

G. HAMMOND.
AUTOMATIC GUN.
APPLICATION FILED JUNE 12, 1909.

954,799.

Patented Apr. 12, 1910.

6 SHEETS—SHEET 1.

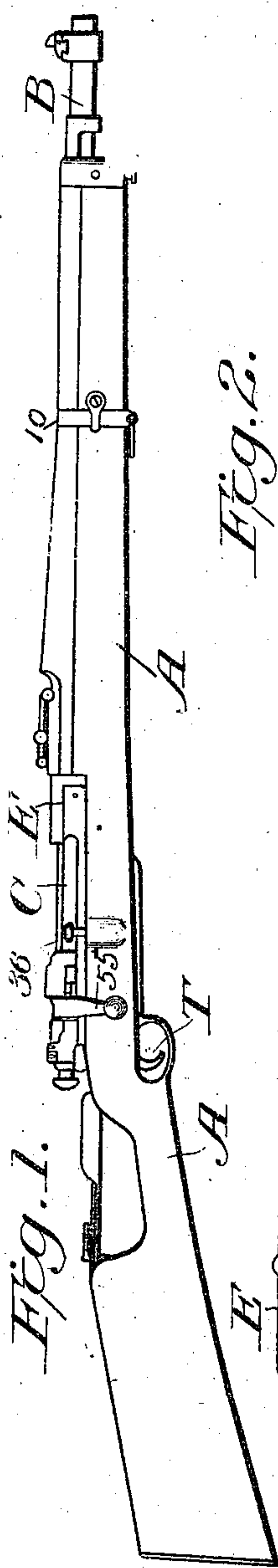


Fig. 2.

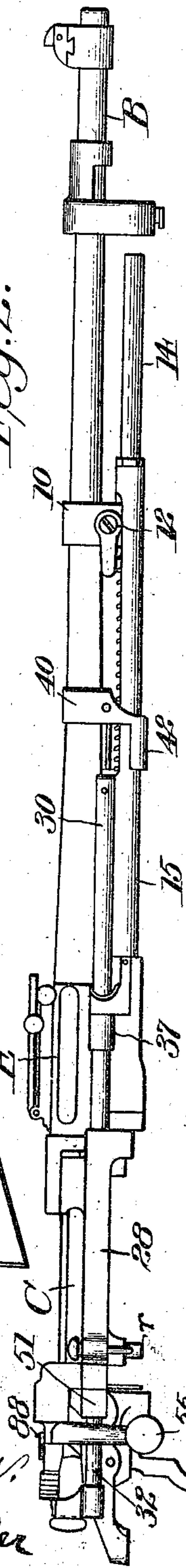


Fig. 3.

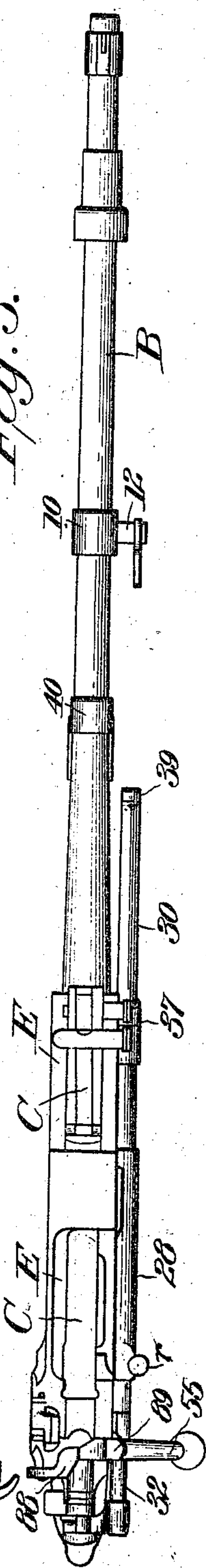


Fig. 4.

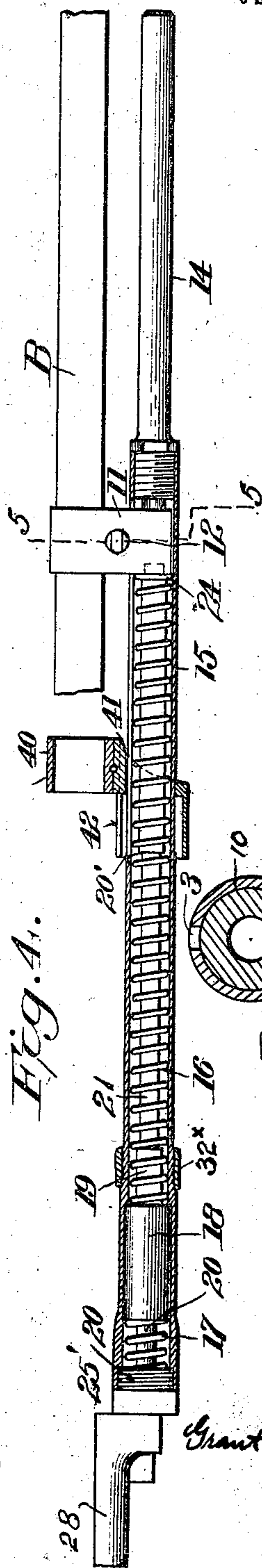
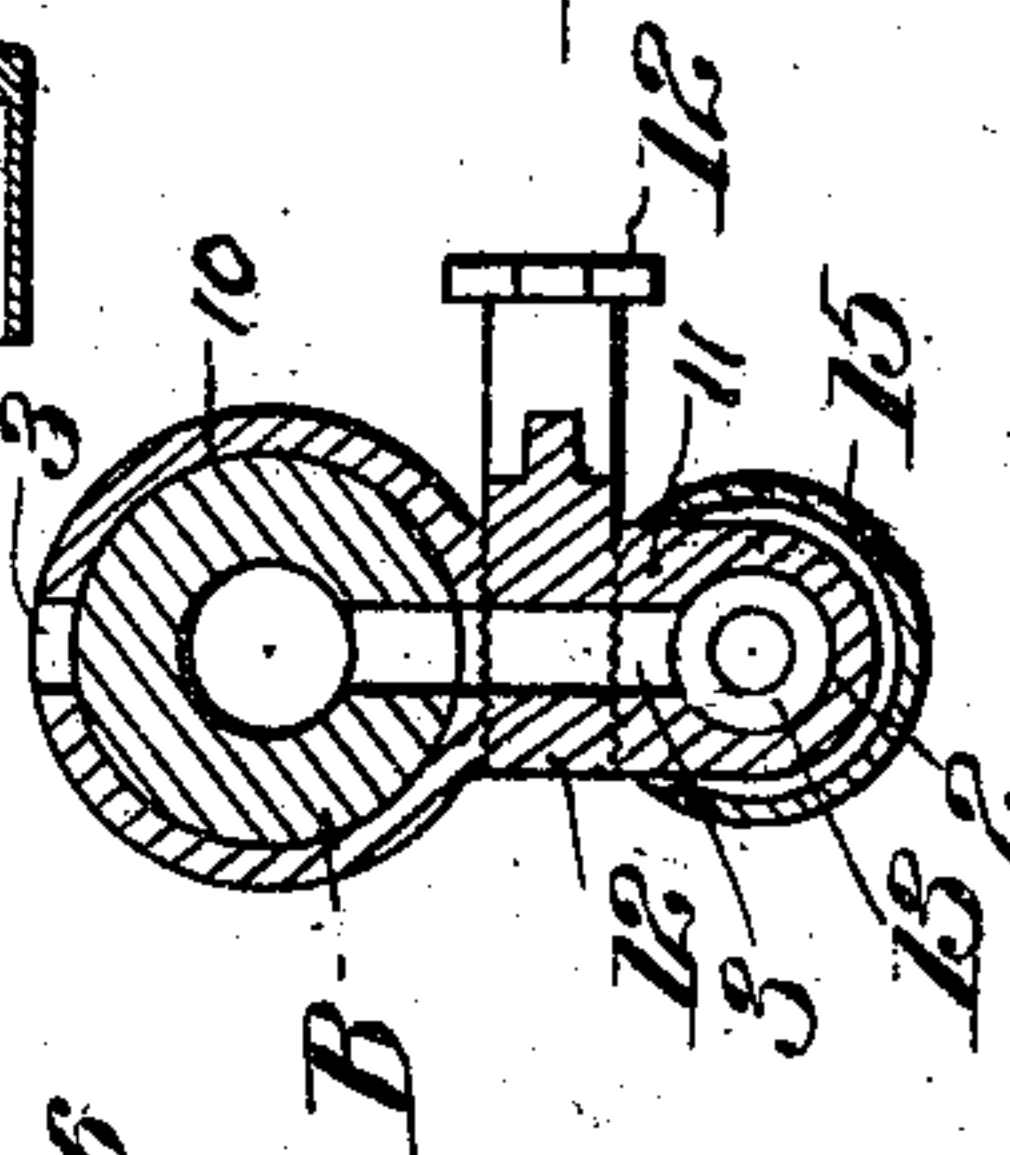


Fig. 5.



Witnesses

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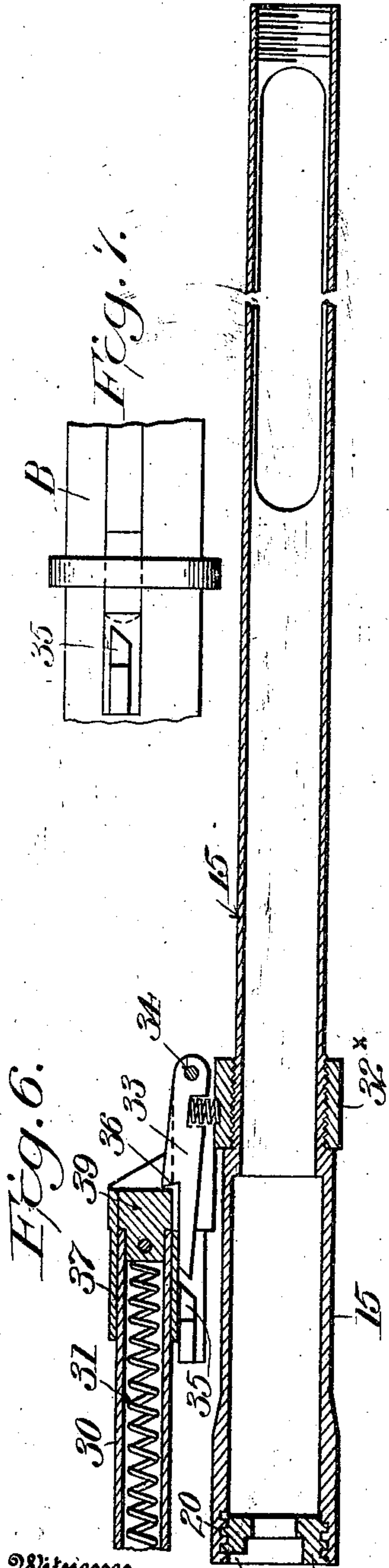
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6 SHEETS—SHEET 2.



