

H. B. KEIPER.
 DRILLING MACHINE.
 APPLICATION FILED DEC. 17, 1909.

979,073.

Patented Dec. 20, 1910.

3 SHEETS—SHEET 2.

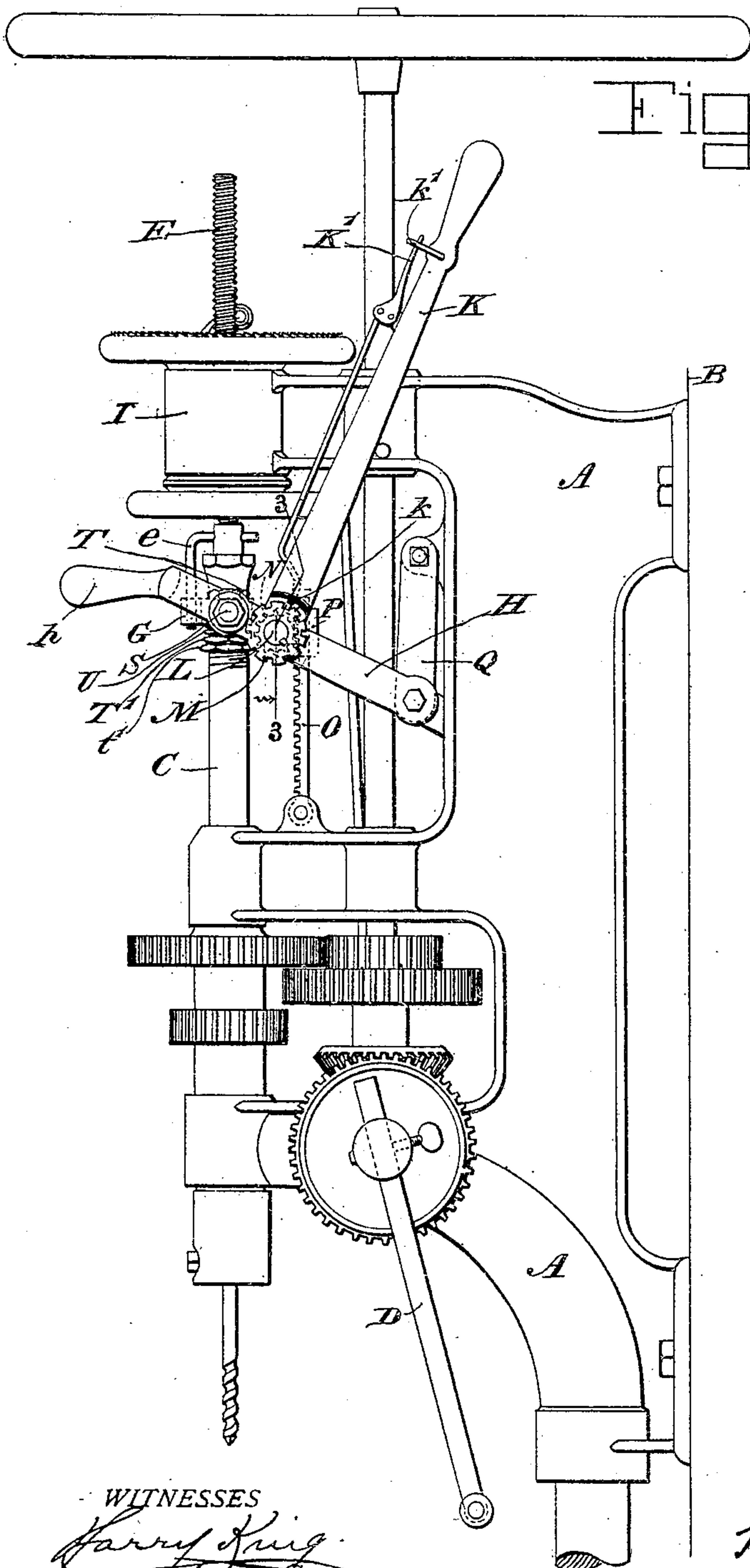


Fig. 2.

