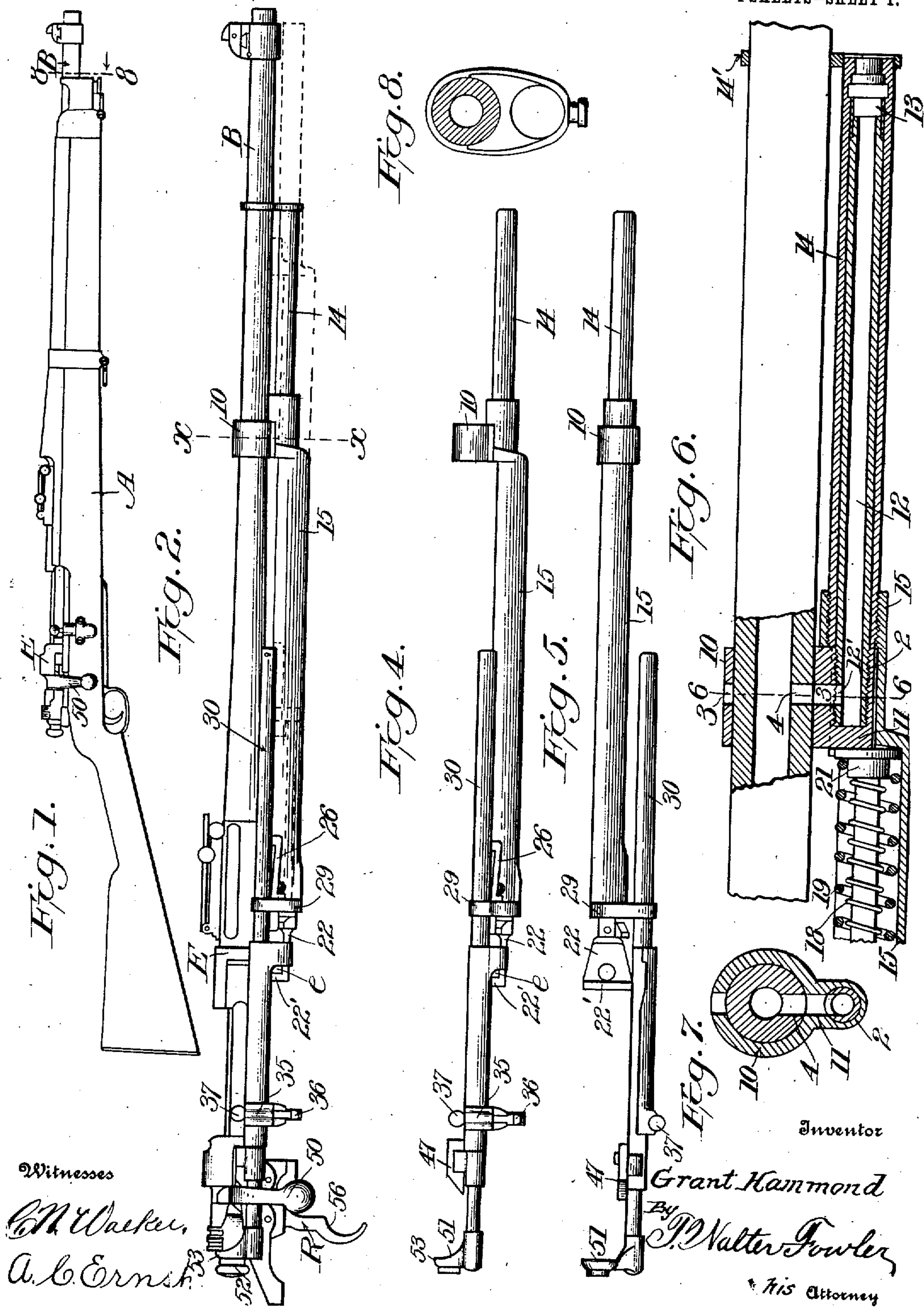


954,798.

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AUTOMATIC GUN.
APPLICATION FILED JULY 27, 1908.

Patented Apr. 12, 1910.

