trip-rod, means for the adjustment of said block along the trip-rod, the spring-seated pin carried by said block to engage with the trip-rod, and the fixed pin to engage with the trip-latch.

15. The combination, substantially as hereinbefore set forth, with the swinging trip-lever, of the chuck-carriage, the trip-rod carried thereby, and a block upon said trip-rod upon the farther side of the trip-lever to engage and restore said lever to its normal position when the chuck-carriage is retracted.

16. The combination, substantially as hereinbefore set forth, with the swinging trip-lever, of the chuck-carriage, the trip-rod carried thereby, a block upon said trip-rod upon the farther side of the trip-lever to engage and restore it to its normal position when the chuck-carriage is retracted, and means for the adjustment of said block along the trip-rod.

17. The combination, substantially as hereinbefore set forth, of the trip-lever, the trip-latch, the chuck-carriage with its trip-rod, stops upon said rod to operate the trip-lever and trip-latch in the advancing movement of the carriage, and a stop upon said rod to restore the trip-lever to position in the retrograde movement of the carriage.

18. The combination, substantially as hereinbefore set forth, of the die-carriers, the sliding collar, and the swinging trip-lever, the trip-latch and trip-pin, means for swinging said lever in one direction and operating the trip-latch to open the carriers, means for restoring said trip-lever to normal, and a closing-lever operated by said trip-lever in its latter movement and acting upon the sliding collar to restore it to normal and close the die-carriers.

19. The combination, substantially as hereinbefore set forth, of the trip-lever, the trip-latch and trip-pin, the sliding collar having cam-grooves and rises, means for swinging the trip-lever in one direction to open the collar and means for restoring it to normal, and the forked closing-lever having an arm arranged to be struck by the trip-lever in its movement toward the normal to project the sliding collar and close the die-carriers.

20. The combination, substantially as hereinbefore set forth, of the trip-lever, the chuck-carriage, the trip-rod, the stop upon said trip-rod to swing the trip-lever in one direction in the advancing movement of the carriage, the stop upon the trip-rod to restore the trip-lever to normal in the return movement of the carriage, and the closing-lever operated by said trip-lever in said return movement.

21. The combination, substantially as hereinbefore set forth, with the trip-lever, of ledges or stops to limit its swinging movement in either direction.

LOUIS T. BOWMAN.

Witnesses:
L. VASSALL,
A. S. WELLS.