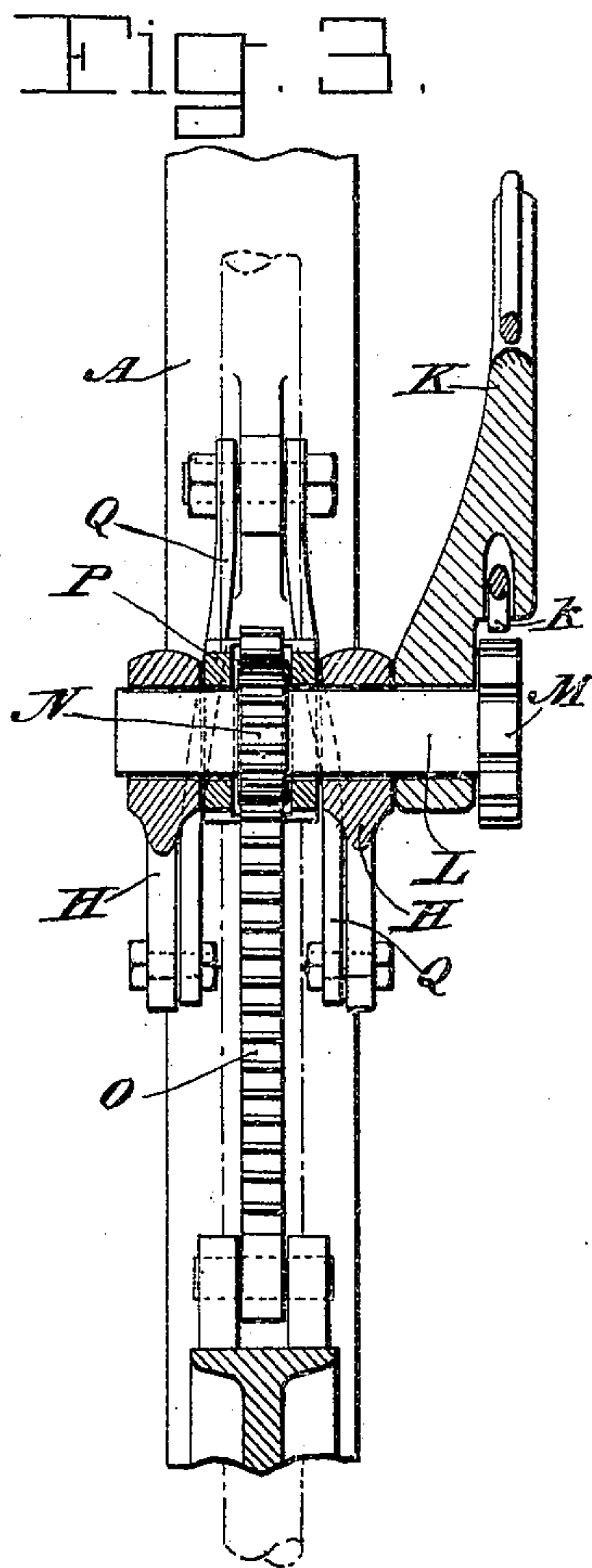


Fig. 3.