4 SHEETS—SHEET 1.



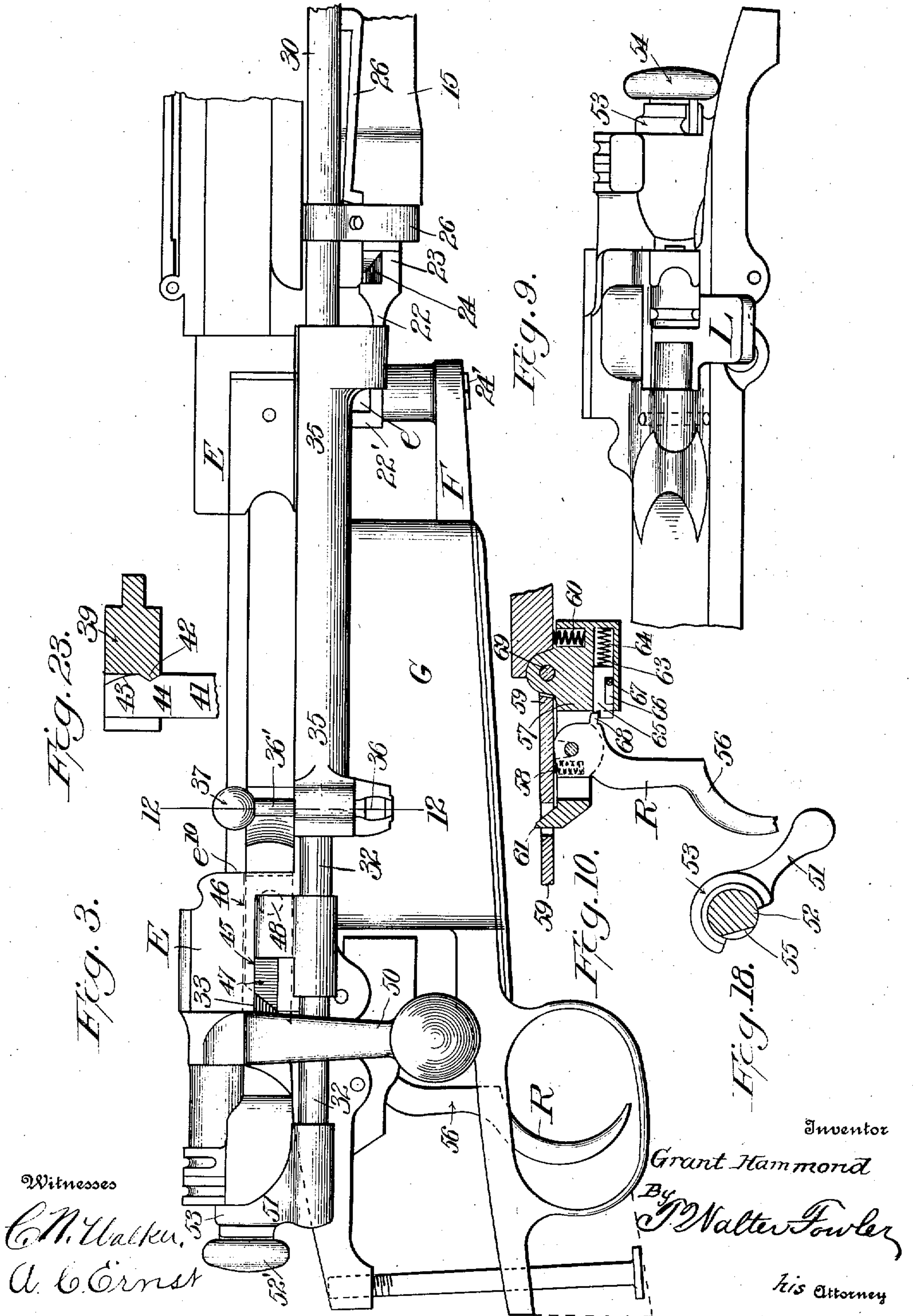
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