

No. 723,706.

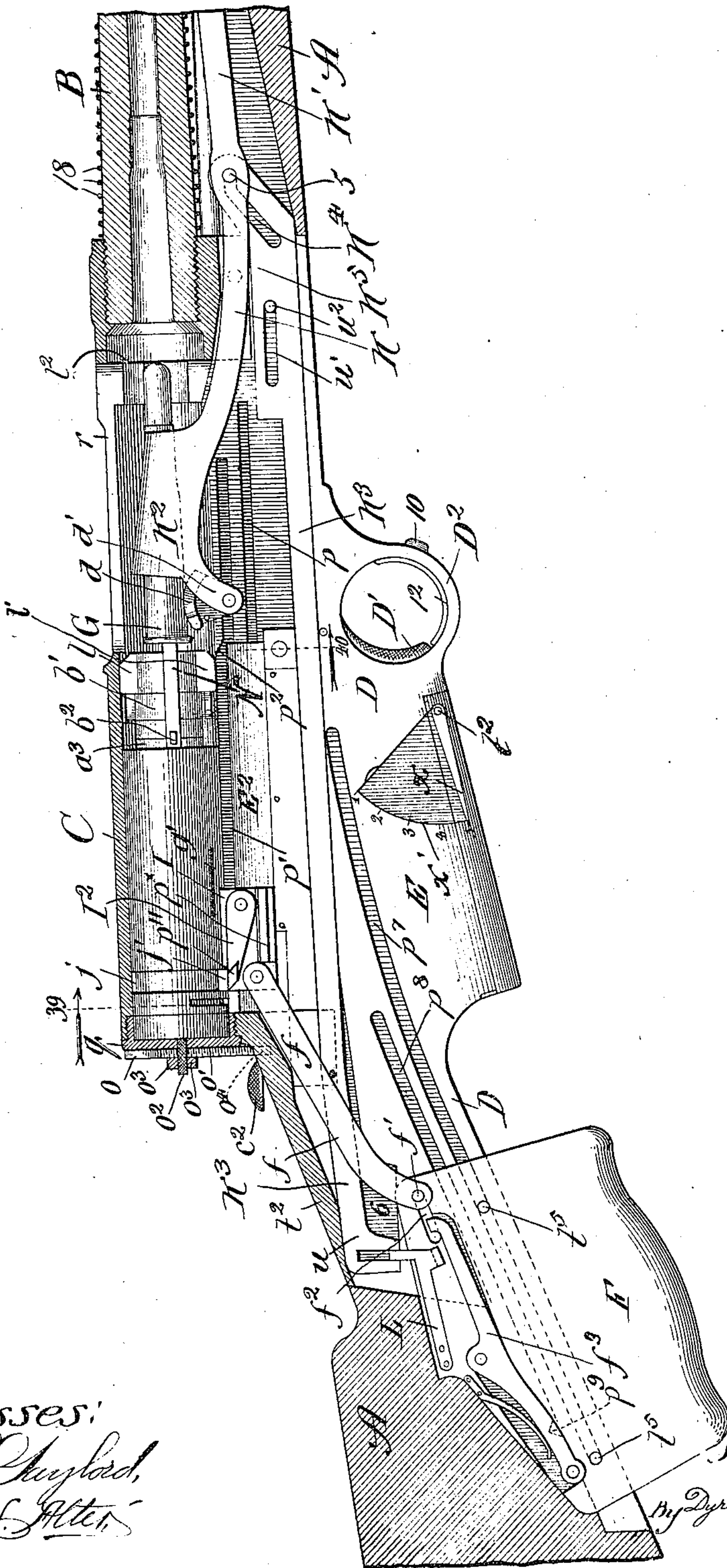
PATENTED MAR. 24, 1903.

S. N. McCLEAN:
MAGAZINE BOLT GUN.
APPLICATION FILED MAY 28, 1896.

9 SHEETS—SHEET 1.

NO MODEL.

Fig. 1.



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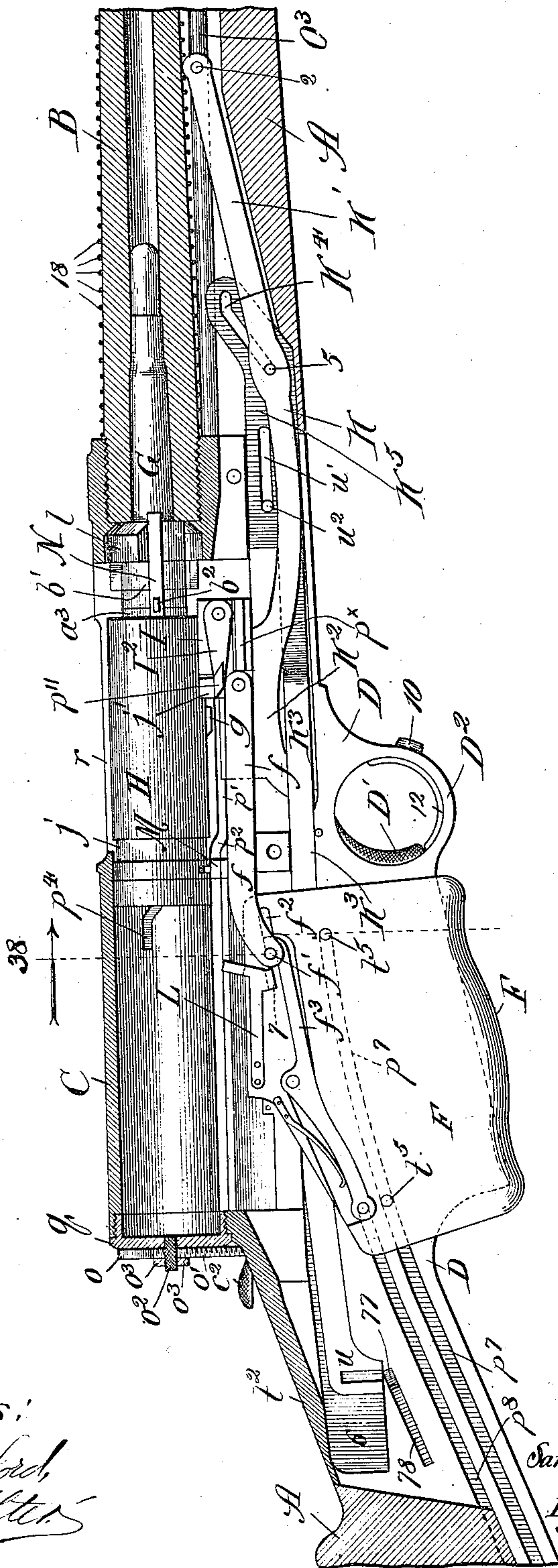
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9 SHEETS—SHEET 2.

NO MODEL.

Fig. 2.



Witnesses:
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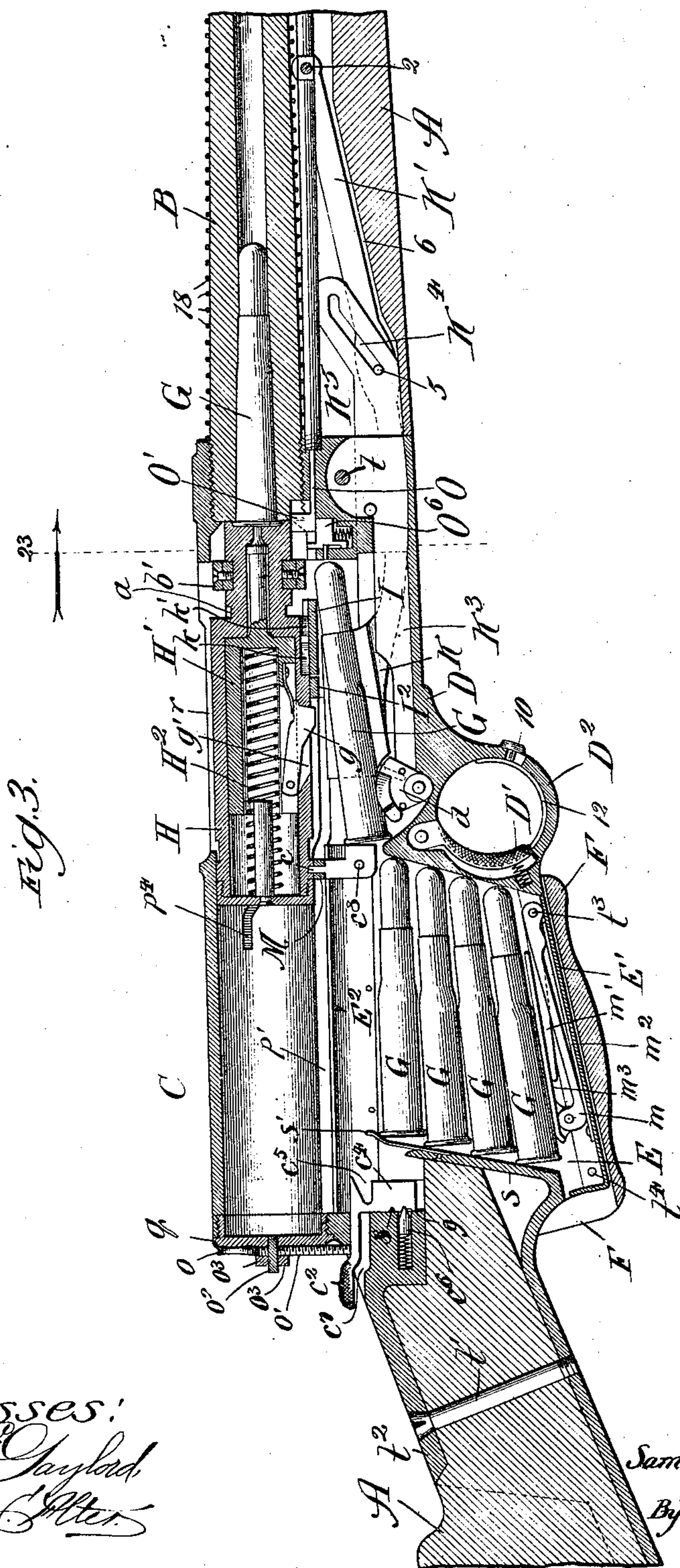
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9 SHEETS-SHEET 3.



Witnesses:

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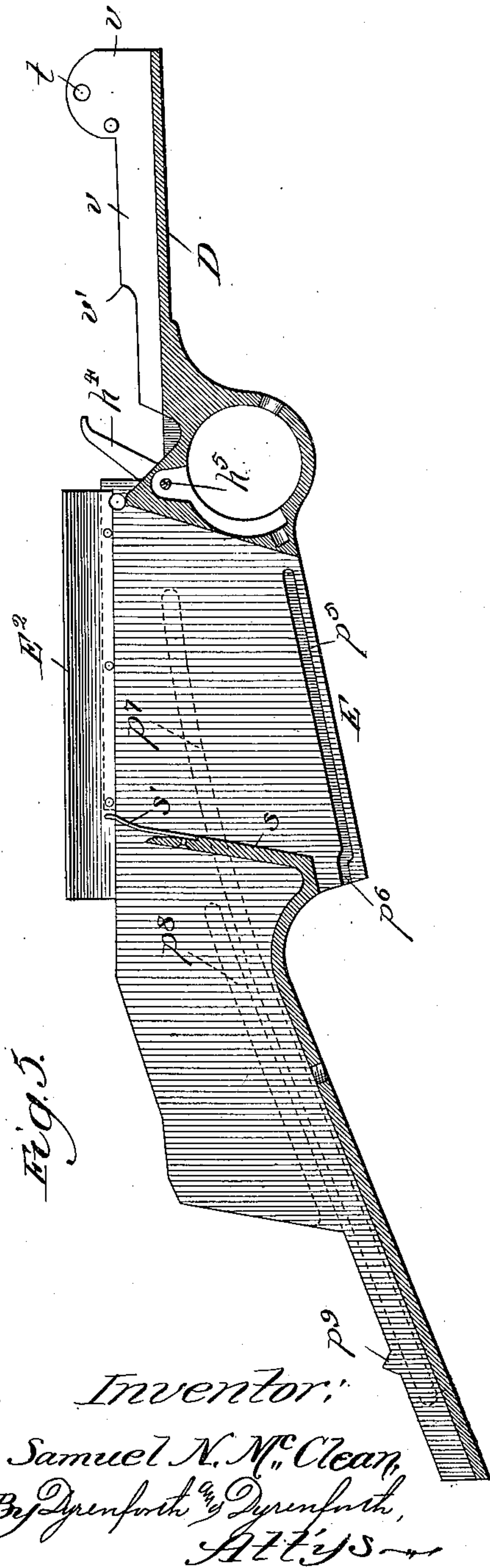
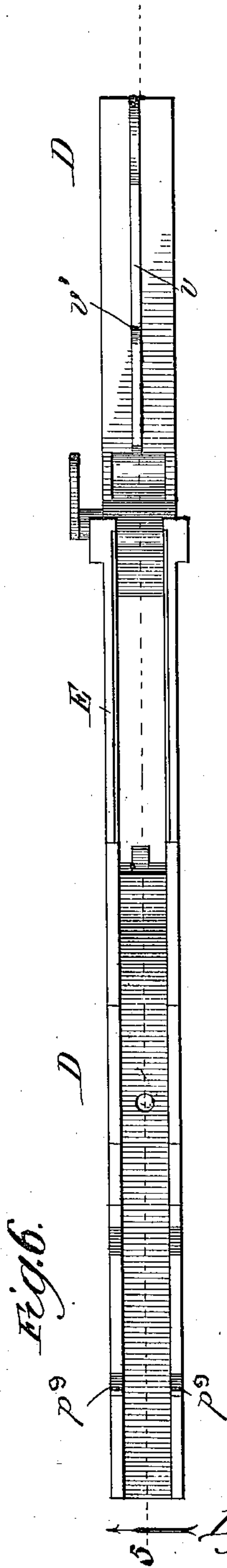
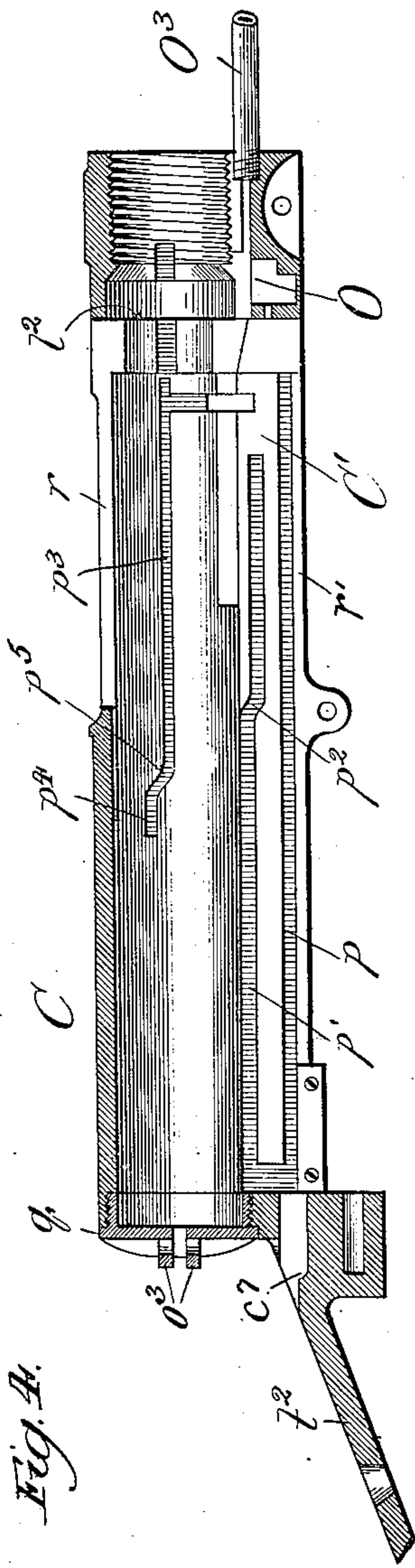
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9 SHEETS—SHEET 4.