Witnesses

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J. V. Fowler

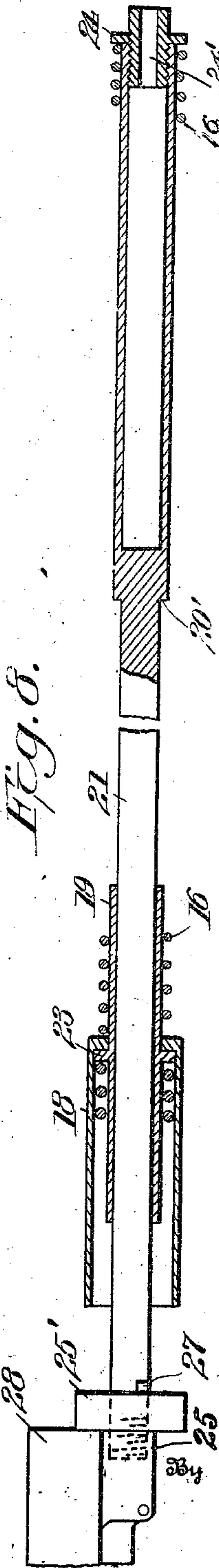
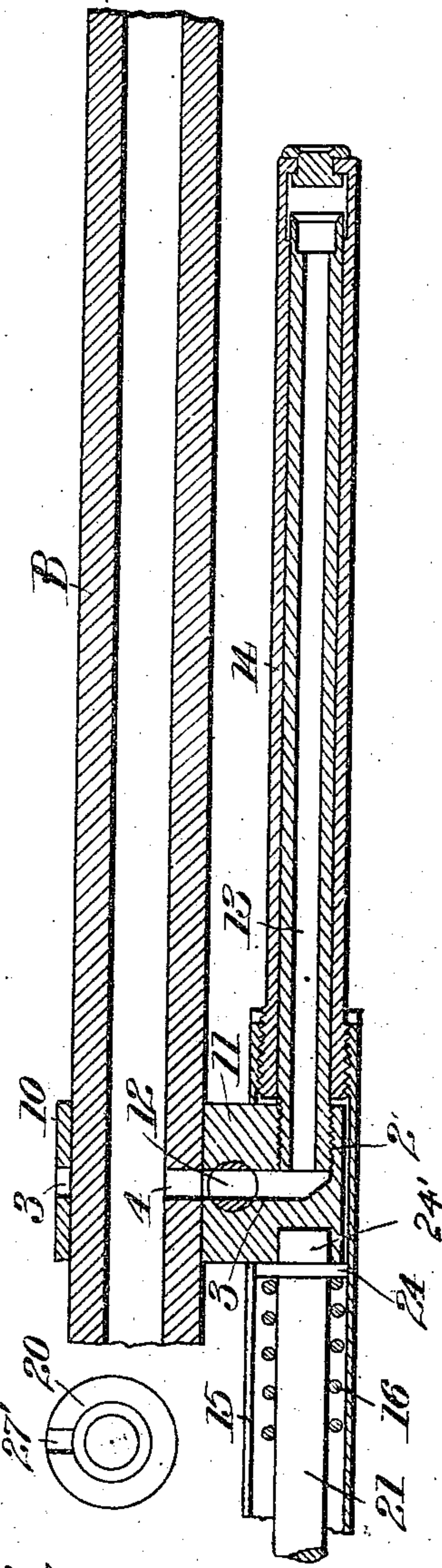


Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.



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6 SHEETS—SHEET 3.

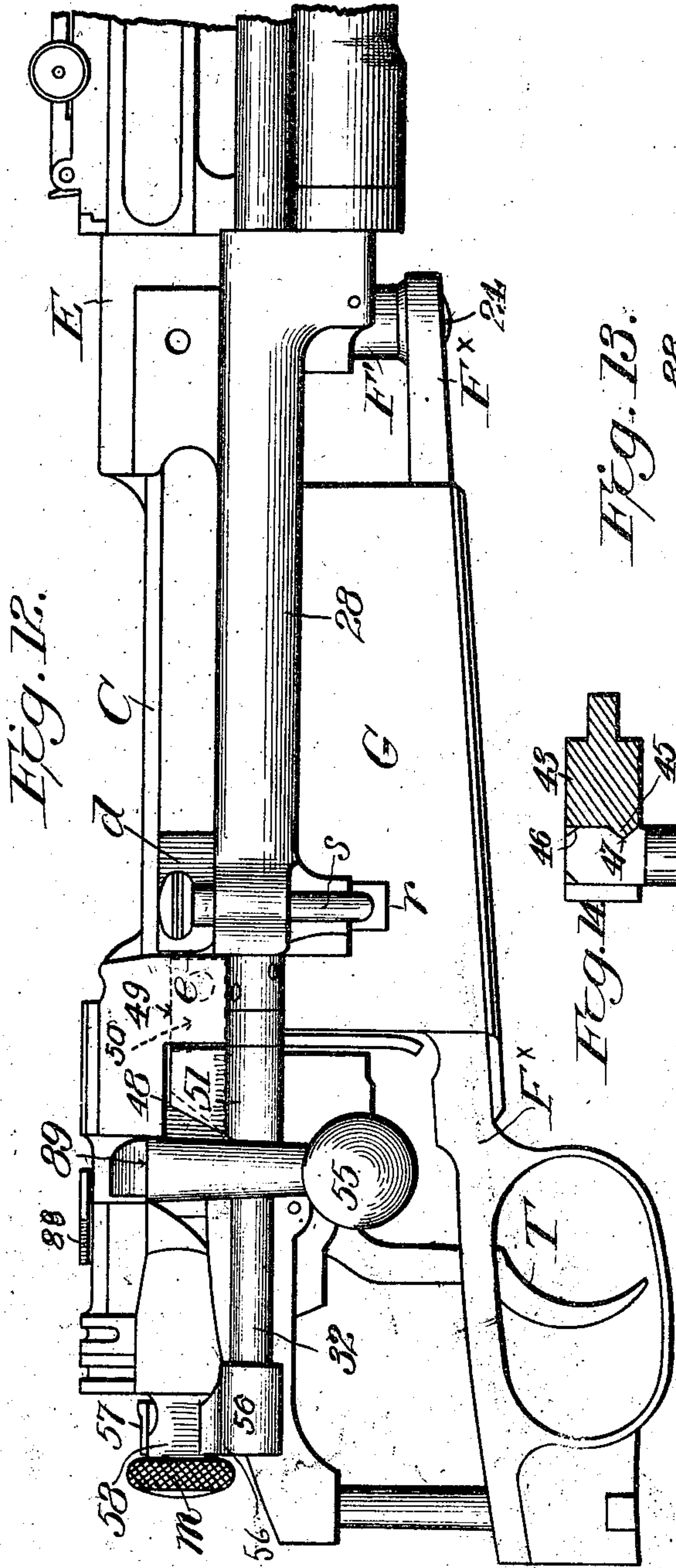


Fig. 13.

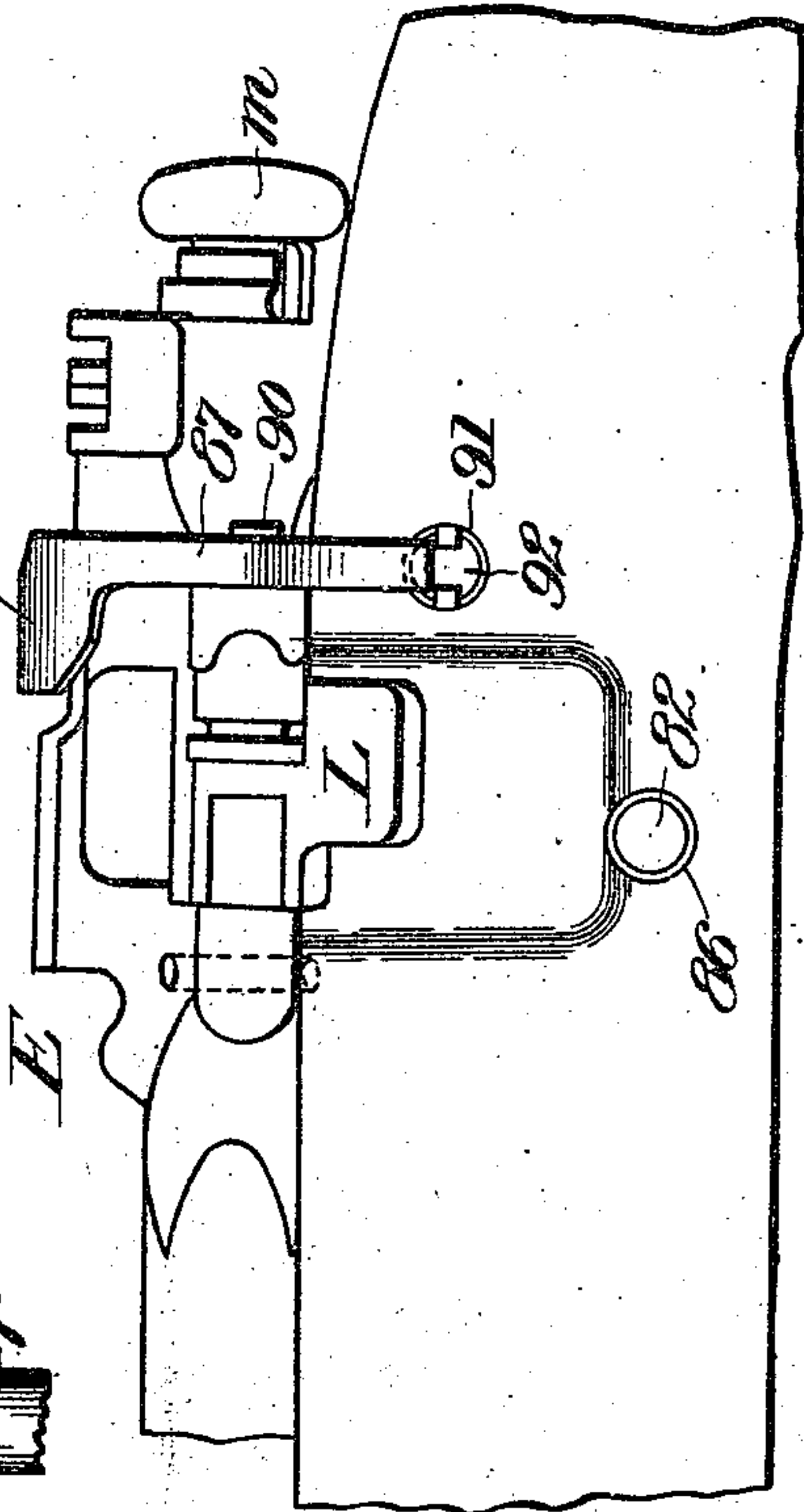


Fig. 14.