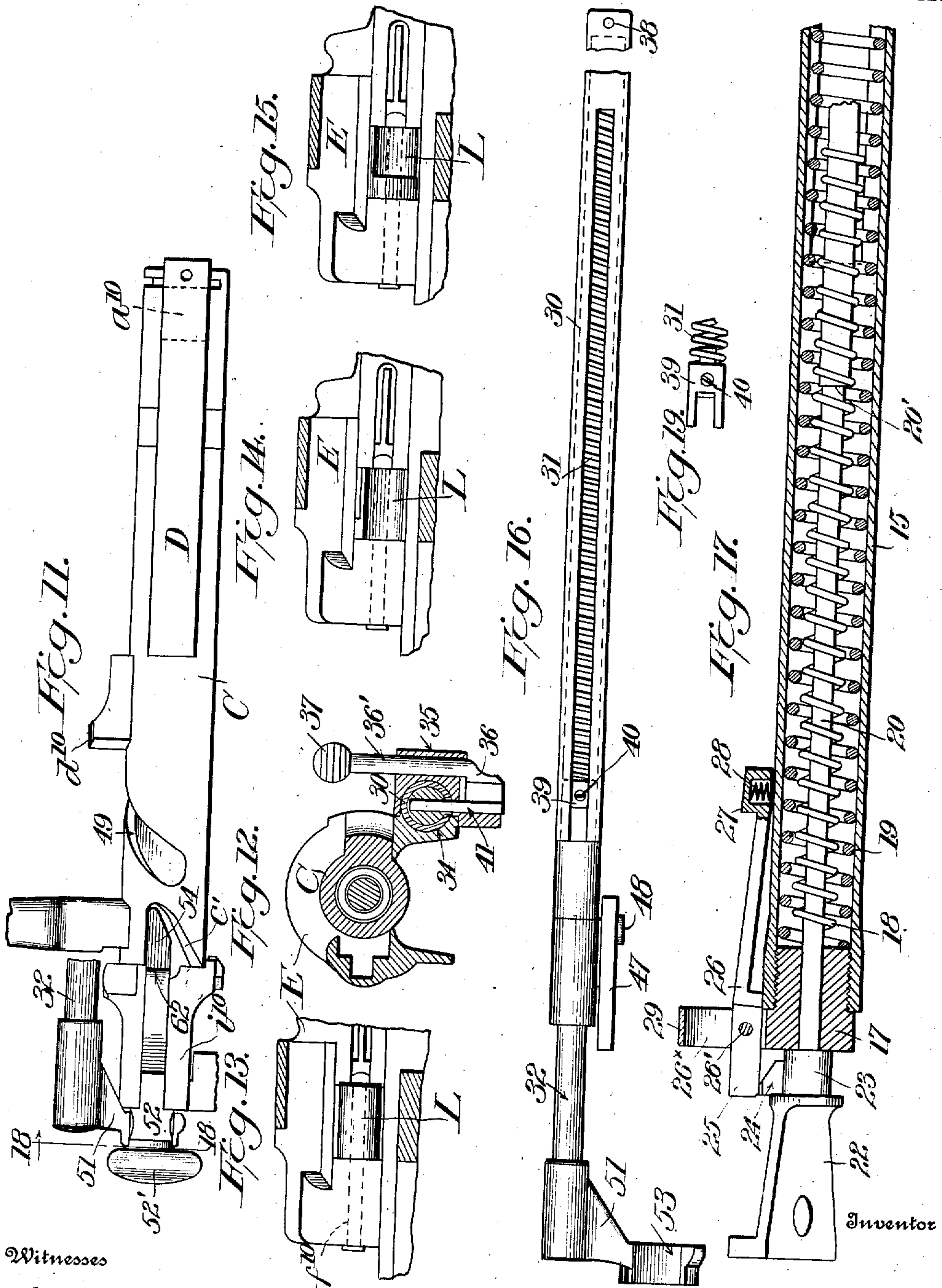
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4 SHEETS—SHEET 3.