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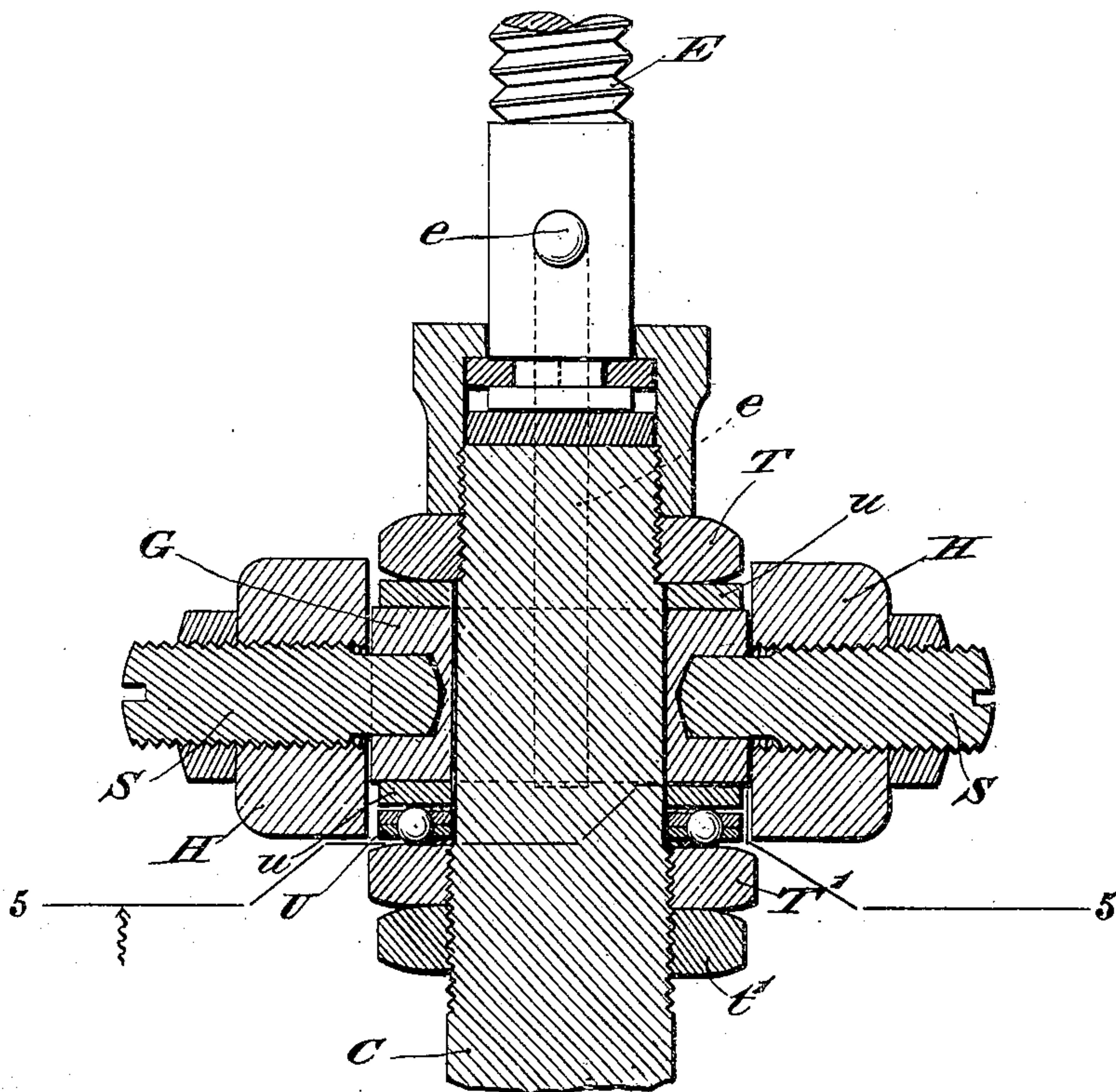
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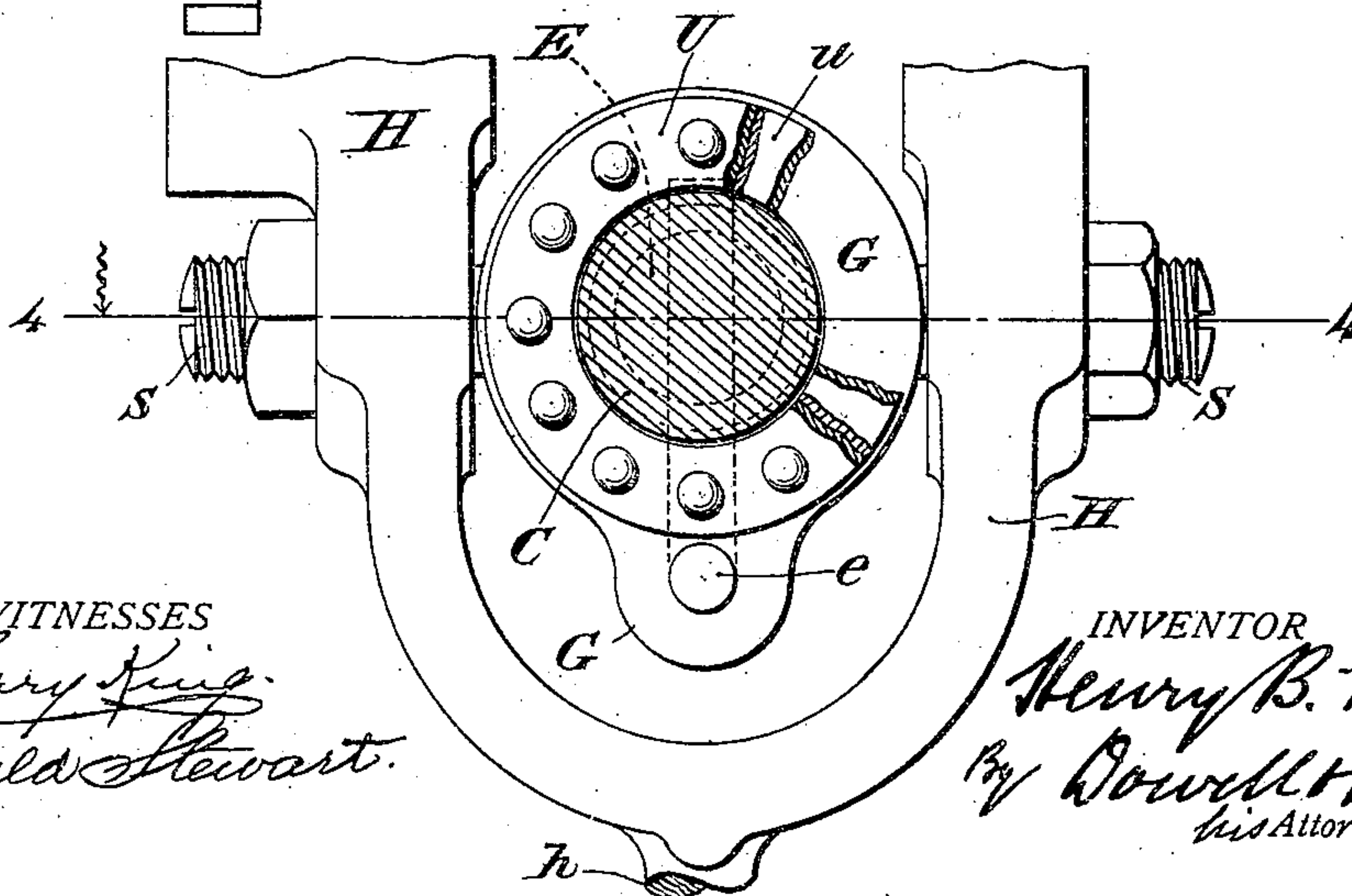
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3 SHEETS—SHEET 3.