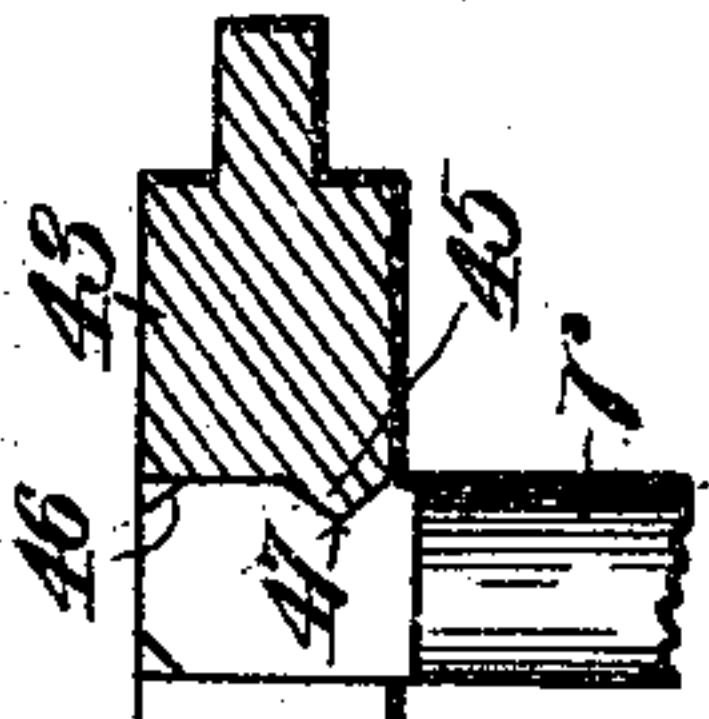
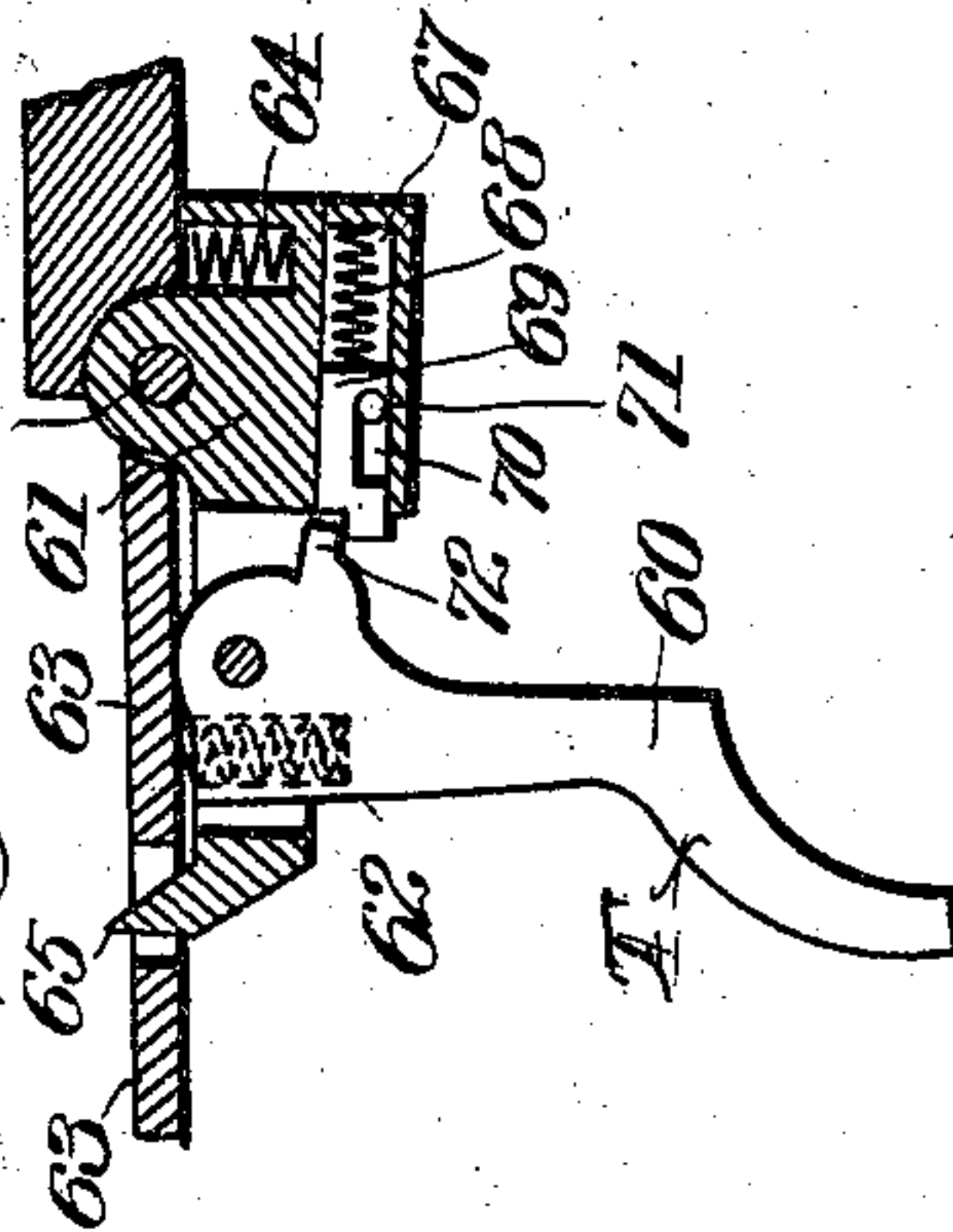


Fig. 15.



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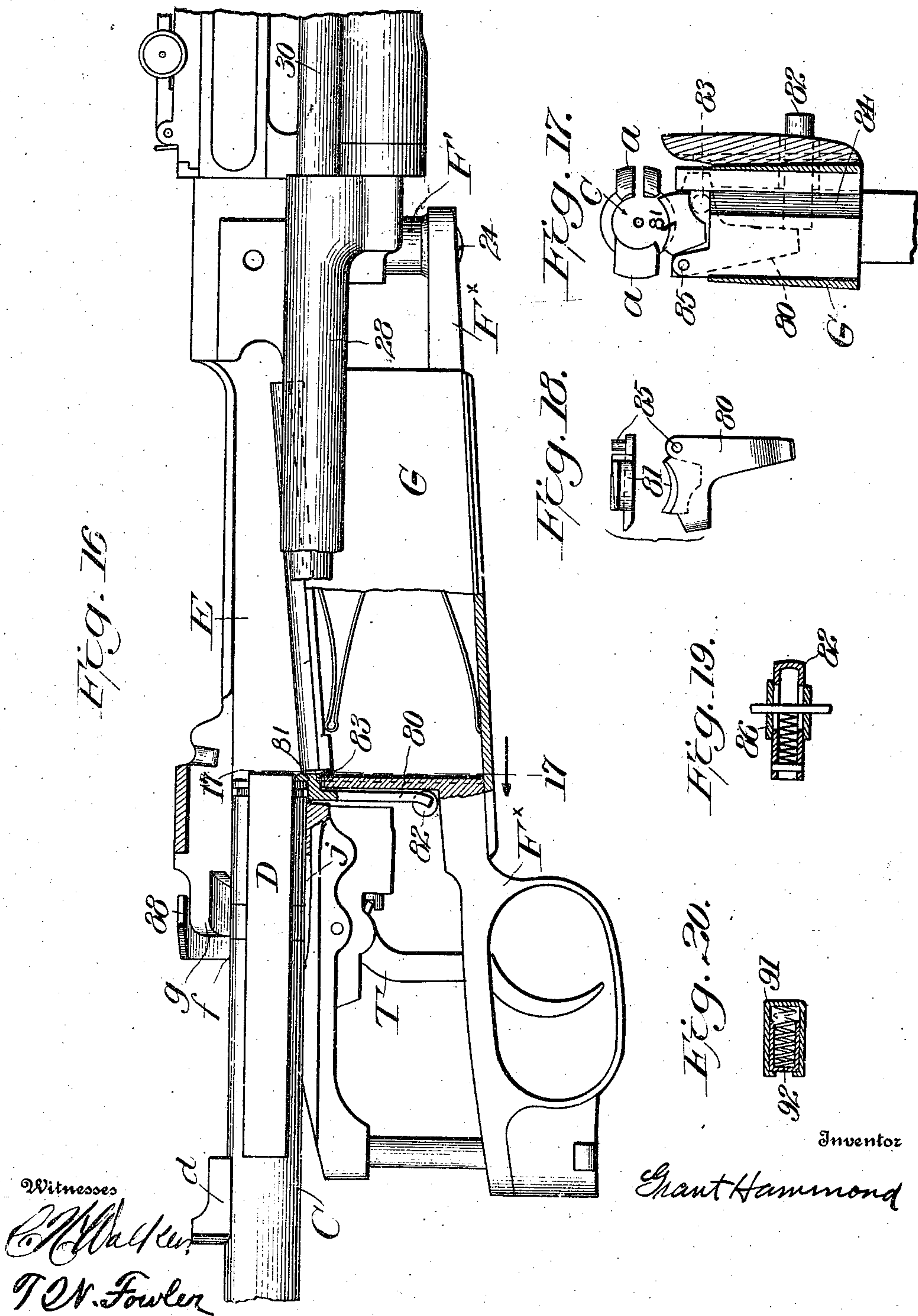
Witnesses

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6 SHEETS—SHEET 4.