Witnesses

C. H. Walker
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His Attorney

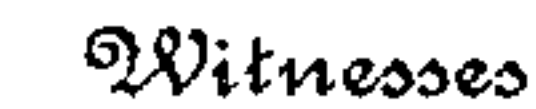
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4 SHEETS—SHEET 4.

954,798.



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UNITED STATES PATENT OFFICE.

GRANT HAMMOND, OF HARTFORD, CONNECTICUT, ASSIGNOR OF ONE-HALF TO THOMAS DARLINGTON, OF NEW YORK, N. Y.

AUTOMATIC GUN.

954,798.

Specification of Letters Patent.

Patented Apr. 12, 1910.

Application filed July 27, 1908. Serial No. 445,529.

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 U. S. service gun 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 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 reciprocate and turn 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 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 Springfield rifle showing my invention applied thereto, Fig. 2 is an enlarged side elevation showing the gun mechanism removed from the stock, Fig. 3, is an enlarged side elevation of the rear end of

the gun mechanism and the automatic attachment, Fig. 4 is a side elevation of the automatic attachment detached from the gun barrel, Fig. 5 is a top plan view of Fig. 4, Fig. 6 illustrates a fragment of the gun barrel showing a portion of the slidable gas-operated casing and associated parts, Fig. 7 is a cross-sectional view on the line 6—6 of Fig. 6, Fig. 8 is a cross-sectional view on the line 8—8 of Fig. 1, Fig. 9 illustrates a portion of the rear end of the receiver and certain of its adjuncts, Fig. 10 is a sectional view of the trigger mechanism, Fig. 11 is a side elevation of the breech-bolt showing the cocking-cam and a portion of the operating rod of the automatic mechanism, Fig. 12 is a cross-sectional view on the line 12—12 of Fig. 3, Figs. 13, 14 and 15 illustrate sectional views of a part of the receiver showing the bolt-stop, L, Fig. 16 is a bottom plan view of the operating rod 30 and its connected parts, Fig. 17 is a sectional view of the rear portion of the slidable casing, showing the power springs, and the spring-actuated latch 26, Fig. 18 is a cross sectional view on the line 18—18 of Fig. 11, Fig. 19, is a detail of the spring-pressed block 46, Fig. 20 is an enlarged side elevation of the gun showing a modified means for operating the breech-bolt Fig. 21 is a side elevation of the rear portion of the receiver showing the cut-out portion in which the operating rod of the automatic attachment slides Fig. 22 is an end view of the modified cam-plate, 60, of Fig. 20, and, Fig. 23 is a sectional detail showing the engaging faces of the coupling-pin 36 and block 39. Fig. 24 is a detail of the front end of the breech-bolt showing its lugs and a part of the extractor. Fig. 25 is a detail of the forward end of the receiver.

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 and that the showing is merely for illustrative purposes and that the attachment can be applied to any magazine or other gun with but 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 in detail nor will I attempt to describe its action in detail, but I will only fully show and

describe those 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, R, and the usual adjuncts of a gun of this type. The breech-bolt, C, is slidably mounted in the receiver, E, and at its forward end it is provided with the lugs a^{10} , which slidably fit the longitudinal grooves, b^{10} , 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^{10} , connecting at their forward ends with the usual transverse or cam grooves c^{10} , behind the shoulders of which the lugs, a^{10} , engage when said lugs are brought into register with the cam grooves and the bolt is given a rotary movement. The breech-bolt also has the usual cam-lug, d^{10} , arranged at right-angles to the lugs, a^{10} , and adapted to engage the wall, c^{10} , at the back end of the cut-away portion of the receiver. The rear end of the receiver, E, has the usual circular opening f^{10} , to admit the breech-bolt, in the manner common in this type of gun. Within the breech-bolt is slidably mounted the firing-bolt, 52, having the usual projecting lug, 62, on its bottom side extending through a bottom slot in the breech-bolt cap, i^{10} . The breech-bolt has a spiral groove, 49, and cocking cam, C'; the firing-bolt has the usual cocking head, 52', and such other parts as will be usually found in a gun of the type shown, but which parts, except as hereinafter specified, are not of my present invention.

The attachment which is the essence of my present invention 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 under side 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.

Into the bored and tapped lug, 11, is screwed the rear end of a gas tube, 12, 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 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 has, by preference, a nickel casing or sleeve, 13, threaded or otherwise fixed to its front end and projecting beyond said end, said casing or sleeve being bored to form relatively thin walls thereon which are exposed to gas pressure and are designed to be expanded thereby against the walls of an inclosing tube, 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 tube, 14. The exterior tube or sleeve, 14, has a close sliding fit with the interior gas tube, 12, and its front end is provided with a sleeve $14'$, which tightly fits the barrel, forming a guide through which the tube, 14, operates to maintain the alinement or parallelism of the tube, 14, relative to the barrel, when the automatic attachment is in operation.