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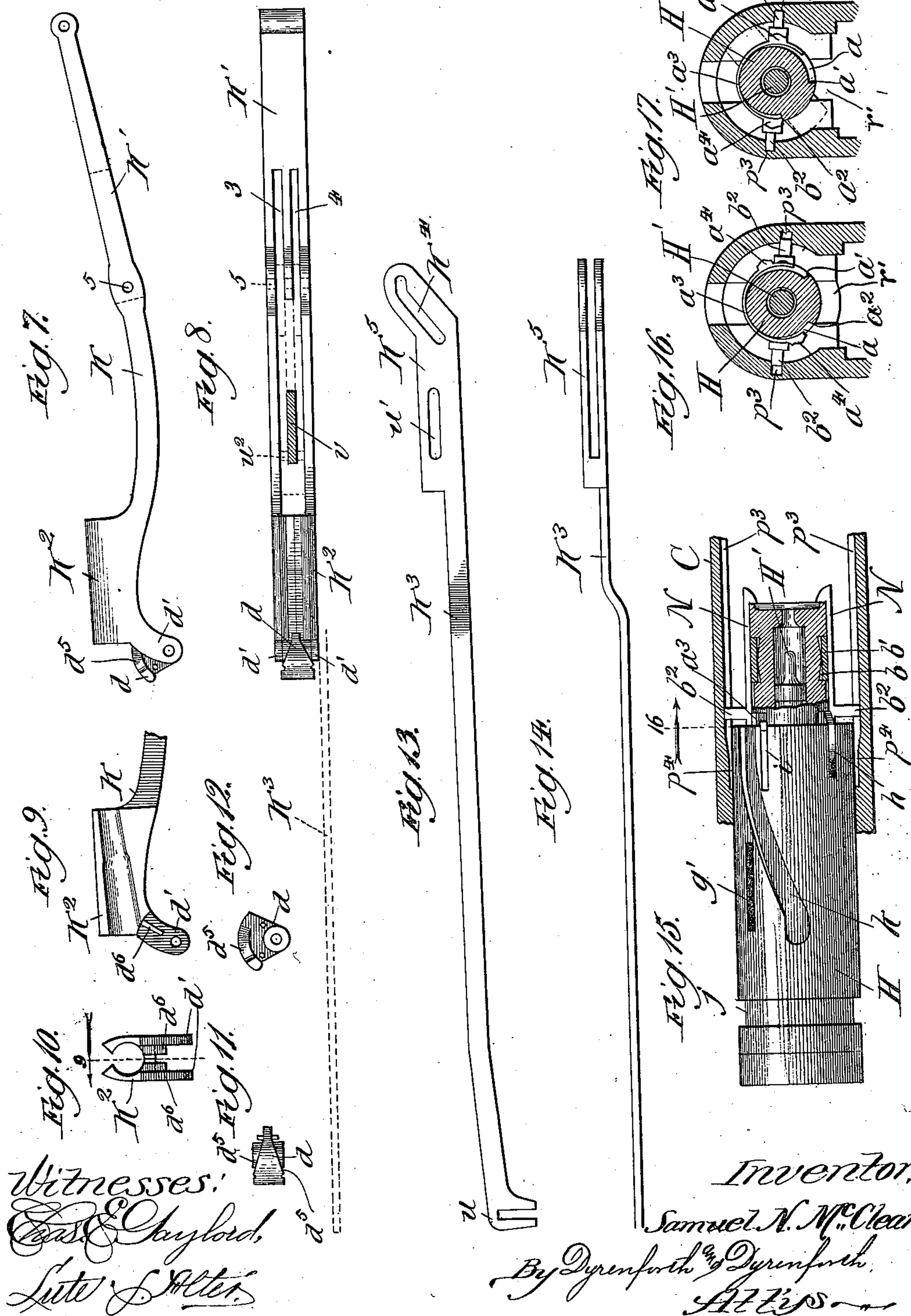
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9 SHEETS—SHEET 5.



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9 SHEETS—SHEET 7.

NO MODEL.

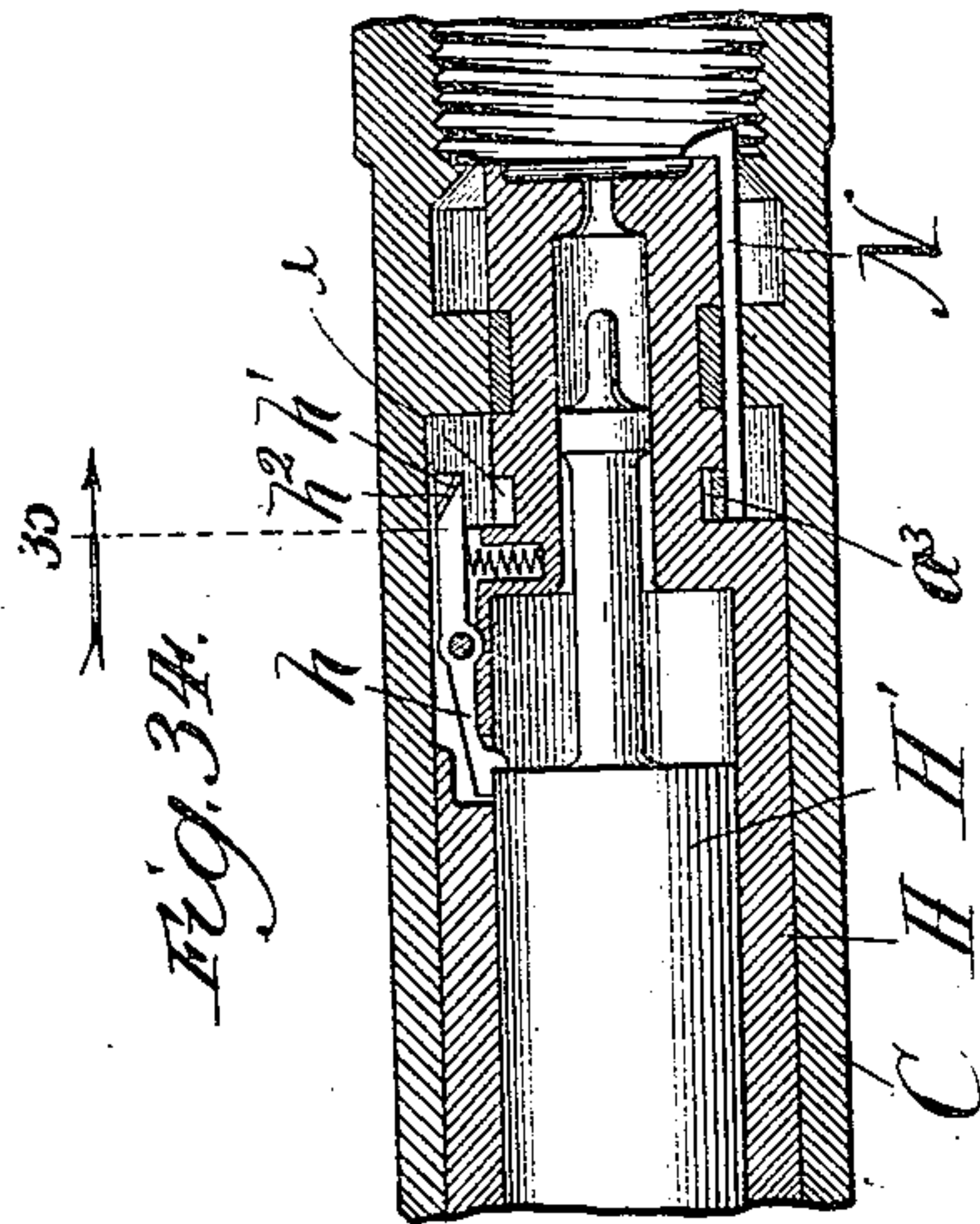


Fig. 34.

Fig. 36.

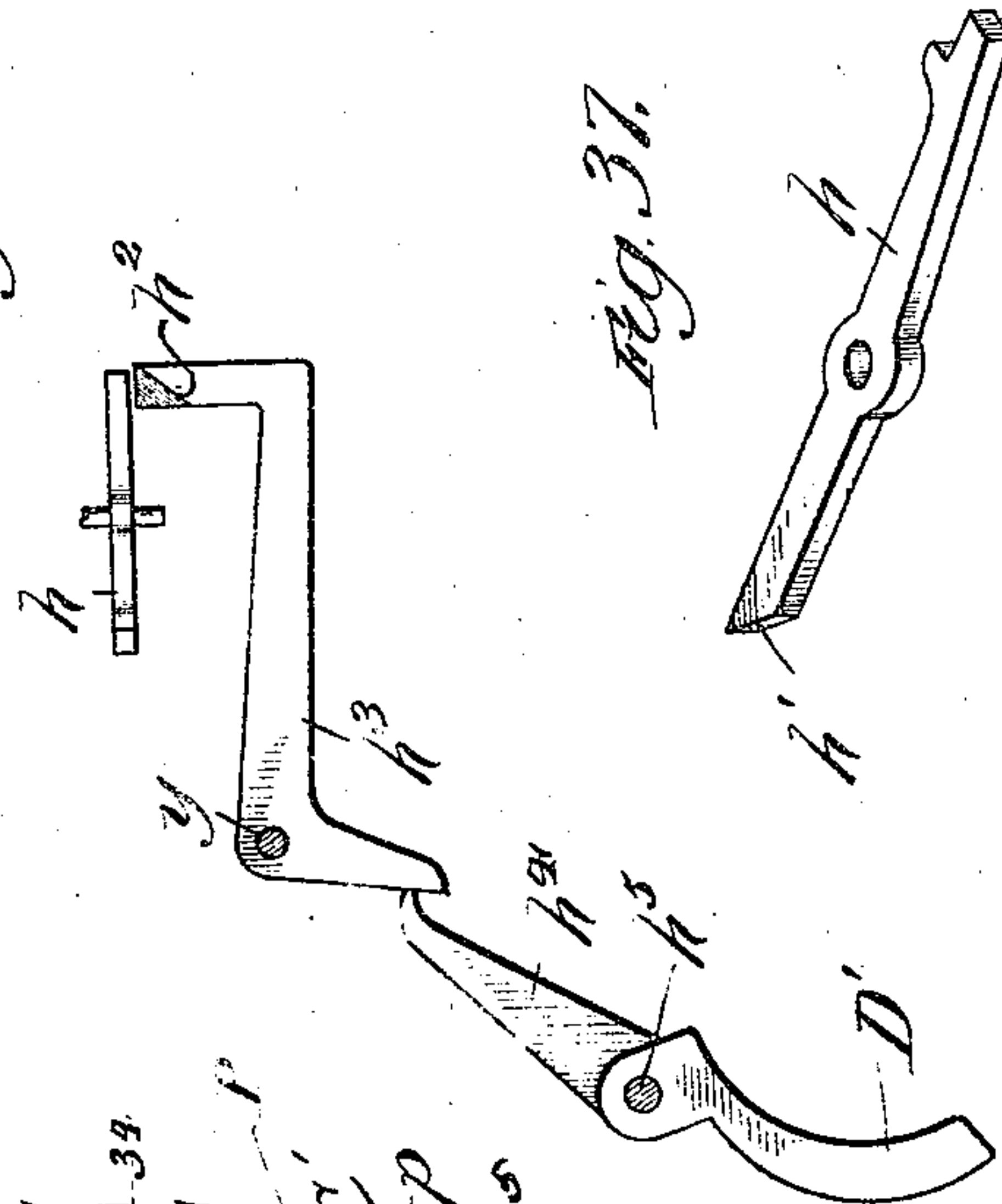


Fig. 37.