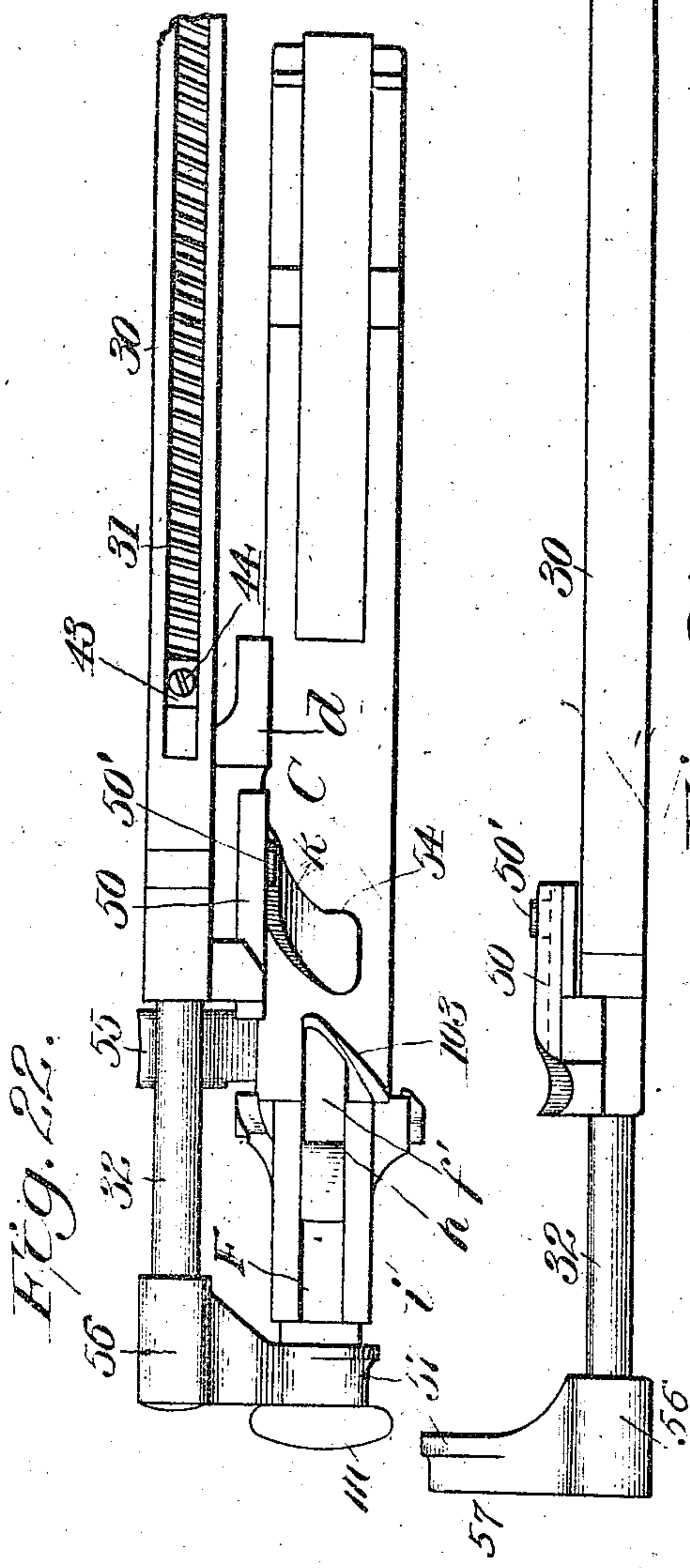
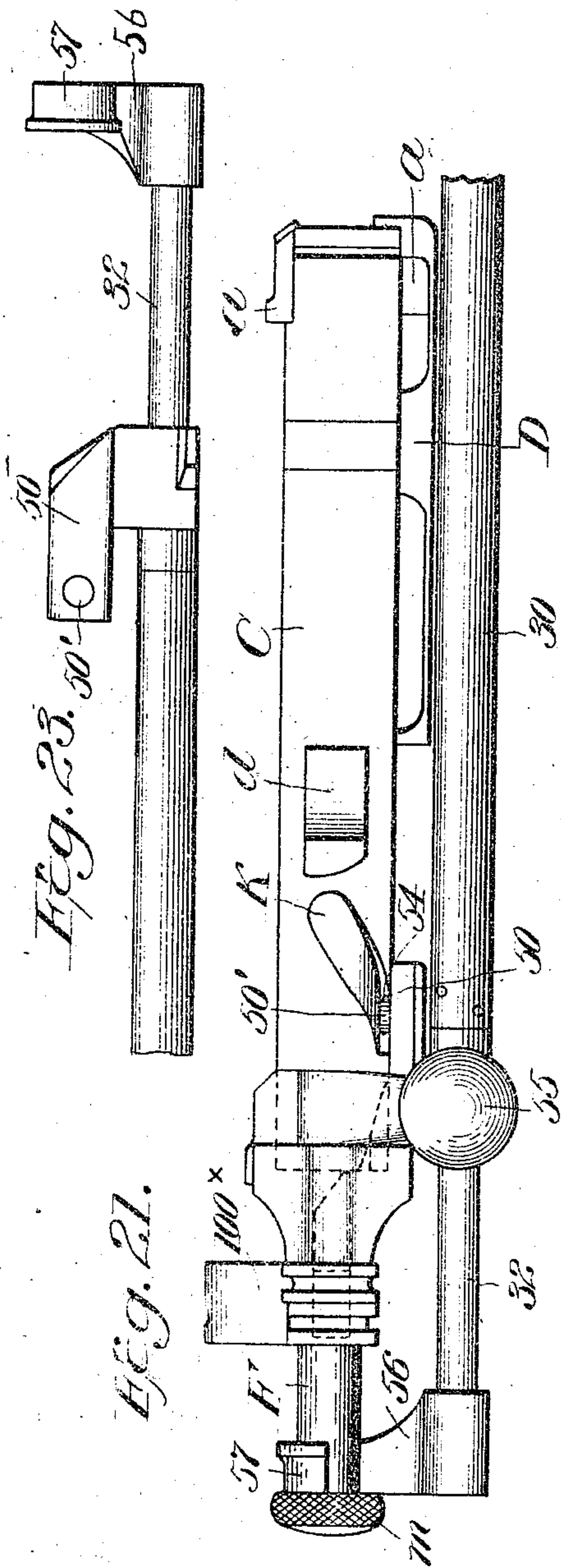
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Patented Apr. 12, 1910.

6 SHEETS—SHEET 5.



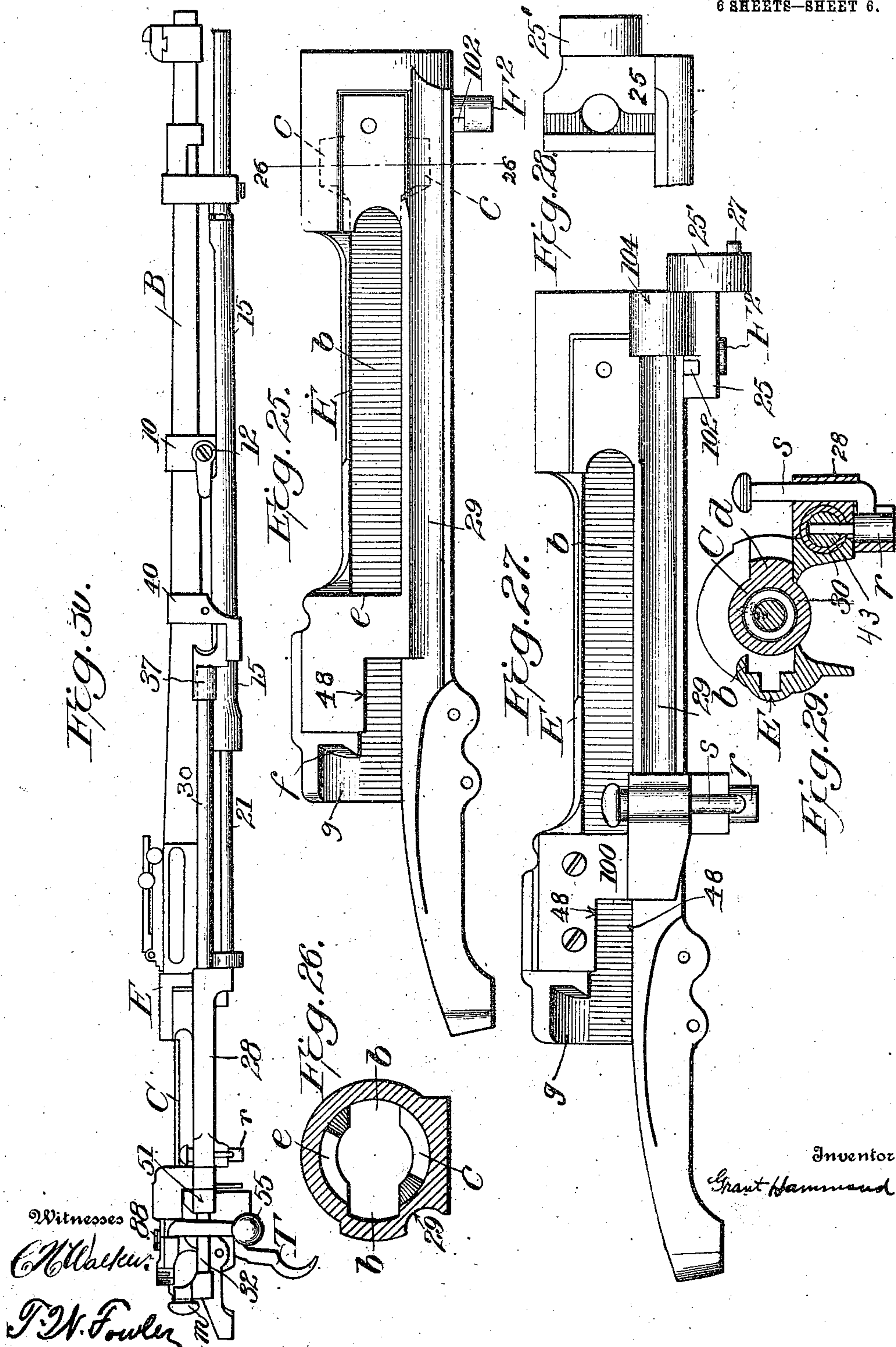
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Patented Apr. 12, 1910.

6 SHEETS—SHEET 6.



UNITED STATES PATENT OFFICE.

GRANT HAMMOND, OF HARTFORD, CONNECTICUT.

AUTOMATIC GUN.

954,799.

Specification of Letters Patent. Patented Apr. 12, 1910.

Application filed June 12, 1909. Serial No. 501,835.

To all whom it may concern:

Be it known that I, GRANT HAMMOND, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Automatic Guns, of which the following is a specification.

My invention relates to fire-arms and particularly to an attachment to the Springfield rifle or other rifles of like type now in use; in other words, the present invention comprehends and includes a mechanism which is capable of being attached to the guns now in use, as well as to other types of guns hereinafter constructed and which mechanism is designed to make such guns automatic in action and to convert the ordinary magazine gun into an automatic gun wherein the power required for rotating and reciprocating the breech-bolt, and retracting the firing-bolt against the tension of its main spring, is derived from the expansive force of the gases of an exploded charge forcing a slidable mechanism forwardly and storing power in a spring, or springs, sufficient to turn and reciprocate the breech-bolt.

The primary object of the invention is to provide a mechanism of simple character which is capable of attachment to existing types of magazine guns and which may be applied thereto at slight expense and with but little alteration of such guns, whereby the gun may be converted into an automatic gun, when desired.

A further object of the invention is to provide means whereby the automatic attachment may be instantly thrown into or out of connection with the gun-action to speedily convert the gun from a single-firer to automatic, and vice-versa, and to semi-automatic.

With the above and other objects in view, my invention consists of the parts and the constructions, arrangements and combinations of parts which I will hereinafter describe and claim.