The rear end of the tube, 12, is threaded and is provided with a gas-port, $12'$, which when the tube is screwed home, is in register with the gas passage from the barrel to the chamber of the tube; the rear end of the other tube 14, is designed to screw into a similarly threaded hole formed in the forward tubular end of a relatively large casing, 15, in which the power springs are contained, said casing having its rear end internally-threaded to receive a screw-plug, 17, (Fig. 17) the inner face of which forms a stop or abutment for the rear end of the power springs, 18 and 19, which springs are of different strength, the spring 18, being the weaker of the two and being coiled about a rod, 20, arranged axially of the casing, 15, and the other spring, 19, being of larger diameter, as well as of greater strength than the spring, 18, and being arranged within the casing concentric with said spring, 18. The aforesaid rod, 20, extends through a hole formed axially through the plug, 17, said rod extending substantially the full length of the casing, 15, and having an enlarged head, 21, fixed to its forward end and normally removed a short distance from the rear face of the lug, 11, on the bottom of the barrel sleeve, 10, as shown in Fig. 6, said head, 21, serving as a stop for the forward end of the power springs, 18 and 19, and operating in conjunction with the rear stop formed by the plug, 17, to compress the power springs when the casing 15, and its associated parts are moved forward.

As shown in Fig. 17, the rod, 20, is turned down for a portion of its length to form a shoulder, $20'$, which serves as a stop against which the inner face of the rear plug, 17, is designed to strike when the gun is fired

and the casing, 15, is shoved forwardly by the expansion of the gases of discharge, said shoulder thereby serving as a stop for limiting the forward movement of said casing.

5 The rod, 20, projects beyond the rear face of the plug, 17, and is screwed or otherwise fixed to the front end of a V-shaped piece, 22, which fits over a lug, *e*, formed on the under side of the forward end of the receiver, E, of the gun, and which latter may be of the usual construction; the forward end of this V-shaped piece, 22, is shown as turned up round, at 23, and it has a threaded opening to receive the rear threaded end of the said rod, 20, said end, 23, being of larger diameter than the rod so as to form a shoulder against which the threaded plug, 17, of the sliding casing, 15, contacts, as shown in Fig. 17. Also as shown in Fig. 20 3, the V-shaped piece, 22, is further held in position by the forward end of the usual trigger-guard plate, F, having the usual post 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 described, and form no essential part of my present invention.

30 By reference to Figs. 2, 3, 4 and 5 it will be seen that the piece, 22, has formed upon its end, 23, a cam-faced lug, 24, which is designed to engage and ride past the heel end, 25, of a spring-pressed latch, 26, that is pivotally-mounted on an arm or diagonal extension, 26*, of the rear end plug, 17 of the sliding casing, 15, the front end of said latch having a hook-shaped toe, 27, the purpose of which will be hereinafter stated. 40 The spring, 28, for operating the latch is a small spiral spring seated under the toe end of the latch, the outer end of the spring pressing outwardly against the under side of the latch at a point forward of the pivot point, 26', of the latter, and normally, pressing the latch upwardly when the heel, 25, of said latch is disengaged by the aforesaid cam-faced lug, 24.

50 The arm or extension, 26*, of the screw plug, 17, is bored to form an opening and thereby constitute substantially a thin band, 29, at the outer end of the arm, said hole having its axis parallel with that of the barrel, B, of the gun, as to form a guide for a longitudinal hollow rod, 30, which lies parallel with the barrel and the sliding casing, 15, said rod containing within it a spiral spring, 31, shown in Fig. 16. A solid rod, 32, is fitted into the rear end of the hollow rod, 30, and extends far enough thereinto to receive a couple of transverse rivets; that portion of the solid rod which enters the hollow rod is, preferably, turned slightly eccentric to bring the bolt operating parts in close to the receiver, E, of the gun. In

the present case, the receiver has a longitudinal slot, 33, milled through the side of its rear end, and it has, also, a groove or channel, 34, made in one side and extending the full length of the receiver; the rear portion of this opening, 34, is somewhat enlarged and deepened (Fig. 21) to accommodate the bolt-operating features. The portion, 35, extending rearwardly from the piece, 22, lies alongside of the receiver and forms a casing over the longitudinal groove or channel, 34, the operating rod, 30, passing through this casing or rear-extension of the piece, 22, and being slidably guided in the same and in the groove or channel, 34, said extension being enlarged or thickened at its rear end to form a bearing and guide for a coupling-pin, 36, vertically-disposed and provided with a round stem, 36', and a spherical head, 37, by which it may be manipulated. The upper projecting portion of this pin, 36, also serves as a stop for the ejected shells, which are thrown out of the receiver with great force and would be liable to seriously injure a by-stander if the pin, or its equivalent was not interposed to stop the momentum of the shell.