Fig. 35.

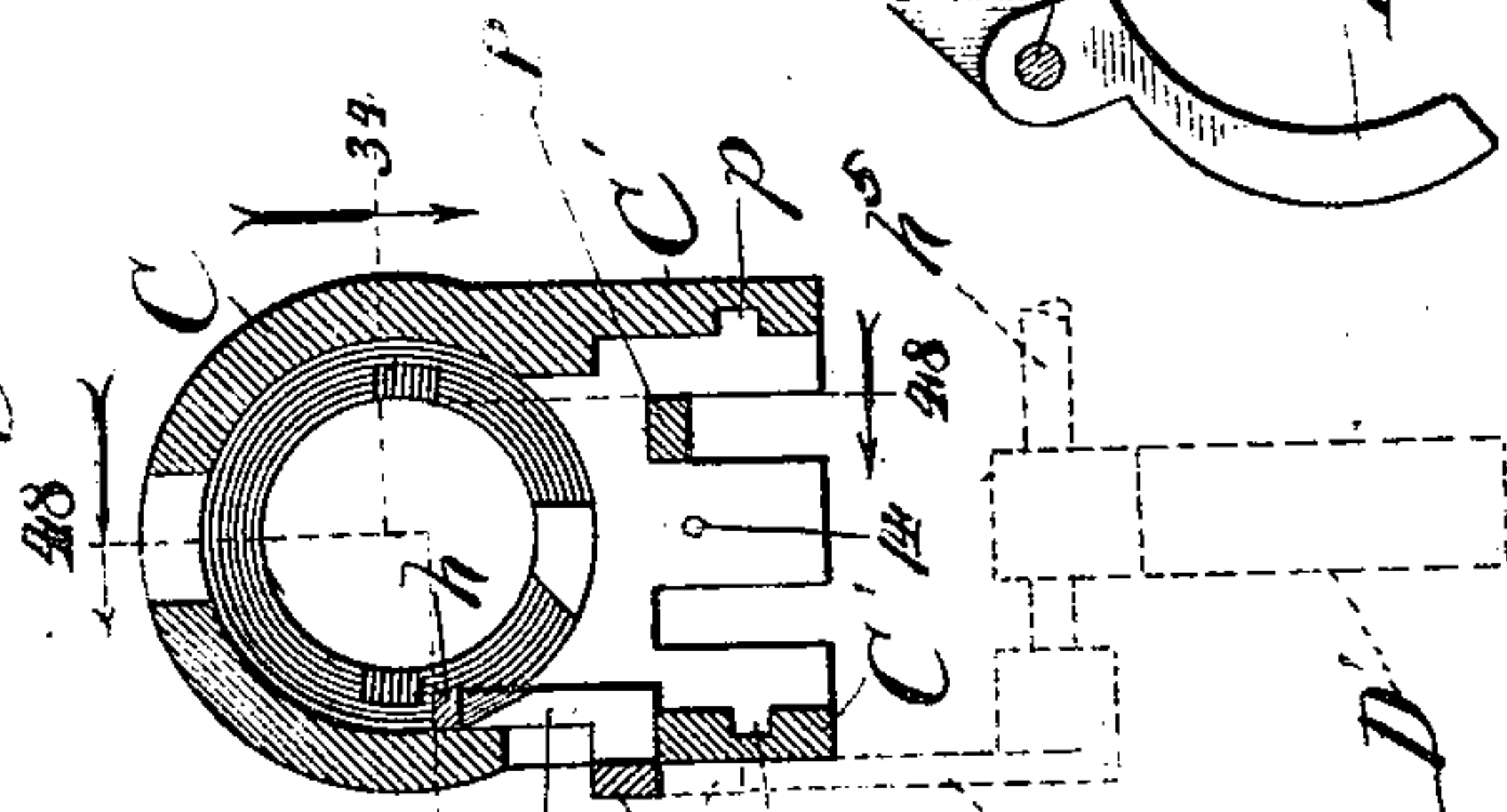


Fig. 26.

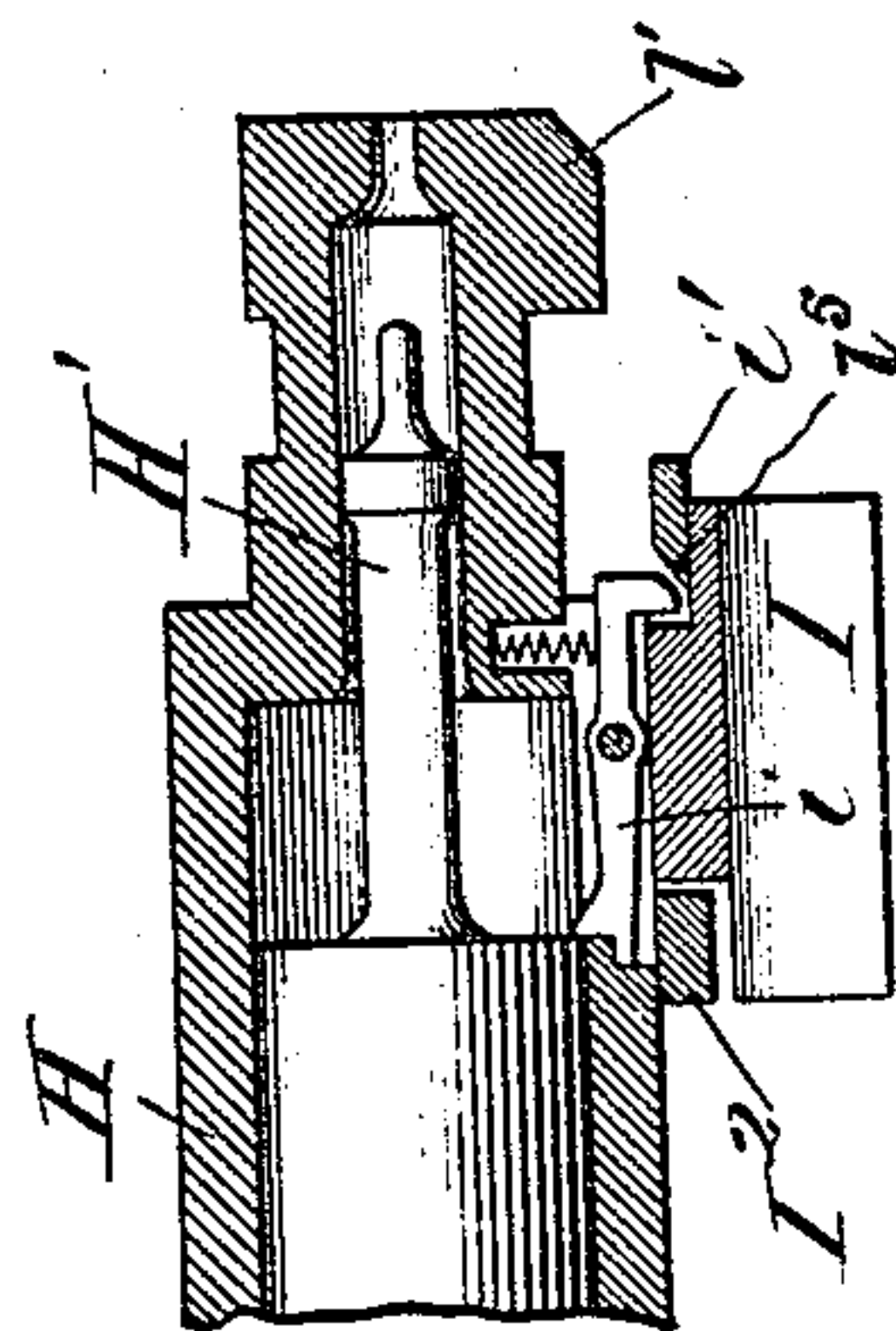


Fig. 27.

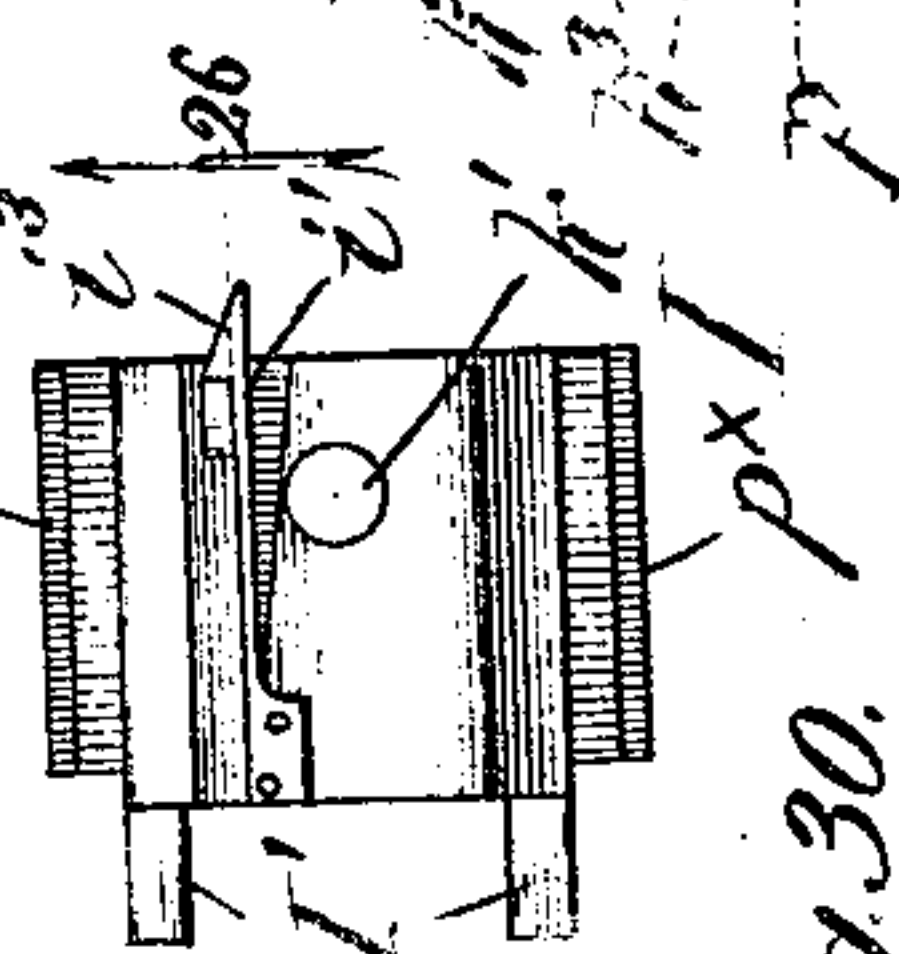


Fig. 30.

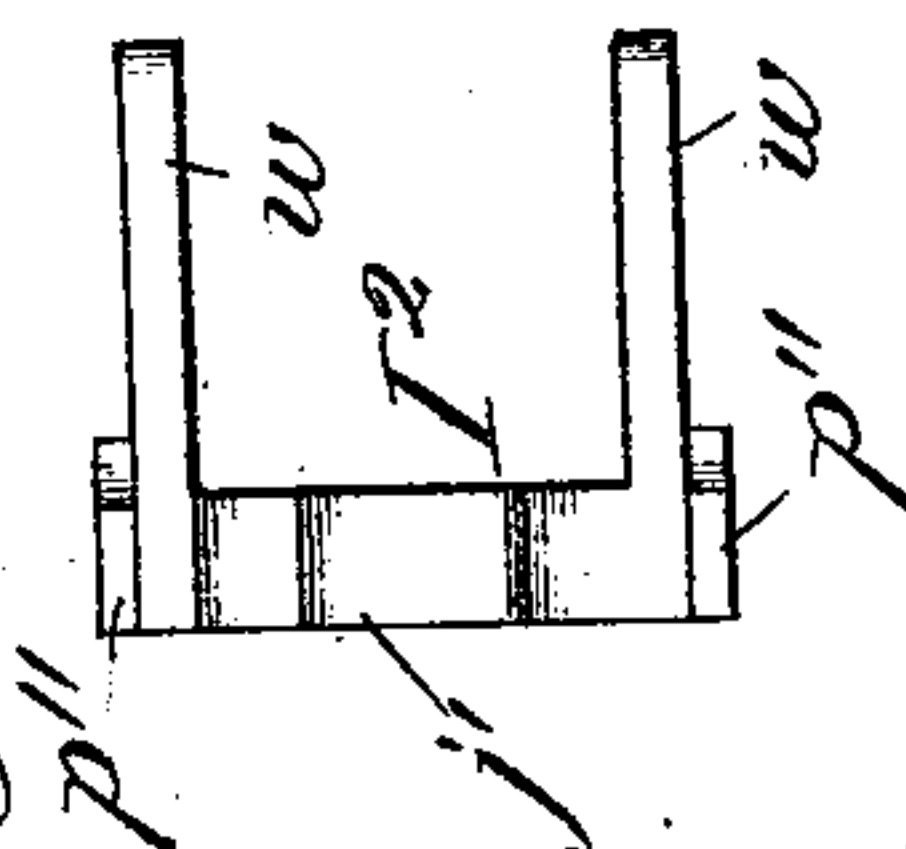


Fig. 29.