In the accompanying drawings forming a part of this specification and in which similar reference characters indicate like parts in the several views; Figure 1 is a side elevation of a gun embodying my invention. Fig. 2 is an enlarged view of the gun mechanism removed from the stock. Fig. 3 is a top plan view of Fig. 2. Fig. 4 is a sectional

view of the slidable casing 15 and of the sleeve 40, showing the power and buffer springs and other features in elevation. Fig. 5 is a cross sectional view on the line 5—5 of Fig. 4. Fig. 6 is a sectional view of the sliding casing 15 and part of the operating rod 30, showing the rod in its latched position. Fig. 7 is a detail showing in bottom plan the cam 35. Fig. 8 is a part sectional view and part elevation of the operating rod 21 and its adjuncts. Fig. 9 is a sectional view showing a portion of the slidable casing 15 and its front sleeve, and showing also the gas chamber and parts of the gun barrel and connections. Fig. 10 is an end view of the block 20. Fig. 11 is an end view of the rod 21. Fig. 12 is an enlarged side elevation showing the rear portion of the gun mechanism in position in the receiver, the stock being removed. Fig. 13 is a side view of the rear end of the receiver showing the wing-cam and cut-out. Fig. 14 is a detail showing the piece 43 in section and in engagement with the coupling bolt. Fig. 15 is a sectional view of the trigger mechanism. Fig. 16 is a side elevation partially in section of the gun mechanism showing the bolt retracted. Fig. 17 is a cross sectional view on the line 17—17 of Fig. 16. Fig. 18 represents details of the bolt stop. Figs. 19 and 20 are details hereinafter referred to. Fig. 21 is a side elevation of the breech-bolt and the parts carried thereby. Fig. 22 is a plan view of Fig. 21. Fig. 23 is a bottom plan view showing the plate 50 and part of the operating rod. Fig. 24 is a top plan view of the same. Fig. 25 is a side elevation of the receiver. Fig. 26 is a cross section of the receiver on the line 26—26 of Fig. 25. Fig. 27 is a side elevation of the receiver of slightly modified form. Fig. 28 is a plan view of the block 25. Fig. 29 is a cross sectional view through the receiver and breech-bolt, showing the coupling bolt in engagement with the rod 30. Fig. 30 is a side elevation of the gun removed from the stock showing the position of the parts when the bolt is retracted.

In the accompanying drawings, I have illustrated my invention as attached to the well known Springfield rifle, or U. S. service gun, but it will be understood that the invention is not restricted to this type of guns; that the showing is merely for illustrative purposes, and that the attachment can be

applied to any magazine or other gun with but a slight modification in the construction of the same.

The gun herein shown being well known both as to its construction and operation, I do not illustrate its internal arrangement minutely nor will I attempt to describe its action in detail, but I will only fully show and describe those salient parts of the same with which my attachment is most intimately connected and which may require some changes to adapt the attachment thereto.

The gun will, of course, include a suitable stock, A, barrel B, breech-bolt, C, extractor, D, trigger-mechanism, T, and the usual adjuncts of a gun of this type, and all of which, except as hereinafter noted, will be of the construction usually found in such guns, and the details of which need not be specifically described and shown; but the real invention, namely the attachment itself will be described in more or less detail that its construction, operation and advantages may be fully understood. The breech-bolt, C, is slidably mounted in the receiver, E, and at its forward end it is provided with the lugs *a* which slidably fit the longitudinal grooves *b*, which are usually formed along the inner sides of the receiver, to accurately guide the breech-bolt in its sliding movement after said bolt has been partially turned—say 90° to unlock it, said grooves, *b*, connecting at their forward end with the usual transverse or cam-grooves *c*, behind the shoulders of which the lugs, *a*, engage when said lugs are brought into register with the cam-grooves and the bolt is turned about its axis, as I will hereinafter describe. The breech-bolt also has the usual cam lug *d* arranged at right angles to the lugs *a* and adapted to engage the wall *e* at the back end of the cut-away portion of the receiver. The rear end of the receiver has a circular opening *f* to admit the breech-bolt, from which opening radiates the groove or channel *g*, to receive the lug *d*, on the central portion of the breech-bolt. Within the breech-bolt is slidably mounted the firing bolt, F, having the usual projecting lug *h* on its bottom side projecting through a bottom slot in the breech-bolt cap *i*, and operating in a suitable guide *j* in the tail-extension of the receiver. The breech-bolt has the spiral groove *k*, and cocking cam 103, and the firing bolt has the usual cocking head *m*, and such other parts as will be usually found in a gun of the type shown, but which parts are not of my present invention.

My automatic attachment is fitted to the barrel, B, of the gun by suitable means as by a tight-fitting sleeve 10, which is formed rigid with a bottom lug, 11. This lug is bored horizontally at 2 whereby the axis of said bore will be parallel with that of the gun barrel when the sleeve, 10, is in position

on the latter. The lug and sleeve are also pierced by a hole, 3, which is bored from the upper side of the sleeve through the upper portion of the lug and until it intersects the bore, 2, said hole, 3, being designed to register with a corresponding gas-port, 4, made through the underside of the barrel and leading into the bore of the latter, the gas-port in the barrel and the hole in the lug being of such area as to provide for a rapid exhaust of the gases of a previous exploded charge after the bullet propelled by said charge has passed the muzzle of the barrel, as I will hereinafter describe.

Mounted in the lug 11, is a valve 12 which is shown as of the turning-plug type, said valve having a port in it adapted to register with the gas-port, 4, and the port 3, leading into a gas-chamber hereinafter mentioned. The valve has a suitable stem provided with a handle which lies on the outside of the stock; the essential object of the valve is to enable the gases of the exploded charge to be throttled, and to be admitted to the said gas-chamber in such proportion or amount as the firing condition of the gun makes desirable. Thus the valve may be turned to open the gas-passage to its full capacity or to open the passage only partially; the valve may also be turned to close the gas passage entirely, as when the automatic attachment is not in action and the gun is being used as a hand-operated gun.

Into the bored and tapped lug, 11, is screwed the rear end of a gas tube, 13, which projects a suitable distance forward of the lug and which tube incloses a chamber into which the gases of an exploded charge will rush (the valve, 12, being then open) under compression when the bullet uncovers the gas-port in the barrel and communication is established between the bore of the barrel and the gas-chamber of said tube.

The gas-tube, 13, is by preference, made of non-rustable steel and may be bored out at the front end to form relatively thin walls which are exposed to gas-pressure and are designed to be expanded thereby against the walls of an inclosing sleeve, 14, to form a gas-tight joint and prevent leakage of gas at this point, and to form a scraper for any deposit on the walls of the sleeve, 14, and which latter sleeve has a close sliding fit with the interior gas-tube, 13.

The rear end of the tube, 13, is threaded and is screwed into the downwardly extending lug, 11, of the barrel sleeve, 10, as shown in Fig. 9. The rear end of the sleeve, 14, is also threaded and is designed to screw into the similarly threaded front end of a tubular casing, 15, in which is placed the power spring, 16, the chamber of this casing being slightly enlarged at the rear end to receive the buffer-spring, 17, the chamber of the casing at this point being sufficiently

large to permit the buffer (by which term I will hereinafter designate this part) and a casing, 18, carried thereby, to be freely slipped into the chamber from the rear. The buffer casing, 18, has a solid front end through which a hole is bored, the hole being of sufficient diameter to slide freely over the front end of the flanged sleeve, 19, which compresses the buffer, and the operation of which sleeve I will hereinafter describe.

A threaded plug, 20, screws into the rear end of the casing, 15, and forms a seat or abutment for the rear end of the buffer. Arranged axially in the casing 15 is a rod, 21, the rear end of which slidably fits an opening in the plug, 20, said rod extending substantially the full length of the casing and having a shoulder formed on it at 20' by turning down the rear portion of the rod. The power spring, 16, surrounds the rod, 21, and the reduced end of the rod has a sliding fit through the sleeve, 19, (Fig. 8) which is formed with a centrally located collar, 23, adapted to seat against the inside of the closed front end of the buffer-casing, 18; the sleeve thus has one portion projecting in front of the buffer-casing, and another and rear portion inclosed by this casing, the front end of the buffer entering the space between the sleeve and casing and bearing against the collar, 23, of the sleeve and which collar thus serves as an abutment for the buffer. The rod, 21, also has a collar or flange, 24, a short distance back of its front end adapted to seat substantially against the rear face of the lug, 11, on the bottom of the barrel sleeve, said collar or flange thereby serving as a stop for the front end of the power spring, 16.

As shown in Fig. 8 the rod, 21, is turned down at an intermediate portion to form the shoulder, 20', which serves as a stop against which the front end of the sleeve, 19, strikes when the gun is fired and the casing, 15, is pulled forwardly, by the expansion of the gases of the exploded charge, said shoulder serving as a stop for limiting the forward movement of the casing and determining the extent of compression of the power spring, 16, and also the compression of the heavier buffer, 17, and which compression is effected by the continued forward movement of the casing, 15, while the buffer casing sleeve, 19, is being held stationary against the stop or shoulder 20' of the rod, 21, before described.

The rod, 21, projects beyond the rear face of the plug, 20, and is screwed or otherwise fixed to the front end of a piece, 25, having a transverse groove or channel to receive a like lug, 102, formed on the under side of the forward end of the receiver, E, of the gun, and which receiver may be of the usual construction. The for-

ward end of the piece, 25, is shown as having a threaded opening to receive the rear threaded end of the rod, 21, while the front end of said piece, 25, has a square-faced shoulder, 25', which seats closely against the screw plug, 20, of the sliding casing, 15. The piece, 25, also has a driven pin, 27, which projects slightly past the shoulder, 25' and is adapted to engage in a corresponding recess or slot 27' cut in the rear face of the screw plug 20, to thereby form a locking connection which is useful in unscrewing the plug from the rear end of the casing, 15.

By reference to Figs. 2, 3, 12, 16 and 30 it will be seen that the piece, 25, has fixedly secured to it a rearwardly extending piece, 28, of tubular form and which lies alongside of the receiver and forms a casing over the longitudinal groove or channel, 29, the operating rod, 30, passing through the casing, 28, and being slidably guided in the same and in the aforesaid groove or channel, 29, said casing being enlarged or thickened at its rear end, to form a bearing and guide for the coupling pin *r*, vertically disposed and provided with a round stem *s*, having a head by which it may be manipulated. The upper projecting portion of this pin also serves as a stop for the ejected shells, which are thrown out of the receiver with such force as to be liable to seriously injure a bystander if the pin, or an equivalent part was not interposed to stop the momentum of the shell. In Fig. 27, the coupling pin *r*, is carried by a bracket 100 which is screwed or otherwise fixed to the receiver. At the front under side of the receiver is formed a transverse lug 102 which is designed to engage a corresponding groove in the upper surface of the rear end of the end block, 25, which block is rigid with the square-face head 25' and has the pin 27 to engage the screw-plug 20. The block, 25, also has a tubular guide 104 for the operating rod 30. Also, as shown in Fig. 12, the piece, 25, is further held in position by the forward end of the usual trigger-guard plate, F', having a post F', through which the screw, 24, passes to thereby secure the magazine, G, of the gun to the receiver; this magazine and trigger-guard plate may be of the form usually found in guns of the character shown and previously mentioned, and they form no part of my present invention.