Figure 4.



His S



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UNITED STATES PATENT OFFICE.

HENRY BRINSER KEIPER, OF LANCASTER, PENNSYLVANIA.

DRILLING-MACHINE.

979,073.

Specification of Letters Patent.

Patented Dec. 20, 1910.

Application filed December 17, 1909. Serial No. 533,712.

To all whom it may concern:

Be it known that I, HENRY B. KEIPER, a citizen of the United States, residing at Lancaster, in the county of Lancaster and State of Pennsylvania, have invented certain new and useful Improvements in Drilling-Machines, of which the following is a specification.

This invention relates to drilling machines of that type in which the drill spindle is rotated and moved longitudinally for feeding the drill in a manner similar to that illustrated and described in a patent issued to me on August 9, 1904, No. 767,282; and the objects of the invention are to provide improved means for feeding the drill by hand adapted for coöperation with means for returning the drill quickly to its normal or initial starting position when released by the feed mechanism.

Other objects are to provide, in combination with the hand and automatic feed mechanism and quick return mechanism of the character illustrated and described in my aforesaid patent, an auxiliary hand-feed mechanism capable of exerting a powerful pressure with little manual labor and which may be thrown into and out of action at will, enabling the operator to use either the automatic or hand-feed mechanism embodied in said patented improvements in coöperation with the quick return device, or the auxiliary hand-feed mechanism comprising my present improvement, each of said feed mechanisms being adapted for coöperation with said quick return movement independently of each other or in alternation, for accomplishing the desired result without the loss of time incident to the use of such devices as have heretofore being ordinarily employed for the same purpose.

The invention will first be hereinafter more particularly described with reference to the accompanying drawings, which form a part of this specification, and then pointed out in the claims at the end of the description.

In said drawings Figure 1 illustrates a side elevation of an ordinary drilling machine having my invention embodied therein; the work-supporting table and base portion of the machine being broken away; Fig. 2 is a similar side elevation of the opposite side of the machine; Fig. 3 is a detail sectional view, on an enlarged scale, of the auxiliary hand-feeding device, the sec-

tion being taken on the line 3—3 of Fig. 2; Fig. 4 is a detail sectional elevation, on an enlarged scale, taken on the line 4—4 of Fig. 5, and Fig. 5 is an inverted plan view, taken on line 5—5 of Fig. 4, these two views showing the connections between the feed-screw and drill-spindle, and between the spindle and quick return lever, to permit rotation of the drill-spindle while it is being fed or moved downwardly by the non-rotating feed-screw.