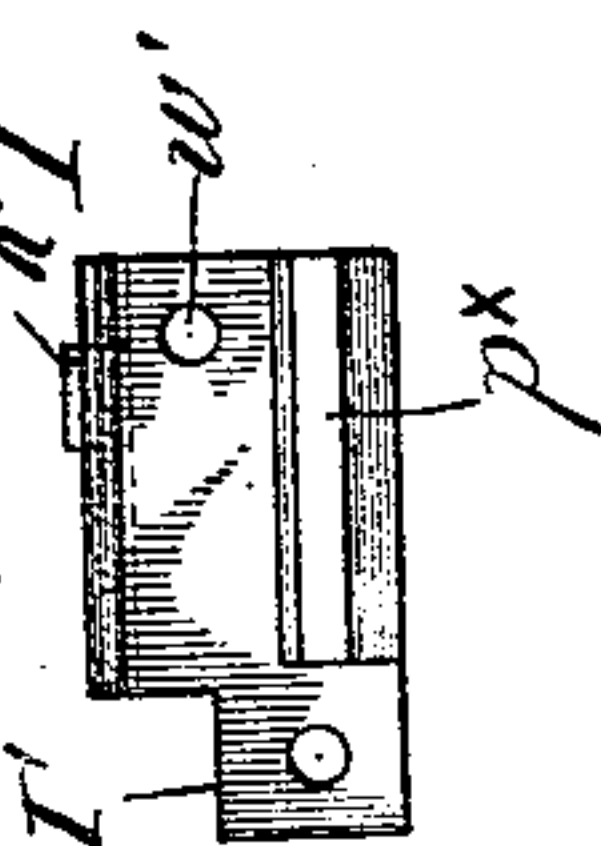


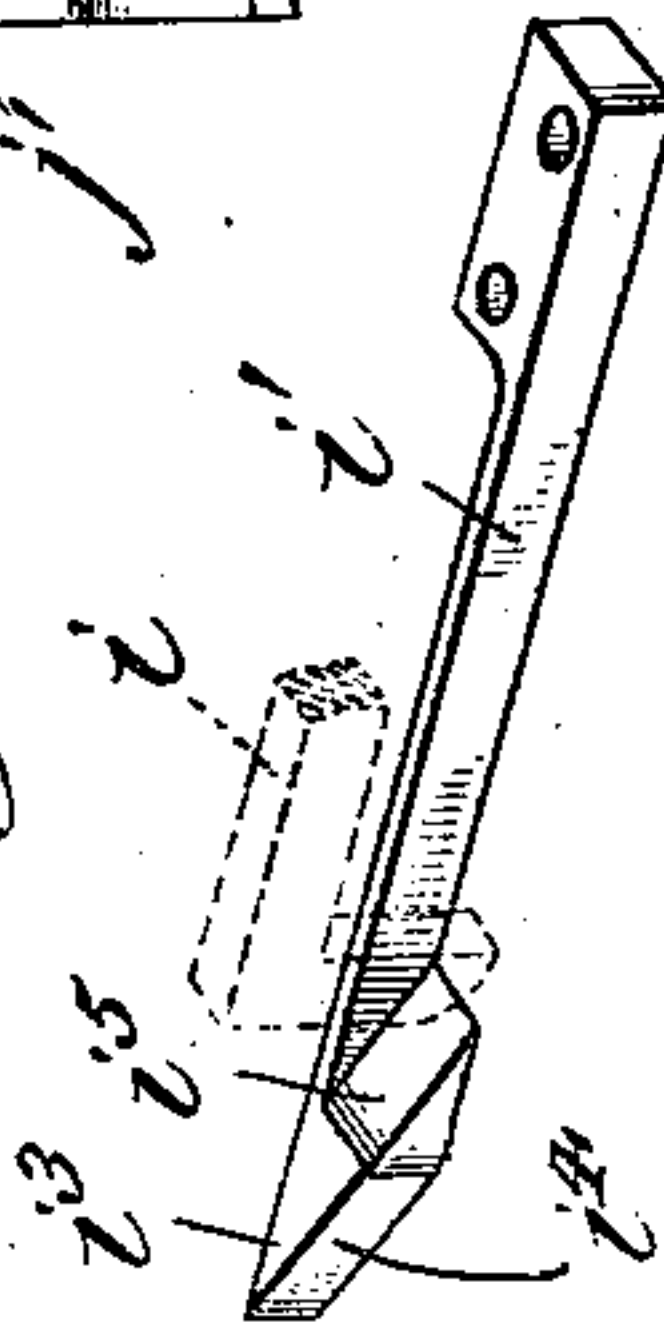
Fig. 31.



Fig. 32.

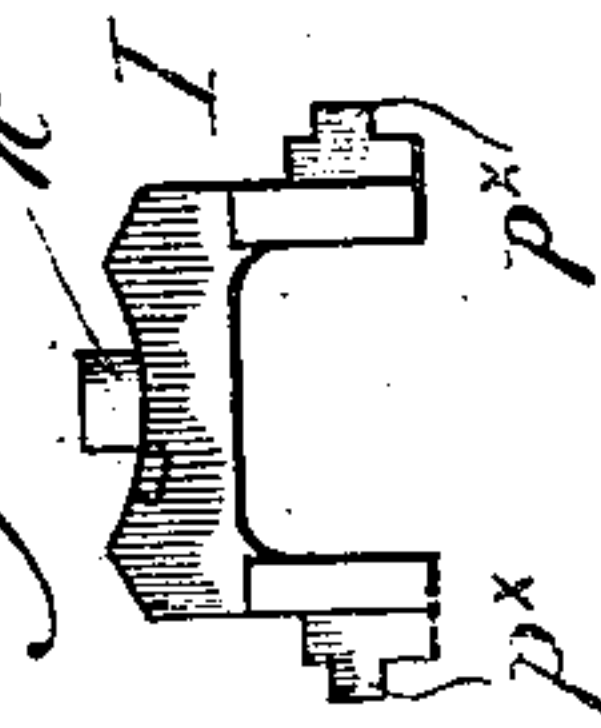


Fig. 33.



Witnesses:
Chas. E. Gaylord,
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Fig. 28.



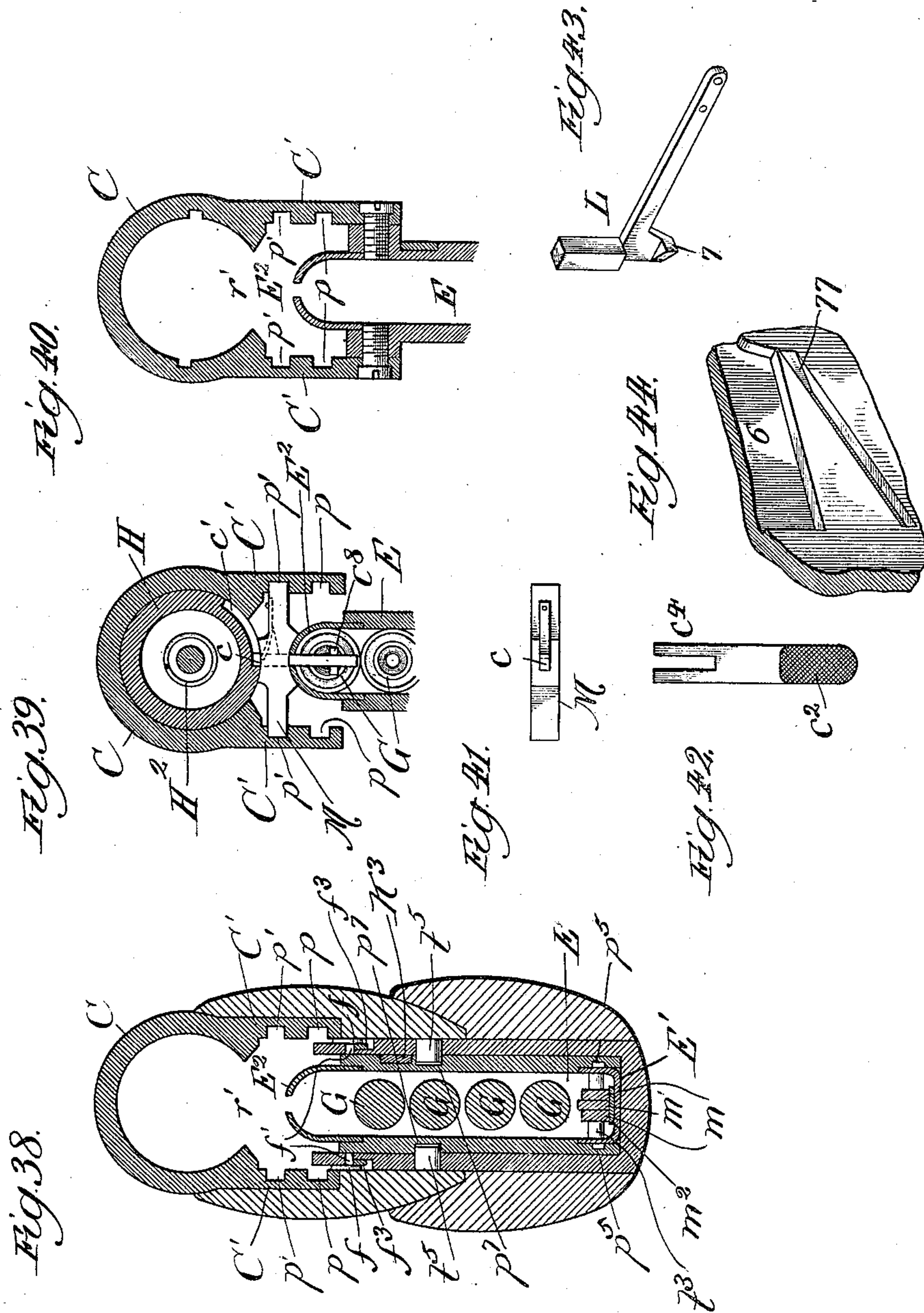
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NO MODEL.

9 SHEETS--SHEET 8.



Witnesses:
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No. 723,706.

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9 SHEETS—SHEET 9.

Fig. 45.

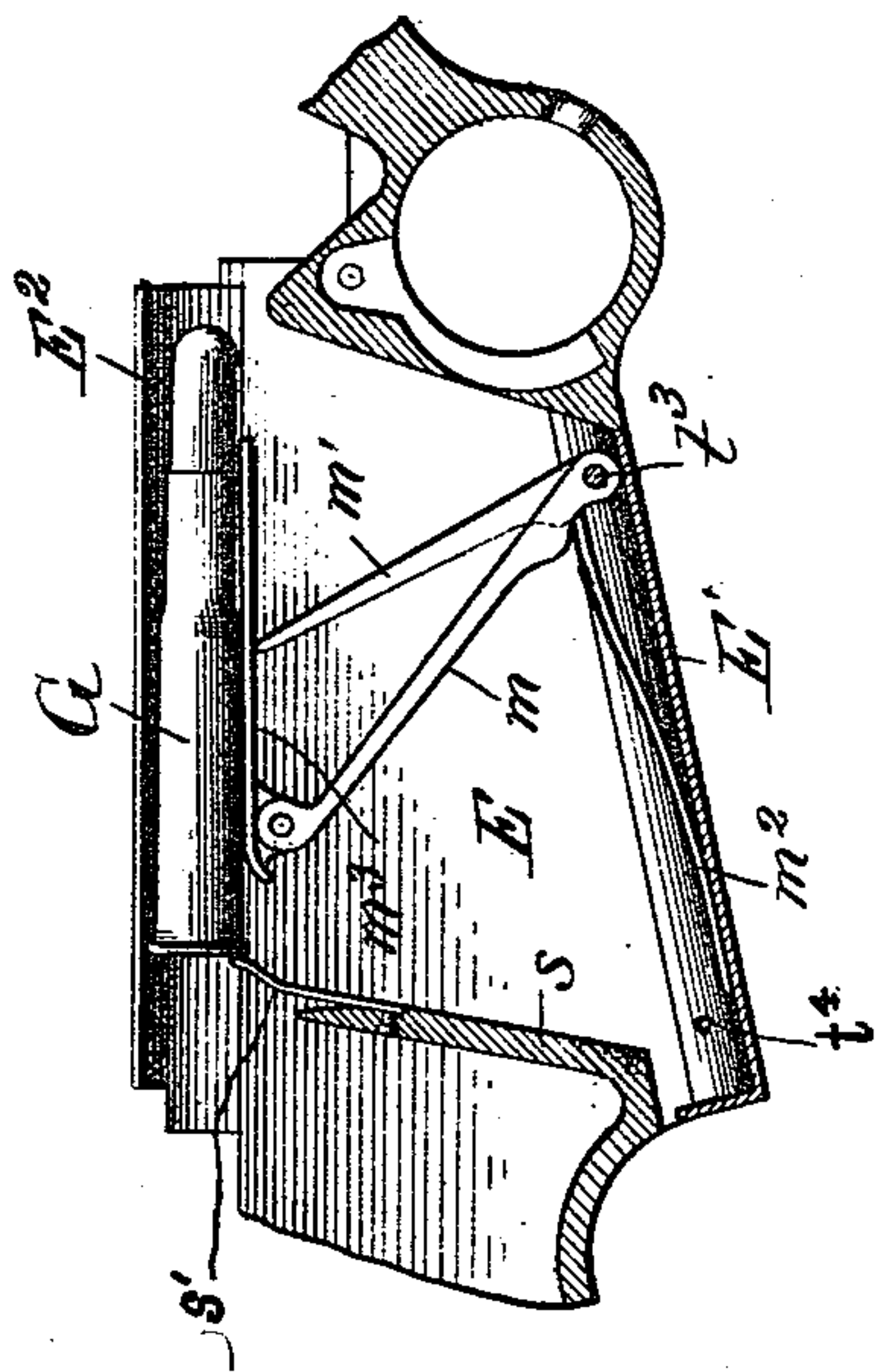


Fig. 48.