To the slidable casing, 15, forward of the rear end thereof, is screwed or otherwise secured the sleeve portion of a bracket or arm, 32*, said bracket or arm being arranged diagonal to the casing and being bifurcated or forked to admit a longitudinally disposed latch-lever, 33, the front end of which is pivotally mounted on the pin, 34, while the rear end extends beyond the bracket and has a beveled rear extremity adapted to be en-

gaged by a lug, 35, arranged in its path and secured to the under side of the gun barrel. The latch or lever also has a shoulder or notch, 36, on an intermediate part adapted to engage the front end of the operating rod, 30, as I will hereinafter describe. The diagonal arm or bracket, 32*, is also provided at its upper end with a rearwardly extending tubular portion or sleeve, 37, in which the forward end of the rod, 30, is slidably guided, said rod lying parallel with the barrel and the slidable casing, 15, and containing the spiral spring, 31.

Fitted into the rear end of the rod, 30, is a solid rod, 32, which extends far enough thereinto to receive a couple of rivets. The driving rod, 30, is hollow and is slotted at its rear end sufficiently to permit the breech-bolt to make its full stroke, the aforesaid slot being formed in the under side of the rod. Inside of the rod, 30, the return spring 31 operates, the rear end of the spring contacting with a small bifurcated piece, 43, through which the coupling pin, *r*, slips. The front end of the rod, 30, has a solid plug, 39, which is pinned in place.

Slightly forward of the front end of the driving rod, 30, a light tight-fitting sleeve 40 is pinned to the barrel, the bottom of said sleeve projecting downwardly and having a dove-tailed slot milled in its face and into which slot fits a lug, 41, of corresponding width and shape carrying a sleeve, 42, whose front end is bored out to permit of the forward end of the casing, 15, reciprocating through it, said sleeve having its rear end bored to a larger diameter; and at a diagonal point from its center the sleeve is slotted to allow the enlarged rear end of the casing, 15, and the sleeve of the bracket or arm 32* to pass into it, thereby forming a guide for the casing, 15, in the first part of its operation in unlocking the breech-bolt. I also place within the rear end of the hollow rod forward of the front end of the solid rod, 32, a short cylindrical piece, 43, of about the interior diameter of the rod, 30, and against the solid forward end of which the spring, 31, suitably seats. The rear end of the piece, 43, is slotted to form two parallel forks (Fig. 14), the slot of the fork lying in register with a slot formed in the underside of the rod, 30, and the short piece, 43, being prevented from turning in the bore of the rod, by means of a screw or pin, 44, the head of which is substantially flush with the outside of the rod, 30, and the sides of the head being substantially in sliding contact with the walls of the slot in the rod.

The lower end of the aforesaid coupling-pin, *r*, is offset and carries an upwardly extending stem *s*, which is arranged parallel with the pin and is spaced therefrom a suitable distance, said pin being normally in register with the longitudinal slot in the bottom

of the operating rod, 30, and the slot in the rear end of the piece, 43, against the front end of which the spring, 31, constantly bears, said piece, 43, having the front wall of its slot provided with a cam-projection, 45, (Fig. 14) and said coupling pin *r*, having a cam-surface, 46, to engage the projection, 45, and a notch, 47, to receive the same, when the stem, *s*, is pulled upward to cause the pin *r* thereof to slidably enter the slot made through the rear end of the cylindrical piece, 43, whereby the parts are held firmly in contact by the pressure of the spring, 31.

One side of the rear end of the receiver is formed with a slot, 48, which extends through the rear end of said receiver, and in the inner wall of this portion of the receiver being formed with a groove or channel, 49, in which is slidably mounted a piece, 50, of substantially trapezoidal form, one portion of which extends transversely from its side through the slot, 48, and is thence turned downwardly and provided with an enlarged portion, 51, which is bored to receive the solid rod, 32, which projects from the rear of the operating hollow rod, 30, and is pinned to the latter to make it substantially a rigid part of the operating rod. The enlarged portion of the piece, 50, has an inwardly extending flange, 52, which slidably engages under a shoulder extending longitudinally along the side of the tail extension of the receiver. The inner face of the trapezoidal piece, 50, is milled to conform to the outer surface of the breech-bolt, C, and said face is provided with an inwardly projecting stud, 50', which engages and operates in the spiral groove, *k*, cut in the outer surface of the rear end of the breech-bolt, and is designed to engage behind a square shoulder portion, 54, of said groove. By reference to Fig. 22, it will be seen that the groove, 53, is not of uniform width, but the side walls are of unequal angles so as to make the upper end of the groove of slightly greater width than the lower end, the width of said groove gradually increasing toward said upper end, for purposes which, and of the shoulder, 54, I will hereinafter state.

The operating lever or handle, 55, for the breech bolt is rigid therewith, as usual in the type of gun shown, and the point of the inclined rear end of the trapezoidal plate, 50, lies normally about 1/16 inch in advance of the under part of the lever or handle, 55, and forms the entering point of a wedge or inclined plane and is adapted to impart to the lever or handle a powerful initial lifting movement in unlocking the breech-bolt.

It will be seen from Figs. 12, 22 and 23, that the rear end of the solid rod, 32, has strongly pinned to it a piece, 56, which extends under and projects diagonally toward the axis of the firing-bolt, F, which is of the

construction usually found in the type of gun illustrated, said piece, 56, having a segmental outer end, 57, which substantially incloses about two-thirds of circumference of that portion of the firing-bolt just in advance of the cocking head *m*; the upper side of this portion of the firing-bolt is flattened at 58, Fig. 12, to facilitate the speedy removal of the operating rod, 30, from the firing-bolt, for by turning the parts until the open-portion of the end, 57, is in register with the flattened portion, 58, of the bolt, the disengagement of the parts is quickly effected.

Referring to the trigger-mechanism of Fig. 15, the trigger, 60, is pivotally mounted within the sear bar, 61, and has a spring, 62, seated in its upper rear face where it contacts with the under side of the tail strap, 63, of the receiver; the forward end of the sear-bar also carries a spring, 64, which is designed to contact with the under-side of the receiver, the sear-bar being recessed to receive this spring. As the sear-bar is pivoted to the receiver rearward of the spring, 64, it is manifest that the sear-bar is forced up in the usual manner to cause its sear, 65, to contact with and engage the usual lug, *h*, on the under side of the firing-bolt and thereby hold the piece in cocked position ready for firing. In the underside of the sear-bar is bored a longitudinal hole, 67, into which is fitted a spiral spring, 68, adapted to operate against the inner end of a pin, 69, slidably mounted in the hole, 67, to thereby normally force the pin rearwardly, until the end wall of a slot, 70, in the pin contacts with a pin or stop, 71, and thereby limits the rearward movement. The trigger is pivoted to the tail strap of the receiver, and when it is pulled rearwardly to lower the sear, 65, and release the firing-bolt, a projection, 72, on the front of the trigger presses down in a notch formed in the upper rear angle of the spring-pressed pin, 69, and thereby rocks the sear-bar about its pivot, 73, to cause the sear at the rear end of the sear-bar to release the cocked firing-bolt. Simultaneously with the release of the sear, the projection, 72, rides out of contact with the spring-pressed pin, 69, when the spring 64, at the front of the sear-bar operates to return this bar and its sear to normal position, to again intercept the lug on the firing-bolt on the return of the bolt and complementary mechanism to locked position. When the trigger is released by the finger of the operator, it is forced forward by its own spring, 62, and its front projection, engages and pushes in the spring-pressed pin, 69, until the projection, 72, escapes by the rear end of the same and enters the notch thereon, when the trigger is again in position to be pulled backward to fire the gun.

In order that the breech-bolt may be held open after the last cartridge has been fired from the magazine, I employ a bolt-stop which is herein shown as being in the form of a lever, 80, pivoted to the receiver and having an upper flanged portion, 81, which is designed to project into the path of movement of the breech-bolt when the latter is retracted, or open, to thereby prevent the return or forward movement of the said bolt. The long arm of the lever or bolt-stop extends down along side the rear wall of the magazine, *G*, and the free end of said long-arm is adapted to be engaged by a transversely slidable releasing pin, 82, mounted in the gun-stock and projecting from the gun beyond the outer side thereof. The bolt-stop is raised into the path of the front end of the breech-bolt so as to engage the same, by a pin or lug, 83, which is fixed to and projects slightly beyond the rear end of the spring-supported magazine floor, said pin or lug sliding in a vertical groove or channel, 84, in the rear wall of the magazine. When the final cartridge has been fired from the magazine the projecting pin on the floor of the magazine, rides under the arm of the bolt-stop thereby rocking the lever, 80, about its pivot, 85, and causing the upper flanged end of the stop to be projected far enough to afford a stop for the front end of the breech-bolt whereby the bolt remains in its most rearward position and with the magazine wide open for the reception of a new clip of cartridges, and the magazine floor is free to be depressed to receive the same. The long arm of the bolt-stop or lever is, as before mentioned, designed to be engaged by the spring-pressed pin, 82, which is held in position by a thin casing, 86, which tightly fits a hole bored through the left side of the gun stock; when the magazine floor raises the bolt-stop into its effective position, the long arm of the stop engages and forces the spring-pressed pin outwardly until its outer end is projected beyond the outside of the stock; when a clip of cartridges is placed in the now empty magazine, the pin is pressed inward by the thumb of the left hand thereby rocking the bolt-stop about its pivot and retracting its upper end out of the plane of movement of the breech-bolt, and allowing the bolt to eject the clip, and place a cartridge in the breech of the gun, thereby leaving the piece ready to be fired by pulling the trigger. Except when the breech-bolt is held open, the spring-pressed pin, 82, is always flush with the side of the stock.

On the rear end of the receiver I pivotally mount a lever, 87, one end of which has a cam-shaped wing, 88, adapted to bear against a flat or shouldered portion, 89, of the base of the lever, 55, to impart to said lever a slight initial movement during the

first turning portion of the closing operation of the bolt after said bolt has been moved forward by the before-mentioned closing spring. The wing-cam, 88, is thus designed to move the lever, 55, to cause the breech-bolt to turn on its axis until the inwardly projecting pin, 50', on the trapezoidal-plate, 50, which operates in the cam-groove, *k*, in the breech-bolt, is moved out from behind the square-shoulder, 54, at the bottom of said groove and into register with the main part of groove, thereby allowing the pin, 50', to ride in contact with the cam-wall of the groove and complete the rotation of and lock the breech-bolt in its closed position.

The lever which carries the wing-cam, 88, is pivotally mounted on the small rod, 90, arranged on the left-hand side of the receiver and which rod also carries the cut-out, *L*, which is common to this type of guns and the operation of which is well known. A hole is also bored through the left side of the stock into which is forced the thimble, 91, and into this thimble is fitted a spring-pressed pin, 92, the inner end of which rests under the lower end of the lever, 87, which carries the wing-cam, 88, and by holding this end of the lever while the operating hand lever, 55, is being moved against the wing-cam in unlocking the breech-bolt, thereby forces the wing-cam outward and places the lever, 87, under sufficient tension to enable it to give the hand lever the slight initial closing movement above alluded to, and which movement is sufficient to move the pin, 50', from its locked engagement behind the square-faced shoulder, 54, at the bottom of the cam groove *k*, in the breech-bolt.