Referring to said drawings, in which the same reference letters are used to denote corresponding parts in different views, the letter A denotes the frame of the machine, which may be of the form shown or any approved construction, and provided with the usual work-supporting table underneath the drill, and on which the metal or part to be drilled is placed. In the type of machine shown the frame A is attached to an upright or support B for holding and securing the machine against a wall or vertical support, but it will be understood, of course, that the invention is adapted for general application and may be applied to other types of drills or analogous machines.

The drill-spindle C may be journaled in suitable bearings formed or provided therefor on the machine frame and may be driven by a train of gears operated by hand or power, as desired. A common form of gearing is shown comprising suitable gear wheels having a spline and groove connection with the spindle and adapted to be actuated by a crank-handle D on a horizontal shaft or arbor which carries a bevel gear meshing with a bevel gear on an upright shaft carrying a nest of gears through which motion is imparted to the drill-spindle.

For feeding the drill automatically while it is being driven by hand or machine power, I may use a feed-screw E having its lower end swiveled to the upper end of the drill-spindle C as shown in Fig. 4 of the drawings, or in any suitable manner. To prevent rotation of the feed-screw, a pin *e* extends upwardly from a bearing block G or other fixed element carried by the lever H of the hand feeding device and quick return movement, said pin having its upper end bent at right angles and passed through an aperture in the feed-screw so that the latter is held against rotation while imparting longitudinal movement to the drill-spindle by engagement with the rotary feed-nut in

bearing I and coöperating feed-mechanism substantially as described in my aforesaid patent. Such feed-mechanism forms no part of my present invention and may be of the form shown or of any other suitable construction.

As thus far described the machine does not differ essentially from the construction illustrated and described in my aforesaid patent. As will be seen the lever H is provided with a handle *h* for manipulation in raising or lowering the drill-spindle by hand, said lever being normally held in a raised position by means of a weight or spring H¹, which is adapted to raise the drill-spindle the instant the feed-screw E is released from the feed-nut in bearing I.

The letter K denotes a hand lever forming a part of an auxiliary hand-feeding device and fitted loosely on a shaft or arbor L, which has its bearings in suitable apertures in the arms of the bi-branched lever H, said lever K being provided with a sliding dog or pawl *k* operated by a thumb lever K¹ adapted for engagement with a toothed wheel M at one end of the arbor L for locking the lever to said arbor in different positions. The letter N denotes a pinion on the arbor L engaging a toothed oscillatory or tilting bar or rack O, which is pivoted at its lower end upon a fixed portion of the machine frame and extends upwardly between the two arms of the hand lever H and may be held in engagement with the pinion N for actuating the lever H when said pinion is rotated by the lever K by means of a clip P embracing the rack and having bifurcated apertured portions which are fitted on the arbor L.

The bi-branched lever H may be fulcrumed on a link or links Q depending from the machine frame to permit lengthwise movement of the lever, which has its short arm connected by a spring H¹ with a fixed part of the machine frame, so that the power of the spring may be exerted in holding the long arm of the lever normally in an elevated position, adapting it to return the drill-spindle to its normal or initial starting position the instant the feed-screw is released from the feed-nut. The lever H is suitably connected with the drill-spindle to adapt the latter to be raised and lowered while permitting it to rotate freely, and to this end the two branches of the lever straddling the drill spindle may each be pivoted to the supporting block or bearing G which is fitted on the drill-spindle as shown in Fig. 4 of the drawings, the pivots of the lever being conveniently formed by means of set screws S passing through screw-threaded apertures in the two arms of the lever and having lock nuts thereon for securing said screws in a fixed position with their inner ends projecting into sockets in