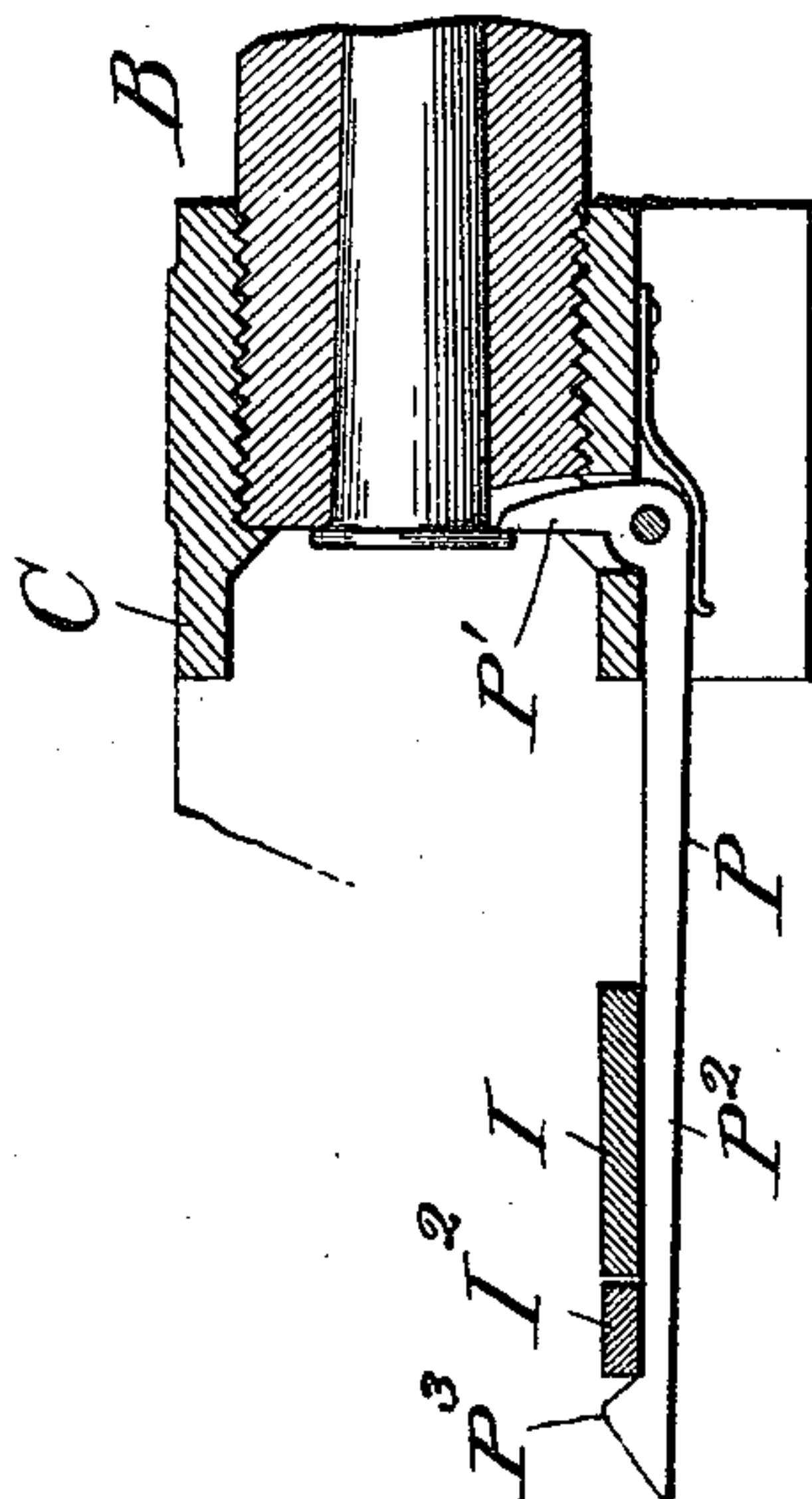


Fig. 47.

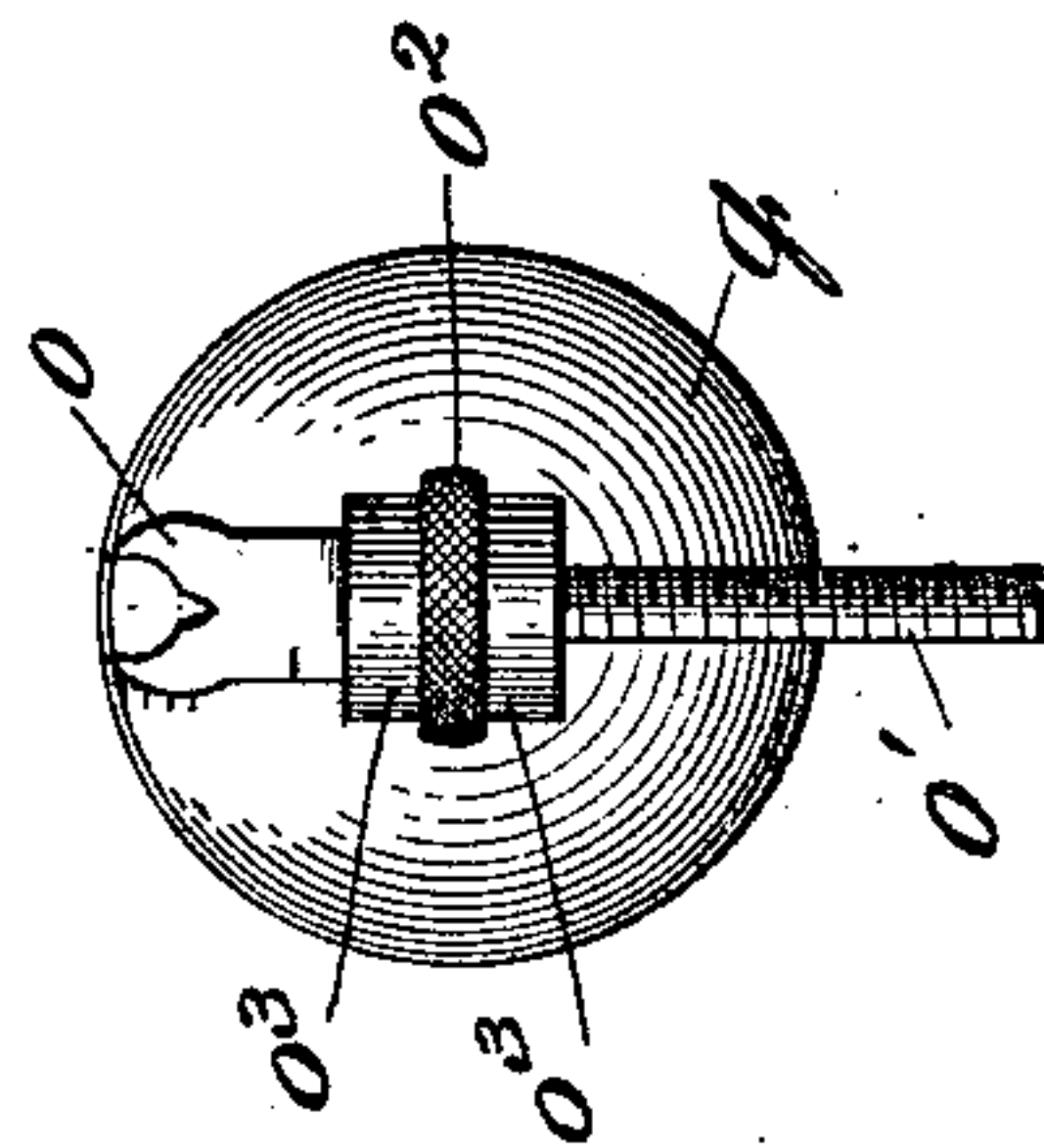
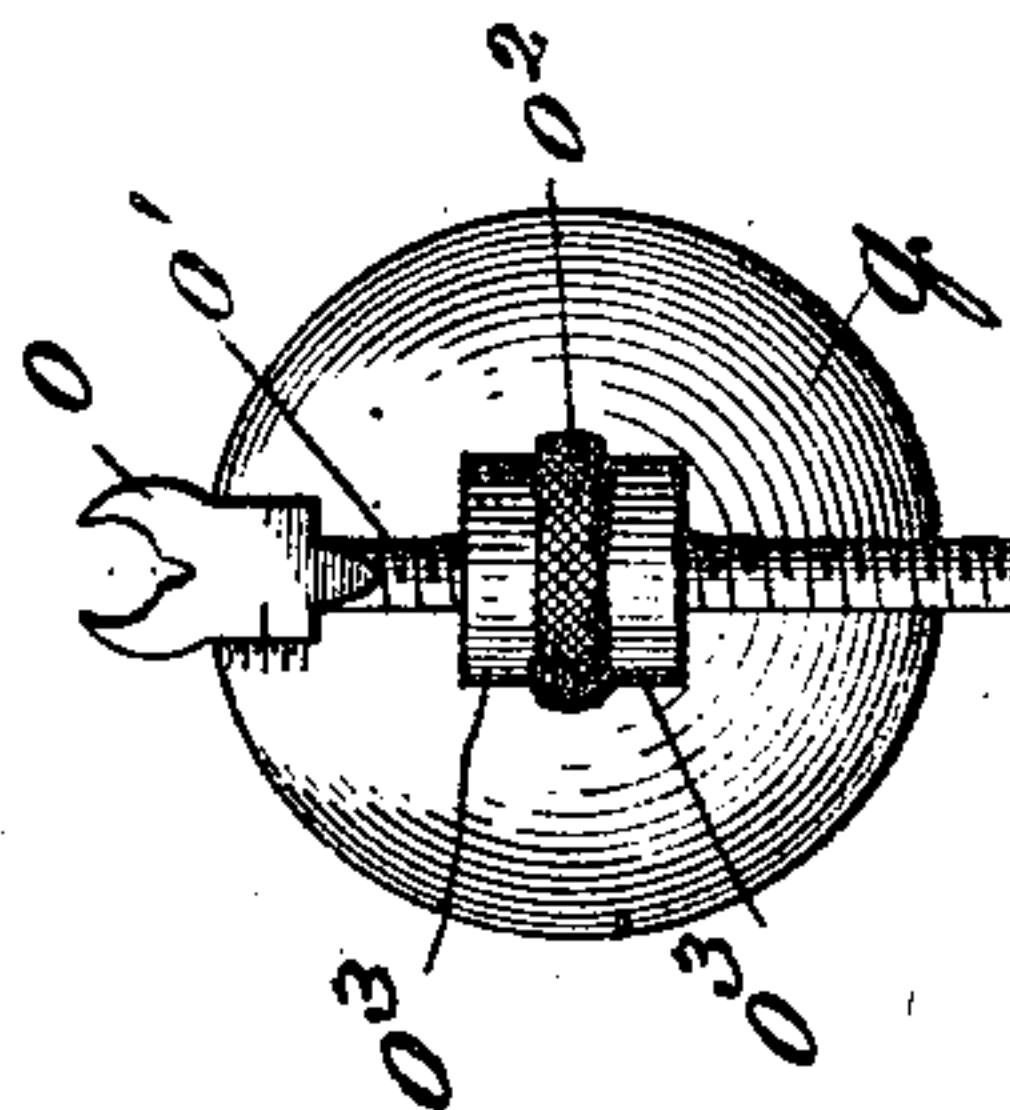


Fig. 46.



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UNITED STATES PATENT OFFICE.

SAMUEL N. McCLEAN, OF WASHINGTON, IOWA.

MAGAZINE BOLT-GUN.

SPECIFICATION forming part of Letters Patent No. 723,706, dated March 24, 1903.