The general operation of the gun is as follows: When the trigger, 60, is pulled back the sear, 65, is depressed releasing the firing-bolt, which strikes the primer and ignites the powder charge starting the bullet along the bore. When the bullet has passed the port, *f*, the gases rush through the gas-chamber of the tube, 13, until they have reached its forward end, they then exert pressure upon the sleeve, 14, which incases the gas-tube and which is screwed to the main casing, 15, forcing it forward until it is stopped by the contact of the front end of the collared bushing, 19, with the square-faced shoulder, 20', formed upon the spring-retaining rod, 21, by turning down its rear end to a diameter somewhat smaller than the front end, and over which the collared sleeve, 19, freely slides, and the contact of its rear end with the face of the screw plug, 20, which fits into the rear end of the main casing, 15, which incloses the power spring, 16, and buffer, 17. When the action as stated has taken place, the spring pressed latch, 33, which is pivoted

at its front end and which lies in a slot, cut longitudinally through the solid part of the driving-rod sleeve, 37, the collar, 32', being threaded internally, and which screws over corresponding thread cut upon the main casing, 15, at a position approximately three and one-half inches from its rear end, is in position to snap up bringing the square-faced shoulder, 36, which is formed on the latch in a position to contact with the front end of the driving-rod, 30. The latch is held in this position until the bullet and gases have left the barrel, on account of the driving-rod sleeve, 37, being made fast to the main casing by its threaded collar, 32', and the main casing being held in its most forward position by the pressure of the gases in the gas-tube, 13, and the tube being threaded to the main casing. The bullet and gases having now escaped the power spring, 16, and buffer, 17, which are at their maximum tension deliver their stored energy to the driving-rod, 30, by means of the shoulder, 36, on the spring pressed latch, 33, contacting with the square end of the driving-rod. The buffer, 17, delivers its power for about 7/8 inch of the backward stroke of the main sleeve, 15, until its front end has left the shoulder formed on the spring retaining rod, the main power spring acting in unison. After the buffer has done its work the main power spring, 16, continues on with its pressure until at the last one-eighth inch of its stroke the spring pressed latch, 33, is depressed by its rear cam end coming in contact with a cam, 35, which is held in position by the front band of the sight sleeve, or which may be held in position in any suitable manner. The depressing of the latch takes place at about one half inch from the end of the complete stroke of the driving-rod, 30; the momentum of the driving-rod and breech-bolt carry the bolt to the end of its stroke. The reason for not delivering power to the driving-rod and breech-bolt to the end of the stroke of the bolt will hereinafter be stated.

Into the front end of the rod, 21, is preferably screwed the short hollow rod, 24, having the large collar or flange, 24, which acts as a stop for the main power spring; the short front end of the small flanged rod, 21', fits into a hole bored in the rear of the barrel sleeve lug, 11, to hold it rigid and parallel with the bore of the gun; the rear end of the rod, 21, is threaded and screws into the retaining block 25, which fits over the lug, 102, which is on the front of the receiver, and which is placed there to keep the action from kicking out of the stock. The lug is part of the Springfield rifle and has nothing to do with my invention as I might fasten the block on in any other desirable manner. In fitting on the block I mill the receiver lug, *F*², (Fig. 25) for the

post F' down to about one-half of its original height and make the block, 25, of sufficient thickness to form a rigid fastening for the spring-retaining rod, 21, also that its rear face may form a stop to keep the action from kicking out of the stock. The reason for fastening to the receiver is to retain the accuracy of the gun, otherwise I could take the shock of stopping the main casing and adjuncts against the projecting lug, 11, of the barrel sleeve into the front face of which the gas-tube is screwed.

The flanged sleeve, 19, which compresses the buffer spring, 17, is made of sufficient length that when the buffer is compressed by the flanged sleeve; i. e., in the last $7/8$ inch of its stroke, both ends of the flanged sleeve are in contact, one end, the front end, contacting with the shoulder, 20', of the spring-retaining rod, 21, and the other with the front face of the threaded plug, 20, which screws in the rear end of the main casing.

The main power spring has its rear end in contact with the front or solid end of the buffer casing, 18. The buffer spring, being of considerably greater power than the main power spring it forces its casing, 18, forward against the tension of the main power spring until in the forward movement of the main casing and adjuncts the tension of the main power spring becomes high enough to force the buffer casing back until its rear end rests against the front face of the threaded plug, 20, which screws in the main casing, 15. The buffer casing now acts to compress the main power spring between its front face and the flange, 24, at the end of the power spring-retaining rod, 21, the buffer spring casing now resting against the front face of the square threaded plug, 20, which screws into the rear of the main casing; the buffer spring is in operation until the casing, 15, and adjuncts have moved forward to approximately $\frac{3}{4}$ inch of its entire forward stroke. At this position the front end of the flanged sleeve, 19, contacts with the faced shoulder, 20', of the power spring-retaining rod, 21, and the continuation of the forward movement of the casing and adjuncts due to the pressure of the gases in the tube, 13, which is screwed into the front end of the main casing, causes the buffer spring to be compressed $\frac{3}{4}$ of an inch, or to its final compression; at the same time, and in unison, the main power spring is compressed to its final compression between the flange, 24, at the end of the retaining rod, 21, and the front face of the buffer spring casing, 18.

The driving-rod, 30, is coupled to the breech-bolt by the diagonal arm, 56, which partially surrounds the end of the firing-bolt F' just in front and resting against the head of the firing-bolt; the body of the firing-bolt

being flattened slightly to permit of the rod, 30, being readily uncoupled from the firing-bolt when the said bolt is removed from the receiver.

In the periphery of the breech-bolt C is milled the spiral slot *k*, the lower wall of which, at its rear end, is milled off at right angles to the axis of the bolt to form the square shoulder, 54, against which the inwardly projecting pin, 50', which is fastened to the trapezoidal shaped piece, 50, which is fastened to the driving-rod and lies normally in the right-hand longitudinal slot in the receiver, rests when the bolt is closed. The rear end of the trapezoidal shaped piece, 50, or cam end rests normally a short distance from the front bottom face of the bolt lever, 55, and the rear face of the diagonal arm, 56, which partially surrounds the body of the firing-bolt rests against the front face of the firing-bolt cocking head *m*. The driving-rod, 30, is held in its most forward position by the coupling pin *n*, which passes through the large end of the driving-rod casing, which lies along the side of the receiver and is attached at its front end to the block at the front of the receiver, being pulled up through the bifurcated piece, 43, against which the driving-rod spring, 31, presses. The spring thus pressing against the coupling pin at its rear end and the solid head at its front end holds the rod rigidly forward.

The reason that power is not applied for the full stroke of the bolt is because the cut-out leaf L on the left side of the receiver, when turned down, stops the breech-bolt short of its final stroke so that the bolt-head cannot be pulled back far enough to feed in cartridges; in this position it is single-fire with magazine in reserve. It is readily seen that the latch, 33, by which power is applied to the driving-rod could not be depressed for both positions of the bolt as it would be impossible to shift the position of the cam, 35, which is held in position by the front band of the sight sleeve, and which depresses the latch so that the driving-rod after it has completed its stroke can return to its forward position.

The mechanical arrangement of the buffer spring and its adjuncts, the flanged sleeve, 19, and casing, 18, is designed to give a powerful initiatory movement in unlocking the breech-bolt and starting the empty cartridge from its seat in the breech of the gun after firing. After this has taken place not much power is needed; an excess is positively disastrous, and the very object of my invention is destroyed, as the bolt stop, 80, and usual safety locking lever, 100', and bolt cap *i*, are soon crystallized and broken by the shock of stopping under high speed, and it would be necessary to redesign and

make new guns, whereas with the mechanical arrangement as above stated my attachment successfully changes the guns now made and in use.

After the energy has been stored and the latch, 32, which contacts with the front end of the driving-rod has snapped to position and the bullet and gases have left the bore, as is hereinbefore mentioned, the main casing, 15, and adjuncts begin moving backward transferring the stored energy to the driving-rod, 30. The first 1/16 inch movement of the rod, 30, is directed against the head of the firing-bolt to start it cocking before the rotary motion of the breech-bolt is taking place, thus keeping the engaging lug, f' of the firing-bolt out of contact with the 45° cocking cam, 103, of the bolt. The trapezoidal cam, 50, now, after the driving-rod has moved 1/16 inch, begins turning the breech-bolt upon its axis, the firing-bolt with its engaging lug, f' , being forced backward and the turning of the breech-bolt being in unison it is apparent that the cocking cam, 103, of the breech-bolt and the engaging lug, f' , of the firing-bolt do not contact at all during the unlocking of the bolt. If the engaging lug, f' , of the firing-bolt did not start in advance of the cocking cam of the breech-bolt and they were in actual contact, it would require at least three times the power to unlock the gun, as the rotary movement of the breech-bolt would have to force the firing-bolt backward against the tension of the usual breech-bolt main spring, up a 45° cam, and it is essential that the normal position of the cam and lug be preserved to enable them to perform their functions when used as a hand operated gun. The breech-bolt turns 90° as is usual with all military guns to unlock. During the first 45° of rotary movement the lugs a of the bolt turn on a level plane, the last 45° of turning the lugs ride up cams which are formed in the shoulders c of the receiver back of which the lugs turn, being made to follow the cams by a cam of corresponding pitch back of which some part of the bolt lever generally rides. The object of these cams is to get powerful leverage in starting the empty shell from the breech. When the bolt is turned to unlocked position, which has taken about 3/4 of an inch of longitudinal movement of the driving-rod, all of the great resistance is overcome, consequently not so much power is now needed. The buffer-spring, 17, has now accomplished its primary work and it remains inoperative until the main power spring, 16, has moved the driving-rod and breech-bolt backward, and the tension of the main power spring is lowered, when just before the complete stroke of the main casing, 15, has taken place the buffer spring, 17, which is stronger than the main power spring, 16, forces its casing, 15, forward thus

raising the heel-tension by slightly compressing the main power spring. When the bolt has reached its most rearward position the empty shell in the meantime having been ejected, the driving-rod moves slightly and the inwardly projecting pin, 50' of the trapezoidal shaped piece, 50, rests against the square shoulder, 54, formed on the lower wall of the spiral slot in the breech-bolt as is mentioned hereinbefore. This movement allows the front end of the lug, f' , on the firing-bolt to rest against the end of the breech-bolt. The breech-bolt now begins its return, being forced forward by the spring, 31, contained in the driving-rod, 30. A new shell is forced into the breech by the breech-bolt, and the bolt turned to its locked position ready for firing by again pulling the trigger. Just before the breech-bolt comes into position to turn, the base of the lever, 55, which projects straight upward, contacts on its left side with the spring-pressed wing cam, 88, which is pivoted to the receiver by the small rod, 90, which holds the cut out leaf, L, in place, and under the lower end of which a spring-pressed piece, 92, contacts. The wing-cam exerts its pressure against the base of the handle of the lever and forces it to the right thus turning the breech-bolt until the square shoulder, 54, on the lower wall of the spiral cam $\frac{1}{2}$ of the bolt, has moved out of contact with the inwardly projecting pin, 50', of the trapezoidal shaped piece, 50, thus allowing the pin to complete the closing of the bolt.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. An automatic gun having a reciprocating breech-bolt, a receiver, co-acting surfaces between the bolt and receiver for rotating said bolt, a mechanism operated forwardly by the gases of the exploded charge, said bolt being normally uncoupled from the gas operated mechanism whereby it is devoid of gas pressure, complementary means intermediate of the bolt-mechanism and gas-operated mechanism, for storing the energy of the exploded charge, said means including a power spring and a buffer of unequal strength and a reciprocating casing (in which said spring and buffer are contained) and means for coupling the bolt-mechanism with the means for storing the power of said charge substantially coördinately with the exhaust of the gases and permitting the stored energy to impart reciprocal and axial movement to the breech-bolt.