the bearing block. The upper end of the drill-spindle, above and below the bearing block G is screw-threaded and provided with nuts T, T¹, one above and the other below said bearing block, the nut T being confined at a given point on the spindle by contact with a shoulder thereon at the terminus of the screw threads, and the lower nut T¹ being secured in a fixed position on the spindle by a lock nut T². Above the nut T¹, between it and the bearing block G, are placed a series of balls which are loosely confined in a suitable ball retaining and separating device U and preferably suitable washers or metallic plates *u* are interposed between the ball retaining device and bearing block and between said block and the nut or collar T as shown more clearly in Fig. 4 of the drawings. I thus provide a very efficient pivotal connection between the lever H and the drill-spindle in which the upper end of the drill spindle is fitted and adapted to rotate while capable of vertical movement under the action of the lever for raising and lowering the drill, and also an efficient ball-bearing for resisting end thrust and relieving the device of friction. A link *k*¹ on the lever K may be provided for holding the dog on the lever out of engagement with the toothed wheel M, thus throwing said lever out of action, and it may be thrown back into the position shown in Figs. 1 and 2 and allowed to remain idle without affecting or being affected by the movements of the hand lever H in manipulating the drill. But when it is desired to feed the drill by hand and at the same time exert a greater pressure thereon than is possible by manipulating the hand lever H, the dog on the lever K may be caused to engage the toothed wheel M and the lever K will then operate to depress or raise the drill through its connections with the lever H, and by reason of the powerful leverage provided by said lever K being fulcrumed on the lever H and having as its short arm the pinion M acting on the hinged oscillatory rack-bar O, the workman may easily exert a powerful pressure in feeding the drill by depressing the lever K with one hand; the automatic feed-mechanism meanwhile being thrown out of operation. On releasing the lever by withdrawing the dog at the end of the boring operation the spring H¹ will quickly raise the lever H and return the drill to normal or initial starting position, and it may be again lowered to working position by means of either of the levers H and K and then fed to the work either by hand, when the feed-nut is disengaged, or automatically, by turning the feed-nut so that it may engage the feed-screw and cause the latter to move longitudinally as the feed-nut is rotated by suitable pawl-and-ratchet mechanism operated by an eccentric

and connecting rod, as shown in Fig. 1, or by other suitable means.

The feed-screw may be operated for feeding the drill automatically, after the drill has been lowered into working position by means of the lever H, or the feed-nut may be disengaged from the feed-screw and the lever H manipulated for feeding the drill by hand in operating upon material which may not require any considerable amount of pressure for feeding, and the hand lever K may be used interchangeably with the lever H in operating upon different classes of material or thicknesses of metal of varying degrees of hardness. When feeding by means of the lever H, or automatically, the lever K will be thrown back into the position indicated in Figs. 1 and 2 of the drawings and allowed to remain idle until again called into service for feeding by hand with greater pressure than it is possible to exert by means of the hand lever H. I thus provide a very efficient auxiliary hand feeding device adapted to operate independently of the automatic feed mechanism and independently of the hand-feeding device provided by the quick return lever H when the automatic feed mechanism is thrown out of action, said auxiliary feeding device operating upon the principle of a compound lever, enabling the operator to exert a powerful pressure with little effort in feeding the drill by hand.

For convenience in manipulating the drill, I preferably provide the hinged bar or quick-return lever H with a handle h, for use in lowering the drill to working position and to feed the drill when automatic feed mechanism is thrown out of action. But the lever K only may be used for lowering the drill to working position and also for feeding the same by hand, the handle on the lever H being omitted and still preserving the connection with lever K by which great power may be exerted in forcing the drill downwardly upon the article to be bored. It will also be understood that the improvement is not confined in its application to a drill having a non-rotating feed-screw and a rotary feed-nut but may be used with a rotating feed-screw and non-rotating feed-nut, or with a drill in which the feed-screw and spindle rotate together.

Other changes will readily suggest themselves to a skilled mechanic, and may be adopted without departing from the spirit and scope of my invention as defined in the claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination with a rotary and longitudinally movable drill-spindle and suitable driving mechanism therefor, means for quickly returning the drill to normal or initial starting position at the end of a boring

operation including a spring-actuated lever having a suitable connection with said spindle for raising and lowering the same while permitting rotary movement, a pinion fixed on an arbor journaled in said lever, a pivoted rack-bar engaging said pinion, a hand-lever loose on said arbor, and means for locking said hand-lever to said arbor, whereby great pressure may be exerted in feeding the drill by means of said hand-lever operating on said first-named lever through said rack-bar and pinion.

2. In a drilling machine, a rotatable, longitudinally movable drill-spindle and suitable driving mechanism therefor, in combination with a lever having a suitable connection with said spindle for raising and lowering the same while permitting rotary movement, a shaft journaled on said lever having a pinion thereon, a rack-bar pivoted at one end and engaging said pinion, a hand-lever loose on said shaft, and means for locking said hand-lever to said shaft for feeding by means of said hand-lever operating through said first-named lever and said rack-bar and pinion.