Application filed May 28, 1896. Serial No. 593,386. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL N. McCLEAN, a citizen of the United States, residing at Washington, in the county of Washington and State of Iowa, have invented a new and useful Improvement in Breech-Loading Firearms, of which the following is a specification.

My invention relates in the main, though not essentially as to all its features, to breech-loading firearms of the magazine variety.

The more important objects of my improvement may be stated as follows: to provide means for automatically locking the weapon in its loaded condition and for retaining it locked until the lock shall be released by the discharge or by hand, thereby avoiding all danger from hang-fire cartridges; to provide a structural plan of the receiver, whereby it shall be rendered light, but adequately strong and steady, by adapting it to receive the strain of the discharge in the line of greatest strength and resist it with the shearing and crushing strength of the metal and to limit the strain to a comparatively small area immediately behind the end of the barrel and by making both the receiver and the bolt extra strong at their forward end portions with the hinder parts thereof formed as thin-walled and light tubes; to provide a structural plan of the operating parts, employing a system of cam-guides to control positively through the reciprocating movement of an operating-handle the actions and combinations of actions of the various mechanisms of the weapon, involving those for loading, firing, extracting, ejecting, and locking; to provide an improved construction of disappearing sight, to adapt it for greater nicety of adjustment, and to protect it against accident, and to improve the construction and mode of operation of the various parts of the weapon, notably the mechanism which controls the longitudinal and locking movements of the bolt—that which controls the extraction and that which controls the trigger cut-off—to enable the user to employ at will either the rapid or single fire action of the weapon, the firing mechanism to prevent its release in any other than the full-locked position of the bolt, the magazine cut-off for converting the weapon from a repeater into a single loader, the cartridge-feed from the magazine to the barrel, and

other details of the weapon, all as hereinafter described, and pointed out in the claims.

Referring to the accompanying drawings, 55 Figure 1 is a broken longitudinal sectional view of the firearm, showing parts of my improvement in side elevation assembled in the relative positions they attain when the bolt is withdrawn to its rearward position; Fig. 2, 60 a similar view of the same with the parts assembled in their relative positions when the bolt is locked in its forward position; Fig. 3, a broken longitudinal sectional view of the mechanism, showing the parts as assembled 65 in the locked position of the bolt; Fig. 4, a view showing the receiver in longitudinal sectional elevation; Fig. 5, a section taken at the line 5 on Fig. 6 and viewed in the direction of the arrow, showing the trigger-guard and 70 magazine; Fig. 6, a top plan view of the same; Fig. 7, a view in side elevation of the cartridge-holding carrier; Fig. 8, a plan view showing the same with its actuating cam-slide; Fig. 9, a section taken at the line 9 on Fig. 75 10 and viewed in the direction of the arrow, showing in elevation the left side of the cartridge-holding end of the carrier; Fig. 10, an end view of the carrier; Fig. 11, a plan view showing the pivotal wedge and cam for spreading apart the bifurcated end forming the cartridge grip or holder of the carrier; Fig. 12, a view of the same in side elevation; Fig. 13, a view in side elevation of the carrier-controlling cam-slide; Fig. 14, a top view of the 85 same; Fig. 15, a broken section showing a bottom plan view of the bolt in the receiver, parts of the firing-pin-controlling mechanism, and the extractor mechanism; Fig. 16, a section taken at the line 16 on Fig. 15 and viewed 90 in the direction of the arrow, showing features of the extractor-controlling mechanism with the extractors unlocked; Fig. 17, a view like that presented by Fig. 16, but showing another relation of the parts with the extractors locked; Fig. 18, a similar view, but showing still another relation of parts; Fig. 95 19, a plan view of the extractors on their divided collar; Fig. 20, a section taken at the line 20 on Fig. 19 and viewed in the direction 100 of the arrow; Fig. 21, a longitudinal sectional view showing a broken section of the barrel with one form of my improved safety mechanism for insuring retention of the bolt in its

locked condition until released by the discharge of the weapon; Fig. 22, a section taken at the line 22 on Fig. 21 and viewed in the direction of the arrow; Fig. 23, a section taken at the lines 23 on Fig. 3 and Fig. 21 and viewed in the direction of the arrows; Fig. 24, a perspective view showing the locking end of the safety mechanism; Fig. 25, a similar view of a stop detail; Fig. 26, a vertical section of the bolt and its slide, taken on the plane 26 of Fig. 27 and viewed in the direction of the arrow, showing mechanism connected with the bolt-operating slide for controlling the action of a firing-pin sear; Fig. 27, a plan view of the slide with the means thereon for engaging and releasing the sear; Fig. 28, an end view of the bolt-operating slide; Fig. 29, a side view of the same; Fig. 30, a plan view of the pawl for cooperating with the breech-bolt slide to lock and unlock it; Fig. 31, a view of the same in end elevation; Fig. 32, a view of the same in side elevation; Fig. 33, a perspective view of the spring-cam device engaging a firing-pin sear, enlarged over the representation thereof in Figs. 26 and 27; Fig. 34, a section taken at the line 34 on Fig. 35 and viewed in the direction of the arrow; Fig. 35, a section taken at the line 35 on Fig. 34 and viewed in the direction of the arrow; Fig. 36, a view showing in elevation the trigger, the trigger-actuated firing-pin sear, and the interposed cam-lever; Fig. 37, a perspective view of the trigger-actuated firing-pin sear; Fig. 38, a section taken at the line 38 on Fig. 2 and viewed in the direction of the arrow; Fig. 39, a section taken at the line 39 on Fig. 1 and viewed in the direction of the arrow; Fig. 40, a section taken at the line 40 on Fig. 1 and viewed in the direction of the arrow; Fig. 41, a plan view of the cartridge-feed device; Fig. 42, a plan view of the magazine cut-off; Fig. 43, a perspective view of the engaging pawl for the carrier cam-slide; Fig. 44, a broken perspective view of the side wall of the frame, showing the guide-slot in which the pawl shown in Fig. 43 slides and the countersunk part of the frame to permit the movement of the engaging rear end of the carrier-actuating cam-slide; Fig. 45, a broken view in sectional side elevation of the magazine, showing its sliding door and contained spring-controlled cartridge-lifter; Fig. 46, an enlarged end view of the receiver provided with my improved disappearing sight in a partially-elevated position; Fig. 47, a similar view of the same with the sight lowered to its shielded position; and Fig. 48 a vertical section taken at the line 48 on Fig. 35 and viewed in the direction of the arrow, showing the relative positions of the bolt-slide and starter-lever to the gun-barrel.

A is the stock, B the barrel, and C the receiver into the forward thickened or reinforced end of which the barrel is screwed and which is fastened to the stock. The receiver is a thin metal shell of tubular and preferably general cylindrical shape and having com-

paratively little of its substance cut away to avoid weakening it, the only openings thus provided being that shown at r , extending partially along its upper side, through which to discharge the extracted shells of spent cartridges and to feed loaded cartridges singly, and the longitudinal opening r' in its base, through which to admit the connections between the mechanism in the receiver and that outside the receiver. At its rear end the receiver C is closed, as by a screw-plug q , containing in its outer face a vertical recess of sufficient depth to embrace and shield a threaded stem o' , terminating at its upper end in a sight o and passing through a pair of guide-lugs o^3 on the outer face of the plug, between which is confined a nut o^2 , encircling the stem to engage the thread thereon, the stem coinciding at its lower end with a socket o^4 , Fig. 1, in the stock. By turning the nut o^2 in either direction the sight may be raised or lowered to any desired height with extreme nicety, owing to the screw form of the adjustment employed, and when it is desired to cause the disappearance of the sight it may be lowered below the top of the receiver in the socket o^4 by properly turning the nut o^2 , in which position it is embraced by and shielded from harm in the plug-recess.

In the opposite inner sides of depending flange portions C' of the receiver C are provided a lower pair of straight longitudinal guides (shown as grooves p p) and an upper pair of similar guides p' p' , each of the latter formed in two longitudinal sections on different planes connected by a diagonal cam part at p^2 , and in the opposite inner sides of the walls of the receiver proper are provided the longitudinal extractor-guides p^3 p^3 , deflected at their rear extremities to a straight rear extension in an upward direction, as shown at p^4 , or in a downward direction for a purpose hereinafter described, these guides also converging toward their rear ends by there decreasing their depth.

D is the frame containing the trigger-guard fastened at one end to the receiver near its forward end at t , Fig. 3, and toward its opposite end to the under side of the stock A by the same screw t' which secures the receiver at its tailpiece t^2 to the stock. Centrally along the forward portion of the trigger-guard frame extends the upward-projecting rib v , the rear portion of which is cut out at v' , as most clearly shown in Fig. 5, to engage a carrier-wedge. In the trigger-guard frame, behind the trigger D' , are provided and formed, preferably integral therewith, the sides and the back s of the magazine E, the sides containing near their lower edges the guides p^5 p^5 , shouldered, as shown at p^6 , at their rear ends and which support the longitudinally-sliding cover or door E' for the open base of the magazine by pins t^3 and t^4 , extending laterally into the guides from near the opposite ends of the door, Fig. 3. On the door E' is carried my improved cartridge-lifter, (see particularly Fig.

45,) comprising a longer lever m and a shorter lever m' , both fulcrumed at their lower ends on the pin t^3 , near which they are engaged by a controlling-spring m^2 , tending normally to throw them upward and forward, the longer and rearmost of the two levers having pivoted to its upper extremity a shelf m^3 , extending forward toward its free end across the lever m' . Where the actuating-spring engages the levers, they are provided with surfaces which have different directions of inclination with respect to the common pivotal support. Thus the two arms of the lifter being of different lengths and being operated upon by a single spring, the long lever, owing to the relative inclination of its spring-engaged surface, is given a slower movement than the short one, thus adjusting the cartridge-shelf to the required position of the cartridges in elevating them.

To load the magazine, the weapon should be turned to bring laterally or uppermost the door E' , which (after sliding back the operating-handle F , hereinafter described) may be withdrawn in a backward direction, thereby withdrawing also the cartridge-lifter (then depressed, as hereinafter described) till the forward pin t^3 strikes the shoulders at p^6 , (which serve to lock the door in its forward or closed position at the pin t^4 .) Thereupon cartridges G to the capacity of the magazine (shown as adapted to contain five) may be introduced into it to rest one lengthwise against the other, the first introduced lodging against the converging top E^2 of the magazine, open along its upper side and at the opposite ends. The back s has an extension s' at its free end, shown as a spring (though it need not be) to engage at its extremity and afford a bearing to the flange end of the cartridge in contact with it. When the magazine has been thus charged, the door E' is closed, thereby bringing the shelf m^3 on the spring-pressed levers then folded, as shown in Fig. 3, against the last-inserted cartridge, so that as one cartridge is fed, as hereinafter described, from the magazine into the barrel the next succeeding one is raised into its position by the action of the spring m^2 . I illustrate also an indicator to show the number of cartridges in the magazine, the same comprising an index-finger x , Fig. 1, on the pin t^3 , pointing to a register x' , formed on a side of the magazine in an arc described by the finger as the lever m' rises, the arrangement of the register being such that its numbers are spaced apart to correspond with the length of arc described by the end of the finger each time a cartridge is taken out of the magazine. The finger x also affords a handle by which to depress the cartridge-lifter to permit it to be withdrawn with the door E' preparatory to loading the magazine.

The operating-handle F may be of any desired form, but is shown as a grip conforming to the shape of the hand when grasping it, and is guided in its reciprocating move-

ments by curved guides p^7 , formed in the opposite sides of the trigger-guard and magazine and in which the handle is confined by studs t^5 , projecting into them from the handle near its opposite ends. On the opposite sides of the stock A are also provided the guides p^8 , serving a purpose hereinafter described and having interposed in them near their rear extremities the cams p^9 .

H is the breech-bolt, formed hollow in tubular and preferably cylindrical shape to fit inside the receiver as a thin metal shell, except as to its forward portion, where it is thickened and provided with opposite external lugs l and l' to engage in the manner hereinafter described with companion lugs l^2 , opposite each other on the inner wall of the receiver C behind the forward limit of longitudinal play of the lugs on the bolt. These lugs have cooperating cam-faces to seat the cartridge and effect firm locking of the bolt. In its under side the bolt contains a cam-slot k , Fig. 15, having its opposite end portions extended in a straight direction or parallel with the length of the bolt, and the bolt carries the firing-pin sears i and h . Toward its rear end the bolt has a circumferential annular recess j , and it is reduced in diameter toward its forward end and contains the firing-pin H' , which is hollow throughout the greater portion of its length and shorter than the bolt which contains it in order that it may be entirely confined within the latter both when cocked and released by its controlling-spring H^2 , thus avoiding its protrusion beyond the rear end of the bolt. On the firing-pin is pivoted a spring-pressed dog g , which projects through a longitudinal slot g' in the bottom of the bolt when the firing-pin is released from its controlling-spring and there presents a medium for encounter by other mechanism for cocking the spring, as hereinafter described. Below the plane of the bolt is the bolt-actuating slide-block or "slide" I , preferably of the general saddle-shape illustrated, with laterally-projecting ribs p^x , which sustain the slide in the guides p , a cut-away rear section affording a seat I' , Fig. 29, and a stud k' extending from its top to engage the cam-slot k in the base of the breech-bolt.