2. In an automatic gun, the combination with the receiver and the breech-bolt, said bolt and receiver having co-acting surfaces, whereby the bolt may be axially turned, of an attachment comprising a sliding casing operated forwardly by the gases of the exploded charge, a power spring within one

portion of said casing, a buffer within another portion of the casing, said buffer having greater power than said spring, a rod extending through both springs, and a sleeve surrounding a portion of said rod having a collar on its intermediate portion, said rod having a shoulder against which the forward end of the sleeve contacts to thereby limit the forward movement of said sleeve, said spring and buffer adapted to store the energy of said gases for subsequent use in turning and reciprocating the breech-bolt, an operating rod and an attachment for fixing it to the breech-bolt, and an automatically engageable and releasable latch and catch mechanism between the slidable casing and said operating rod.

3. In an automatic gun, the combination with a receiver and a breech-bolt, said receiver and bolt having co-acting surfaces to permit the turning of the bolt, means normally disconnected from the breech-bolt and operated in a forward direction by the gases of the exploded charge, a motor actuated by said forward operating means and storing the energy of the gases, said motor comprising a power-spring, a rod extending through the same and having a shoulder on an intermediate portion, a sleeve embracing the rod and having a collar between its ends, a casing surrounding said sleeve having its front end to contact with the collar thereof and to form a stop for the rear end of the power spring, and a buffer inclosed by said casing and having its forward end adapted to contact with said collar, the forward end of the sleeve adapted to engage the shoulder of said rod to thereby limit the forward movement of the sleeve and the compression of the power spring, and means automatically coupling the breech-bolt with the motor coordinately with the exhaust of the gases.

4. In an automatic gun, the combination with a receiver and a reciprocating breech-bolt, said receiver and bolt having co-acting cam surfaces to permit the turning of the bolt, of a casing slidably mounted parallel with the bolt, a rod passing through the casing, a gas tube connected with the forward end of the casing, a breech-bolt mechanism maintained uncoupled from the gas operated means until the bullet leaves the muzzle of the gun, a spring-motor normally coupled to the gas-operated means and actuated thereby to store power for subsequent reciprocation and rotation of the breech-bolt, valve controlled means connecting the gas tube with the interior of the gun barrel and controlling the amount of gas admitted to said tube, and means adapted to connect the breech-bolt with the motor for retracting said breech-bolt coordinately with the exhaust of the gas and the release of the power of said motor.

5. In an automatic gun, the combination

with the receiver and the breech-bolt, said receiver and bolt having co-acting surfaces to permit the turning of the bolt, of a casing slidably mounted parallel with the bolt, a rod passing through the casing, a gas-tube connected with the forward end of the casing, valve-controlled means connecting the gas tube with the interior of the gun-barrel and controlling the amount of gas admitted to said tube, said rod having a shoulder near its forward end and having a shoulder at an intermediate portion, a power spring inclosing the rod having its front end to engage the first-named shoulder, a sleeve slidable on the rear portion of the rod having a shoulder between its ends, a casing surrounding said sleeve having a flanged front end to engage said collar, a plug fitting into the rear end of the slidable casing, and a buffer on the rear end of the rod, the collar of said sleeve and the said plug forming stops for opposite ends of the buffer, and the intermediate shoulder of said rod forming a stop for the front end of the sleeve to thereby limit the forward movement of the sleeve.

6. In an automatic attachment for a gun, the combination with a slidably mounted casing, mounted on the gun parallel with the barrel thereof, a screw plug fitted in the rear end of said casing, said rear end having a greater diameter than the forward end, a rod passing through the casing, the front end of said rod containing a tubular extension provided with a collar, and the intermediate portion of the rod being turned down to form a shoulder, a sleeve slidably mounted on the rod having a collar between its ends, a casing embracing the rear portion of the sleeve having a flanged front end forming a stop for the collar, a power spring confined between the front end of the casing and the collar at the front end of the rod, a buffer within the casing between the collar of the sleeve and said plug, the front end of said sleeve adapted to contact with the collar on the intermediate portion of said rod and thereby limit the compression of the spring and buffer.

7. In an automatic gun, the combination with a slidable casing having an enlarged bore at its rear portion, a screw-plug fitting the rear end of said bore, a sleeve secured to the casing and arranged diagonally thereto, a spring motor within the casing comprising two alined springs of unequal power one of said springs serving as a buffer, a sleeve surrounding the rod having a collar at its central portion, said rod having a shoulder forming a stop for the front end of the sleeve, a casing inclosing the rear portion of the sleeve having a flanged front end engaging said collar, a spring-actuated operating rod arranged parallel with the casing, a spring-pressed latch carried by the diagonal sleeve having a shoulder behind which the

front end of the operating rod catches when said rod is moved past said shoulder, whereby the rod and slidable sleeve are coupled together, and a fixed cam arranged in the path of movement of the latch and adapted to trip the latter to release the operating rod, substantially as described.

8. In an automatic gun, the combination with a receiver, of a breech-bolt adapted to reciprocate therein, said bolt and receiver having co-acting surfaces operating to permit the bolt to turn, and said bolt having a spirally-arranged groove near its rear end with a square-faced shoulder at the base of said groove, a slide-mechanism operated forwardly by the gases of the exploded charge, a compression motor connected to the slide-mechanism and adapted to store the energy of said gases for subsequent use in reciprocating and turning the breech-bolt, an operating rod and an attachment for fixing it to the breech-bolt, a bolt-operating lever, and a trapezoidal plate carried by the slide-mechanism having a pin operating in the groove of the breech-bolt and adapted to engage the square-faced shoulder thereof, said plate having a cam-end to operate under the lever to impart rotation to the breech-bolt.

9. In a gun of the character described, the breech-bolt having a spirally arranged groove with a square-face shoulder at the lower end thereof, in combination with a gas-operated slide mechanism having a member with a lug operating in said groove and adapted to seat against said shoulder and a hand lever connected to the bolt, said member having a cam-portion to operate under the lever and initially elevate the same sufficiently to unlock the breech-bolt from the receiver.

10. In a gun of the character described, the combination with the receiver, the magazine, the breech-bolt, means for axially turning the bolt and means for reciprocating said bolt, of a stop for holding the bolt open at the end of its rearward movement, said stop comprising a cross-wise extending pivoted member located just in rear of the magazine and operated by the magazine floor to project into the horizontal plane of the bolt and to engage the front end of said bolt.

11. In a gun of the character described, the combination of the stock, the receiver, the breech-bolt mounted therein, a magazine, means for turning the bolt in the receiver, means for reciprocating said bolt, and means for holding the breech-bolt in an open retracted position, said means including a lever pivoted at an upper angle so as to move cross-wise of the end of the receiver, said lever having a flange at its upper end adapted to be projected into the range of action of the breech-bolt to engage the front end of the bolt, said magazine

having a spring-pressed floor provided with a lug to operate under the lever and thereby elevate the lever-flange above the horizontal plane of the lower side of the breech-bolt.

12. In a gun of the character described, the combination of the stock, the receiver, the breech-bolt mounted therein, a magazine, means for turning the bolt in the receiver, means for reciprocating said bolt, and means for holding the breech-bolt in an open retracted position, said means including a lever pivoted at an upper angle so as to move cross-wise of the end of the receiver, said lever having a flange at its upper end adapted to be projected into the range of action of the breech-bolt to engage the front end of the bolt, said magazine having a spring-pressed floor provided with a lug to operate under the lever and thereby elevate the lever-flange above the horizontal plane of the lower side of the breech-bolt, and a spring-pressed pin arranged cross-wise of the stock and projecting from the outer side thereof and having its inner end to operatively engage the free end of the bolt-stop lever.

13. In a gun of the character described, the combination of the receiver, a reciprocating breech-bolt, means for operating the bolt, a magazine having a spring-pressed floor, said magazine having a vertical groove in its rear wall, and a breech-bolt stop including a pivoted lever arranged cross-wise of the rear end of the magazine having a flanged upper end, said magazine floor having a lug guided in said groove and adapted to operate under said lever to elevate its flanged end into the range of action of the front end of the breech-bolt, and a push-pin mounted in the gun stock and exposed on the outside thereof, for withdrawing the bolt stop out of the range of action of the breech-bolt.

14. In a gun of the character described, the combination of the receiver, the breech-bolt, means for reciprocating the bolt, an operating lever fixed to the breech-bolt, for turning the latter, a spring-pressed cam-wing placed under compression by the lever, said bolt having a spirally-arranged groove with a square-face shoulder at the lower end thereof, a reciprocating member having a lug engaging the groove of the breech-bolt and adapted to engage behind said square-face shoulder, said cam-wing exerting its stored energy upon the bolt lever to impart an initial closing movement to the bolt and to withdraw said lug from engagement with the square-face shoulder at the lower end of the spiral groove.

15. In a gun of the character described, the combination of the receiver, the breech-bolt, means for reciprocating the bolt, an operating lever fixed to the breech-bolt, for turning the latter, a spring-pressed cam-

wing placed under compression by the lever, said bolt having a spirally arranged groove with a square-face shoulder at the lower end thereof, a reciprocating member 5 having a lug engaging the groove of the breech-bolt and adapted to engage behind said square-face shoulder, said cam-wing exerting its stored energy upon the bolt to withdraw said lug from engagement with 10 the square-face shoulder at the lower end of the spiral groove, said cam-wing being of substantially lever form pivotally mounted on the side of the receiver, and a spring-pressed thimble or sleeve mounted in the gun-stock and against which the free lower 15 end of the lever contacts.

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

GRANT HAMMOND.

Witnesses:

T. WALTER FOWLER,

C. W. FOWLER