The spiral spring, 31, is contained within the hollow operating rod, 30, the front end of said rod being closed by a plug through which is passed a rivet, 38, designed to hold the plug in place, and to prevent its being forced out by the tension of the spring, 31. 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, 39, 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, 39, is slotted to form two parallel forks, (Fig. 19) the slot lying in register with the slot formed in the under side of the rod, 30, and the short piece, 39, being prevented from turning in the bore of the rod, by means of a screw or pin, 40, the head of which is substantially flush with the outside of the rod, 30, and the sides of said head being substantially in sliding contact with the walls of the slot in the rod. The lower end of the aforesaid coupling-pin, 36, is offset and carries an upwardly extending plate, 41, which is arranged parallel with the stem of the pin and is spaced therefrom a suitable distance, and is 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, 39, against the front end of which the spring, 31, constantly bears, said piece, 39, having the front wall of its slot provided with a cam-projection, 42, and said plate, 41, of the coupling pin, 36, having a cam-surface, 43, to engage the projection, 42, and a notch, 44, to receive the same, when the coupling pin is pulled upward to cause the plate thereof to slidably

enter the slot made through the rear end of the cylindrical piece, 39, whereby the parts are held firmly in contact by the pressure of the spring, 31.

5 One side of the rear end of the receiver is formed with the slot, 33, which extends through the rear end of said receiver, the inner wall of this portion of the receiver being formed with a groove or channel, 46, in
10 which is slidably mounted a piece, 47, of substantially trapezoidal form, said piece, 47, having a member which extends transversely from its side through the slot, 33, and is thence turned downwardly and pro-
15 vided with an enlarged portion 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
20 rod. The inner face of the trapezoidal piece, 47, is milled to conform to the outer surface of the breech-bolt, C, and said face is provided with an inwardly projecting stud, 48, which engages and operates in the spiral
25 groove, 49, cut in the outer surface of the rear end of said breech bolt. By reference to Fig. 11, it will be seen that the groove 49 is not of uniform width but the side walls are of unequal angles so as to make the lower
30 end of the groove of slightly greater width than the upper end, the width of said groove gradually increasing toward said lower end, for purposes which I will hereinafter state.

The operating lever or handle, 50, for the
35 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, 47, rests normally in contact with the under part of the lever or handle, 50, and forms
40 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. 1, 3, 4, 5 and 16, that the
45 rear end of the solid rod, 32, has strongly pinned to it a piece 51 which projects diagonally toward the axis of the firing-bolt, 52, which is of the construction usually found in the type of gun illustrated, said piece, 51,
50 having a segmental outer end, 53, which substantially incloses about two-thirds of circumference of that portion of the firing-bolt just in advance of the cocking head, 54; the underside of this portion of the firing-bolt
55 is flattened at 55, Fig. 18, 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, 53, is in register with the flattened portion, 55, of the
60 bolt, the disengagement of the parts is quickly effected.

Referring to the trigger-mechanism of Figs. 3 and 10, the trigger, 56, is pivotally mounted within the sear bar, 57, and has a spring, 58, seated in its upper rear face

where it contacts with the under side of the tail strap, 59, of the receiver; the forward end of the sear bar also carries a spring, 60, which is designed to contact with the under side of the receiver, the sear bar being re-
70 cessed to receive this spring. As the sear bar is pivoted to the receiver rearward of the spring, 60, it is manifest that the sear bar is forced up in the usual manner to cause its sear, 61, to contact with and engage the
75 usual lug, 62, on the under side of the firing-bolt and thereby hold the piece in cocked position ready for firing.