I^2 is the pawl, shaped substantially like the slide in cross-section and provided with forward-projecting arms w , at the ends of which it is pivoted at w' to the sides of the slide near its forward end, the slide being embraced by the arms, so as to locate the transverse portion of the pawl over the seat I' , with the connecting cross-stud j' , projecting upward from it, entering the annular recess j in the bolt, and the cam-faced studs p^{11} , extending from its opposite sides, engaging the guides p' in the receiver. From the sides of the slide I there extend rearward from its forward end the pivotal links f , connected at their rear extremities by a pin f' , passing through slots f^2 in the handle, into the path

of which pin there extend the engaging ends of the spring-controlled levers f^3 , fulcrumed between their ends and riding at their rear spring-pressed ends in the guide-tracks p^8 .

5 K is the cartridge-carrier comprising a curved arm K' , pivoted at its forward extremity at 2, Fig. 2, in the frame under the rear portion of the barrel B, to extend thence backward into the receiver, where it terminates in a bifurcated spring-cartridge-holder K^2 , which should conform inside to the shape of a cartridge, the sides of the holder K^2 terminating at their rear extremities in downwardly-curved extensions d' , between which is pivotally supported a wedge-shaped cam d , performing a function hereinafter described.

10 K^3 is the carrier-actuating cam-bar, shown most clearly in Figs. 13 and 14 as comprising a bar having at one extremity a depending slotted head u and a bifurcated head K^5 at its opposite extremity, in the sides of which are the straight guide-slots u' , embracing a limiting-pin u^2 on the trigger-guard, and in the extremities of which are companion diagonal cam-slots K^4 , straight or extending lengthwise of the sides for a short distance at their upper ends and shouldered to hold the carrier in its lifted position and affording a carrier-lifting cam. The bifurcated head K^5 straddles the web v on the trigger-guard frame and projects upward through longitudinal slots 3 and 4 in the bar K' , with which the cam-bar is connected through the cam-slot K^4 in its head by a pin 5. The bar K^3 is confined and guided in its movements in a channel 6, provided for it in a side of the frame of the weapon.

15 L is a spring-pawl, (see Fig. 43,) fastened at one end to the operating-handle to engage the slotted head u on the rear end of the carrier-lifting cam-bar, this spring-pawl having a depending inward-extending V-shaped nose or cam 7 to encounter a rigid companion cam 77 in its path in the trigger-guard frame, (see Figs. 2 and 44,) and thereby force the dog laterally out of the slot in the head u in the forward movement of the operating-handle, as and for a purpose hereinafter described.

20 M (see particularly Fig. 39) is the feed device for engaging at its rear end the uppermost cartridge in the magazine by the forward movement of the operating-handle F, shoving the cartridge out of the magazine into the holder K^2 of the carrier K. The feed device is shown in the form of a cross-bar confined at its ends to slide in the rear portions of the guides p' , behind the pawl I^2 of the breech-bolt slide, and having a spring-pressed stud c , which enters a groove c' in the base of the breech-bolt, which groove permits the rotary locking and unlocking actions of the bolt, the stud extending downward into the magazine through the slot in the top E^2 . When the breech-bolt approaches its rear position, the feed device encounters the magazine cut-off to release the feed device from the bolt, and thus take the magazine-feed out

of action, thereby converting the weapon into a single-loader. This is done through the medium of a block c^4 , having a cam-recess c^5 in its face and two notches 8 and 9, one above the other, in its back to be engaged by a spring-pressed pin c^6 , protruding from its bearing in the rear end of the receiver into the latter, and an operating thumb-stem c^2 projects from the cut-off block c^4 backward through an opening c^7 behind the receiver. When it is desired to utilize the magazine-feed of the weapon, the block c^4 is raised by its stem c^2 until the pin c^6 snaps into the lower notch 9, whereby the block is held in its raised position, wherein the cam-recess c^5 is above the path of a pin c^8 , projecting laterally from the depending stud of the feed device, which accordingly permits the engagement of the stud c with the bolt. When, however, it is desired to use the weapon as a single-loader, the block c^4 is depressed until its holding-pin c^6 snaps into the upper notch 8, in which position the cam-recess c^5 is in the path of the pin c^8 , which accordingly enters it when the feed device is retracted and withdraws the stud c from engagement with the bolt.

25 N N are the extractors of the usual or any suitable variety extending along opposite sides of the reduced forward portion of the breech-bolt, shown to be provided with a circumferential recess b , (see Fig. 15,) highest about its center, and in which is loosely confined the divided collar b' , carrying as part of it to extend across its perimeter at opposite points of its circumference the extractors N, from the rear ends of which there project laterally outward the studs b^2 into engagement with the extractor-guides p^3 . Immediately behind the recess b in the reduced forward end of the bolt it is provided with a circumferential recess a , extending only part way about the bolt to afford the abutments or shoulders a' and a^2 at its opposite ends, and in the recess is loosely confined a spring-collar a^3 , presenting its ends to the aforesaid abutments and carrying at diametrically opposite points in its outer surface the cam projections a^4 , to be wedged underneath the rear end portions of the extractors and maintain their forward ends in locked engagement with a cartridge, as and for a purpose hereinafter described.

30 The spring-pressed pivotal firing-pin sear i for locking the firing-pin H' when its spring is compressed is pivoted to the breech-block H and projects laterally outward at its forward end into the path of a spring-finger i' , fastened at one end to the slide I to extend lengthwise across it and terminating at its opposite end in a head i^3 , having a lateral cam-face i^4 and an upper cam-face i^5 , the former adapting it to slide past the sear i without tripping it in the forward movement of the slide I and the cam-face i^5 operating to trip that sear in the rearward movement of the slide, as and for a purpose hereinafter described.

The trigger firing-pin sear h , which is pivoted to the breech-block and spring-pressed like the sear i , (see Fig. 34,) is cam-faced at its forward end, as shown at h' , to adapt it to be there engaged by a companion cam-face h^2 on the adjacent end of a substantially Z-shaped trigger-lever h^3 , fulcrumed at y at one of its angles, adjacent to which it is engaged by the finger extension h^4 of the trigger D' , and with which the latter is connected by a pin h^5 . Obviously when the trigger is pressed the lever h^3 trips the sear h , and when the trigger is locked in its pressed condition, as it may be by means provided for the purpose, (shown as a button 10, working through the trigger-encircling ring D^2 to press and lock an arc-shaped stop 12 against the trigger,) the lever h^3 remains in the path of the sear h to trip the latter whenever it encounters the lever, leaving the sear i alone to control the firing-pin.

A desirable (but not the only) construction of safety mechanism for preventing the bolt from being unlocked to enable it to be retracted by the operating-handle until the explosion of the cartridge has occurred is best shown in Fig. 21. As shown, it involves a chamber O in the bottom of the forward end of the receiver C , carrying a locking-head O' on the end of a rod O^2 , passing through a protecting-tube O^3 , screwed at one end into the forward end of the receiver and extending thence underneath the barrel B into a cylinder O^4 , fastened to the barrel, with the bore of which it communicates through a port z , the cylinder being also provided with a port z' , leading to the outer air and located out of alignment with the port z , but short of the limit of the outer stroke of a spring-controlled piston O^5 in the cylinder, with which the rod O^2 is connected. The lock is shown in Fig. 24 at O' . In its normal position (shown in Fig. 21) it engages the bolt at one of its locking-lugs, so that the bolt cannot be turned in the direction to unlock it until the lock O' has been withdrawn from the path of the lug, since the latter is then underneath the head. When, however, a cartridge has been exploded in the barrel, the gas evolved by the explosion from the powder enters through the port z the cylinder O^4 under sufficient pressure to force forward the piston O^5 past the port z' , through which the gas then escapes, and this movement of the piston withdraws the head O' out of the path of the lug on the bolt, permitting the latter to be turned to unlock it. Unless means were provided to the contrary immediately after the escape of the gas from the cylinder the piston under the recoil of its controlling-spring would be forced back in the cylinder, thereby correspondingly forcing back the lock O' , whereby had the bolt not yet been turned to unlock it the lock would reengage the lug on the bolt and prevent the latter from being so turned. To obviate this, there is provided in the chamber O a spring-controlled stop O^6 , having a recess 13 in its

rear side to receive a rigid pin 14, which projects into it to limit the vertical play of the stop, which when the lock O' has been driven ahead rises into its path and obstructs its return. The stop has an upward-projecting finger 15, cam-faced at its end where it rises into the path of the lug on the bolt, which when the bolt is turned to lock it depresses the stop out of the path of the lock O' and permits the return of the lock into engagement with the bolt. To enable the lock O' to be withdrawn by hand, as in the case of failure of a cartridge to fire, there may be provided to extend from the rod O^2 , through a longitudinal slot in the tube O^3 , a button 17, or the like, by manipulating which the rod may be moved accordingly. The essential feature of this safety mechanism is a lock actuated by the discharge to release the bolt, and this irrespective of any particular means for accomplishing such release.

It is a matter of importance to avoid overheating of the barrel by the explosion of the cartridges. To accomplish this purpose, simple means are herein shown, involving the roughening of the outer surface of the barrel throughout a portion of its length from the receiver forward, (a construction not shown in the drawings by reason of the smallness of the scale on which the views are presented,) whereby innumerable heat-radiating points are afforded, and coiling about the roughened surface a wire 18 with the coils spaced apart to avoid obstructing the heat radiation and afford to the hand of the user of the weapon a practically non-conducting protection against contact with the hot roughened surface of the barrel.

Means are provided for facilitating the extraction of the shell by employing a direct cam-action of the operating-handle to start the shell with increased power. The means referred to are shown in Fig. 48 as comprising a spring-controlled shell-starter P , pivoted in the frame of the receiver near the rear end of the barrel, having a short arm P^1 engaging the flange of the cartridge and a long arm P^2 extending into the path of the slide I , which encounters a V-shaped cam P^3 on the arm P^2 to swing it on its pivot and start the shell when the bolt-slide passes through the rear straight part of the bolt-actuating cam k .

The operation of the several mechanisms hereinbefore described is as follows: As the parts are shown assembled in Fig. 1 the breech-bolt is in its retracted position and has presented in its return-path by the carrier a cartridge ready to be introduced into the barrel. By then moving forward the operating-handle F the following-described functions are performed: The spring-pressed levers f^3 are moved forward on their tracks p^8 against the pin f' , which connects the arms f , thereby advancing the bolt H until the rear ends of the levers f^3 encounter the cams p^9 in their path. In this movement of the

bolt the studs b^2 of the extractors N are brought into the deeper parts of their guides p^4 , permitting the spring-collar a^3 to actuate the rear ends of the extractors to swing them out, and thereby cause the forward ends to swing inward and grip the cartridge, and this movement of the bolt further carries the extractor-studs b^2 from the extensions p^4 of the guides p^3 into the latter, thus bringing them into their straight path of movement. Moreover, as a further function of this advance movement of the bolt the cam-wedge d is encountered by it and forced between the sides of the carrier-holder K^2 to spread them apart and force the shoulders d^5 on the cam-wedge past companion shoulders d^6 on the extensions d' to hold the wedge in position to keep open the carrier-holder until the carrier descends to its lower position, where it encounters the rib v to swing it on its axis and allow the carrier to close. When the rear ends of the levers f^3 encounter the cams p^9 , their forward ends are depressed out of engagement with the pin f' , thereby maintaining the bolt at a standstill until the pin f' encounters the rear ends of the slots f^2 . Meantime this movement of the handle has advanced the carrier-actuating cam-bar K^3 , owing to the engagement therewith at its slotted head u of the spring-pawl L until the latter is forced laterally out of such engagement by encountering the track 77 in its path in the trigger-guard frame, as shown in Figs. 28 and 44. This movement of the bar K^3 actuates the carrier K to descend into position in front of the magazine by the action of the cam-slot K^4 on the pin 5. As will be understood, the connection of the operating-handle F with the breech-bolt is through the medium of the pawl I^2 at its projection j' entering the annular recess j in the bolt. The continued advance movement of the handle advances the pawl I^2 in its guides p' until the lugs at the forward end of the bolt have passed beyond the companion lugs in the forward end of the receiver, when the pawl I^2 will have passed through the cam-sections p^2 of the guides p' and have been depressed to withdraw the projection j' out of the recess j , thereby releasing the bolt from the pawl. Thereafter the continued advance of the slide I causes its pin k' to traverse the cam-guide k in the under side of the bolt and actuate the bolt to rotate to its locked position, bringing the lugs on the bolt into line with and in front of the companion lugs on the stock-wall and causing the cam-faces of these lugs to firmly seat the cartridge in the chamber of the barrel and lock the bolt. The further advance of the slide I causes the pin k' to advance through the straight part at the forward end of the cam-groove k until the cam-face i^3 of the spring-pawl i' has encountered the sear i and passed beyond it sufficiently to allow the pawl i' to swing into the path of that sear and bring the cam-face i^3 in front of the forward end of the said sear. During this movement

the trigger-sear h has been advanced into the path of the trigger-lever h^3 above the cam-face h^2 . This movement having brought the lug l' into its fully-locked position, the lock O' is actuated by the spring of the piston O^5 to retreat into locked engagement with the bolt and retain its engagement until, by the discharge of the weapon, a portion of the gas is permitted to escape into the cylinder O^4 and drive the piston forward, thus carrying the lock O' out of engagement with the lug l' and permitting the spring-stop O^6 to rise into the path of the lock and retain it out of action until by the initial part of the rotating movement of the bolt in locking it the lug l' comes into contact with the cam-face 20 on the stop O^6 , causing the stop to be depressed out of the path of the lock O' and permitting the latter to return to reengage with the lug by the reverse movement of the parts. The operating-handle being now in its forward position, as represented in Fig. 2, the loading action is produced as follows: The initial part of the rearward movement of the handle brings the slide I into engagement with the pawl g and causes a rearward movement of the firing-pin to cock the spring H^2 . This movement also brings the cam-face on the under side of the pawl g into engagement with the companion cam-face at the rear end of the slot g' in the bolt, which actuates the pawl to rise out of engagement with the pawl I^2 and permits the firing-pin to engage with the sears i and h . This movement of the slide I causes the projection k' to traverse the cam-groove k and rotate the bolt to its unlocked position. The further rearward movement of the parts causes the cam-studs p^{11} of the pawl I^2 to pass through the cam-sections p^2 of their guides p' , thus causing the projection j' to rise into engagement with the annular recess j in the bolt. The continued backward movement of the parts causes the extractor-studs b^2 to pass into the rear cam extensions p^4 of the guides p^3 , and thereby actuate the spring-ring a^3 to unlock the extractors, and in the rear straight converging parts of the cam extensions p^4 the rear ends of the extractors are caused to swing on their hinges and the forward ends of the extractors to release the flange of the cartridge. At this time the movement of the handle has carried the spring-pawl L back into its cam-slot 78, which permits it to engage with the slotted head u of the carrier-cam bar K^3 . The further rearward movement of the handle carries the levers f^3 into engagement with the cams p^9 and actuates them to release the pin f' , when the continued rearward movement of the handle actuates the pin f' to traverse the slot f^2 , and the spring-pawl L actuates the carrier-cam bar K^3 to cause the pin 5 to traverse the cam-slot K^4 and lift the carrier into position in front of the bore of the barrel.