3. In a drilling-machine, a rotatable, longitudinally movable drill-spindle and suitable driving mechanism, in combination with means for feeding, comprising a lever fulcrumed on the machine frame, a shaft journaled on said lever, a pinion on said shaft, an oscillatory rack-bar engaging said pinion for transmitting motion to said lever, a second lever normally loose on said shaft, and means for locking said second lever to said shaft.

4. In combination with the feed-screw and drill-spindle coupled thereto, means for rotating said spindle and moving it longitudinally with said feed-screw, means for feeding by hand, and an auxiliary hand-feeding device comprising a compound lever movement of which said first named hand-feeding device forms a part, the latter device being adapted to operate independently of and interchangeably with said auxiliary hand-feeding device.

5. In a drilling-machine, a rotatable, longitudinally movable drill-spindle, and suitable driving mechanism and means for feeding, including a lever fulcrumed on the machine frame and means acting on said lever for effecting a quick return movement, said lever being adapted to be utilized for feeding by hand with slight pressure, in combination with an auxiliary hand-feeding device operating through said lever for increasing the pressure, said auxiliary device comprising a shaft revolubly supported on said lever, a pinion on said shaft, an oscillatory rack-bar engaging said pinion, a hand-lever normally loose on said shaft, and means for locking said hand-lever to said shaft.

6. In a drilling machine, an automatic feeding device adapted to release the drill and permit it to be fed by hand, and a spring-actuated lever for automatically quickly returning the drill to initial starting position when released, in combination with a hand-feeding device operating independently of said automatic feeding device, comprising a shaft journaled upon said spring-actuated lever, a second lever loose on said shaft and means for locking the second lever thereto in different positions and for allowing the shaft to turn without affecting the second lever, a pinion on said shaft, and a rack-bar pivoted at one end to a fixed part of the machine frame and having its free end in mesh with said pinion.

7. In a drilling-machine, a hand-lever pivoted on the machine frame and having one arm suitably connected with the drill-spindle for raising or lowering the same and permitting rotary movement thereof, means acting on another arm of said lever for automatically returning the drill-spindle to initial starting position, a shaft revolubly supported on said lever, a second hand-lever having its fulcrum on said first-named lever but normally loose, a rack-bar pivoted at one end on the machine frame and having its other end free, a pinion engaging said rack-bar, and means for locking said second lever and adapting it to rotate said pinion, thereby actuating said first-named lever and exerting increased pressure through the combined action of said levers, rack-bar and pinion.

8. In a drilling-machine, a rotatable, longitudinally movable drill-spindle, and feed-mechanism therefor, in combination with a hand-lever suitably connected with said spindle for raising or lowering the same while permitting rotary movement thereof and adapted for feeding by hand, together

with an auxiliary hand-feeding device operating through said hand-lever with increased pressure, said auxiliary device consisting of a shaft revolubly supported on said hand-lever, a pinion on said shaft, a rack-bar engaging said pinion and pivoted on the machine frame so as to permit an oscillatory movement, a second hand-lever mounted loosely on said shaft for rotating the same when locked thereto, and means for locking said second hand-lever to said shaft.

9. In a drilling-machine, a rotatable, longitudinally movable drill-spindle and suitable automatic and hand-feed mechanism combined therewith, said hand-feeding mechanism comprising a hand-lever suitably connected with said spindle for raising and lowering the same while permitting rotary movement thereof, and adapted for feeding by hand, together with an auxiliary hand-feeding device comprising a shaft journaled on and movable with said hand-lever, a pinion on said shaft, an oscillatory rack-bar engaging said pinion, a second hand-lever mounted loosely on said shaft, and means for locking said second lever to said shaft.

10. A drilling-machine having a rotatable, longitudinally movable drill-spindle, and a bearing block on said spindle in which it rotates, in combination with anti-friction devices adapted to resist end thrust, comprising collars screwed on said spindle, lock nuts securing said collars in fixed positions, one at each side of said block, and a ball retaining and separating device containing an annular series of balls arranged between said bearing block and one of said collars.

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

HENRY BRINSER KEIPER.

Witnesses:

CHAS. E. LONG,
C. B. LONG.