The firing action is as follows: The firing-spring being cocked and the firing-pin being in engagement with the sears h and i , as shown

in Fig. 15, the initial part of the rearward movement of the operating-handle brings the cam-face i^5 of the spring-pawl i' into engagement with the sear i , and the further movement of the slide I trips the sear i .

The trigger-firing action is as follows: The sear h is carried by the initial part of the rearward movement of the bolt into the path of the vertical movement of the cam-lever h^3 , and this lever is actuated by pressure on the trigger to rise and release the sear, thus accomplishing the trigger-firing of the weapon.

The automatic discharge of the weapon is accomplished by retracting the trigger and moving the lock 12 by means of the button 10 into engagement with the trigger to retain it out of action and moving the cam end of the lever h^3 into the path of the trigger-sear h to cause this sear to be engaged by it, and release the firing-pin by the movement of the handle.

The locking action of the extractors is accomplished as follows: The unlocked position of the extractors is shown in Fig. 16, the lugs on the bolt being then in the unlocked vertical position, and when the bolt is actuated to rotate to its locked position the spring-collar a^3 encounters the shoulder a^2 , and the further rotary movement of the bolt carries the lugs a^4 into locked engagement with the extractors, the rotating of the extractors being prevented at this time by the engagement of the studs b^2 with the guides p^3 . In the reverse or unlocking movement of the bolt the annular groove a permits the spring-collar a^3 to remain in locked engagement at its lugs a^4 with the extractors until the bolt has been fully unlocked and partially withdrawn, when the studs b^2 in passing through the cam parts p^5 of the guides p^3 cause the extractors to rotate, and the shoulder a' prevents the spring-collar a^3 from rotating, thus carrying the extractors out of engagement with the lugs a^4 . The further and final movement of the extractors brings the studs b^2 into engagement with the parts b^4 , when the diminished depth of the latter causes the extractors to release the cartridge.

The shell-starter P, which is auxiliary in its action, is engaged by the initial part of the rearward movement of the pawl I^2 , and it is depressed by means of its cam-face P^3 , causing it to swing on its pivot and the short arm to start the cartridge by engagement with the flange thereof. The movement of the slide I, which permits the entire force of the hand to be exerted on this lever P^2 , is permitted by the straight part at the rear end of the bolt-locking cam-groove k . The cartridges are elevated in the process of loading by the action of the cartridge-follower and its levers m and m' . These levers maintain the required position of the cartridge-shelf m^3 by the action of the spring m^2 , which engages the levers m and m' in the manner described.

While I show and describe in this applica-

tion centrally-hinged shell-extractors attached to a breech-bolt, I do not make claim therefor herein, the same being claimed in a concurrently-pending application, Serial No. 667,361, filed January 20, 1898.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a firearm, the combination of a reciprocating breech-bolt, shell-extractors having collar-sections centrally hinged together, a spring-collar actuating the extractors to engage the cartridge, and means for actuating the extractors to release the cartridge, substantially as described.

2. In a firearm, the combination of the reciprocating and rotating breech-bolt, shell-extractors having collar-sections at which they are hinged together about said bolt, and a spring-collar device on the bolt for engaging the extractors to actuate them to grip a cartridge, substantially as described.

3. In a firearm, the combination of the reciprocating and rotating breech-bolt, shell-extractors on the bolt and a spring-collar in a seat about the bolt, provided with lugs and engaged by said bolt, in its rotary locking movement, to force said lugs into locked engagement with the extractors, substantially as described.

4. In a firearm, the combination of the reciprocating and rotating breech-bolt, shell-extractors having collar-sections at which they are hinged together about said bolt, and a spring-collar in a seat about the bolt, provided with lugs and engaged by said bolt, in its rotary locking movement, to force said lugs into locked engagement with the extractors, substantially as described.

5. In a firearm, the combination of the reciprocating and rotating breech-bolt, shell-extractors having collar-sections at which they are hinged together about said bolt, a spring-collar in a seat about the bolt, provided with lugs and engaged by said bolt, in its rotary locking movement, to force said lugs into locked engagement with the extractors, and a receiver having cam-guides in its side walls engaging said extractors to unlock them, substantially as described.

6. In a firearm, the combination of a reciprocating and rotating breech-bolt, shell-extractors having collar-sections at which they are hinged together about said bolt, a spring-collar in a seat about the bolt, provided with extractor-locking lugs, and a receiver having in its side walls cam-guides for said extractors diminishing in depth toward one end to control the gripping and releasing action of the extractors on a cartridge, substantially as described.

7. In a firearm, the combination of a reciprocating and rotating breech-bolt, shell-extractors having collar-sections at which they are hinged together about said bolt, a spring-collar in a seat about the bolt, provided with extractor-locking lugs, and a receiver having in its side walls cam-guides for said extrac-

tors diminishing in depth and varying in direction toward their rear ends, substantially as and for the purpose set forth.

8. In a firearm, the combination of an actuating-handle, a reciprocating and rotating breech-bolt having a cam-guide, a connecting medium between said bolt and handle carrying a pawl, shell-extractors having collar-sections at which they are hinged together about said bolt, a spring-collar in a seat about the bolt, provided with lugs and engaged by said bolt, in its rotary locking movement, to force said lugs into locked engagement with the extractors, and a receiver having cam-guides engaging said pawl and cam-guides for said extractors diminishing in depth and varying in direction toward their rear ends, substantially as described.

9. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt, a spring-actuated firing-pin in the bolt, a sear engaging the firing-pin, and a connecting medium between said bolt and handle carrying a pawl, a receiver having guide-grooves engaging the pawl and governing its engagement with the bolt, and the said connecting medium engaging the firing-pin to cock the spring and the sear to release it, substantially as described.

10. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt, a spring-actuated firing-pin in the bolt, a connecting medium between said bolt and handle, and a spring-actuated pawl *g* carried by the firing-pin and projecting into the path of said connecting medium to be actuated by it to cock the firing-pin spring, substantially as described.

11. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt, a connecting medium between said bolt and handle, a spring-actuated firing-pin in the bolt, a connecting medium between said bolt and handle carrying a cam-faced spring-pawl, a spring-actuated pawl *g* carried by the firing-pin and projecting into the path of said connecting medium to be actuated by it to cock the firing-pin spring, and a sear for the firing-pin having a cam-face for engagement with said cam-faced spring-pawl to release said sear, substantially as described.

12. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt, a connecting medium between said bolt and handle, a spring-actuated firing-pin in the bolt, a connecting medium between said bolt and handle carrying a cam-faced spring-pawl, a spring-actuated pawl carried by the firing-pin and projecting into the path of said connecting medium to be actuated by it to cock the firing-pin spring, a trigger-sear *h* and a sear *i* for the firing-pin, a trigger for releasing said sear *h* and a cam-face on said sear *i* for engagement with said cam-faced spring-pawl to release said sear *i*, substantially as described.

13. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt,

a connecting medium between said bolt and handle, a spring-actuated firing-pin in the bolt, a sear *i* carried by the bolt to engage the firing-pin and having a cam-faced forward end, and a spring-pawl *i'* on said connecting medium having the cam-faces *i'*⁴ and *i'*⁵ on its head end, and permitting the weapon to be discharged by the rearward movement of said handle, substantially as described.

14. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt, a spring-actuated firing-pin carried by the bolt, a connecting medium between said bolt and handle carrying a pawl, a receiver having guide-grooves engaging the pawl and governing the engagement with the bolt, and the said connecting medium engaging the firing-pin to cock its spring, a sear for the firing-pin, a trigger for controlling said sear, and a locking device for retaining said trigger out of action, substantially as described.

15. In a firearm, the combination of an actuating-handle, a reciprocating and rotating breech-bolt, a spring-actuated firing-pin carried by the bolt, a connecting medium between said bolt and handle, means for compressing the firing-pin spring, a firing-pin sear on the bolt having a cam-faced forward end, a trigger and a connection between said trigger and sear having a cam-face, substantially as and for the purpose set forth.

16. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt operated by the handle, a magazine, cartridge-carrier supported to vibrate between said magazine and the barrel, and a reciprocating bar actuated from said handle and having a cam-slot near its forward end at which it engages said carrier to operate it, substantially as described.

17. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt operated by the handle, a magazine, a cartridge-carrier supported to vibrate between said magazine and the barrel, a spring-pawl carried by said handle and having a cam-face, a companion cam-face in the stock-frame in the path of the cam-face on said pawl, and a reciprocating bar releasably engaged near one end by said spring-pawl and having a diagonal cam-slot at its forward end at which it engages said carrier to actuate it, substantially as described.

18. In a firearm, a cartridge-carrier having a bifurcated spring cartridge-holder and a cam-wedge pivoted between the sides of said holder, substantially as set forth.

19. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt operated by the handle, a magazine, a cartridge-carrier movable between said magazine and the barrel and having a bifurcated spring cartridge-holder and a cam-wedge pivoted between the sides of said holder, and means in the path of movement of said carrier to release said cam-wedge, substantially as set forth.

20. In a firearm, the combination with a reciprocating breech-bolt and its actuating-handle, of a cartridge-magazine containing a spring-actuated cartridge-lifter, a cartridge-carrier movable between said magazine and the barrel, a reciprocating cartridge-feed device, and a magazine cut-off engageable by said feed device to arrest its action, substantially as described.
21. In a firearm, the combination with a reciprocating breech-bolt, its actuating-handle and the connecting medium between them, of a cartridge-magazine containing a spring-actuated cartridge-lifter, a cartridge-carrier movable between said magazine and the barrel, a reciprocating cartridge-feed device having a spring-stud normally engaging said connecting medium, and a magazine cut-off having a cam-face c^5 and adjustable into the path of said spring-stud to engage it and withdraw it from engagement with said connecting medium, substantially as described.
22. In a firearm, the combination with a reciprocating breech-bolt, its actuating-handle and the connecting medium between them, of a cartridge-magazine containing a spring-actuated cartridge-lifter, a cartridge-carrier movable between said magazine and the barrel, a reciprocating cartridge-feed device having a spring-stud normally engaging said connecting medium, and a magazine cut-off adjustable into and out of the path of said stud and comprising a block c^4 having notches 8 and 9 engageable by a spring-stud c^6 , a cam-

notch c^5 and an operating-handle c^3 protruding through an opening c^7 in the rear end of the receiver, substantially as described. 35

23. In a firearm, the combination of an actuating-handle, a reciprocating breech-bolt having a cam-groove k , a connecting medium between said handle and bolt engaging said groove, a pawl carried by said connecting medium and engaging with the bolt, a receiver having in its side walls cam-guides for said pawl, and a shell-starter pivotally supported in the receiver to engage the flange of a cartridge and having a cam-face at its rear end extending into the path of said connecting medium to be engaged thereby to start the shell, substantially as described. 40 45 50

24. In a breech-loading firearm, the combination with the reciprocating and rotating breech-bolt and its locking means, of a tube O^3 extending along the barrel B and containing a reciprocating stem O^2 provided at one end with a lock to engage a lug on the bolt in a chamber O in the receiver and carrying at its opposite end a piston O^5 , a cylinder O^4 in which said piston is confined against a spring and communicating with said barrel through a port z and with the outer air through a port z' , and a spring-controlled stop O^6 in said chamber, substantially as described. 55 60

SAMUEL N. McCLEAN.

In presence of—

SYLVESTER BARBOUR,
HAROLD F. C. FLINT.