In the under side of the sear-bar is bored a longitudinal hole, 63, into which is fitted a
80 spiral spring, 64, adapted to operate against the inner end of a pin, 65, slidably mounted in the hole, 63, to thereby normally force the pin rearwardly, until the end wall of a slot, 66, in the pin contacts with a pin or stop, 67, and thereby limits the rearward move-
85 ment.

The trigger is pivoted to the tail strap of the receiver, and when it is pulled rearwardly to lower the sear, 61, and release the firing-
90 bolt, a projection, 68, on the front of the trigger presses down in a notch formed in the upper rear angle of the spring-pressed pin, 65, and thereby rocks the sear bar about its pivot, 69, to cause the sear at the rear end
95 of the sear bar to release the cocked firing-bolt. Simultaneously with the release of sear, the projection, 68, rides out of contact with the spring-pressed pin, 65, when the
100 spring, 60, 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
105 the operator, it is forced forward by its own spring, 58, and its front projection, engages and pushes in the spring-pressed pin, 65, until the projection, 68, escapes by the rear end of the same and enters the notch thereon,
110 when the trigger is again in position to be fired.

In the modification, Fig. 20, I show that the breech-bolt may also be operated by a device somewhat different from the trape-
115 zoidal plate. In this instance the whole mechanism of the gun attachment is the same as before described, but the trapezoidal plate, 47, and the inwardly projecting stud thereon and the breech bolt having the spiral slot are eliminated; also, the end piece, 51 of the operating rod, 32, which cocks the firing pin in advance of the cocking-
120 cam of the bolt is omitted. In said Fig. 20, the driving-rod, 32, extends past the transverse coupling-pin, 36, and has rigidly attached to its rearward end a curved thin piece of metal, 60', which conforms largely to the cross-sectional shape of the rear end
125 of the receiver, and having a spiral-slot, 61', 130

milled through it, the lower wall of the slot operating on the under-side of the lever, 50, to unlock and open the bolt, and the upper wall operating to close and lock the action. This slot, 61, being open at the rear, it will readily be seen that the breech bolt may be operated by hand without compressing the return-spring inside of the driving-rod or operating the driving-rod itself, but that when the operating rod is pushed backward by the power springs the gun will in all cases be automatic, and that when the coupling pin is depressed the gun will be one-half automatic as hereinbefore described.

The general operation of the gun shown is well known and will not be specially described except in its connection with the novel features which make the gun automatic in action, and the operation of which features may be expressed as follows: The gun being in normal condition, when the trigger is pressed backward the firing bolt is released, and the forward end, or firing pin strikes and explodes the primer, igniting the powder charge, and forcing the bullet along the bore of the gun, as usual. When the bullet has passed the hole, or gas-port, 4, leading into and through the gas tube, or pipe, 12, the entering gas forces the inclosed casing, 14, forward, compressing the power-springs, 18, 19, which are held from forward movement by the rod, 20, which screws into the V-shaped piece, 22, fastened to the receiver, and allowing the spring-pressed latch, 26, which is pivoted to the plug, 17, which screws into the rear end of the large casing, 15, and which latch has now ridden past the end of the operating rod, 30 to bring its toe or projecting undercut lug, 27, in front of the end of the operating rod, 30. Coördinately with the arrival of the latch at the point where it may spring over the end of the operating rod, 30, the forward end of the plug, 17, in the rear of the large casing, 15, has come into contact with the square faced shoulder, 20, of the spring-retaining rod, 20, over which the springs lay, and has stopped the forward movement of the thimble or sleeve, 14, and the casing, 15. The parts, as is readily seen, must remain in this position until the bullet leaves the muzzle of the barrel. As soon as the bullet clears the muzzle, the gas rushes out of the chamber of the tube, 12, through the gas ports into the barrel, and the powerful springs, 18 and 19 act to exert their force against the plug, 17, in the rear of the large casing to cause it to move backward carrying, or pushing the driving rod, 32, with it, thus unlocking and forcing the freed bolt rearward, compressing the smaller spring, 31, in the driving rod, 30, until the heel end, 25, of the spring pressed latch, 26, engages with the cam faced lug, 24, on the V-shaped piece, 22, when the latch is de-

pressed out of engagement with the driving rod, 30; the momentum of the breech bolt and attachments carries the bolt the remainder of its stroke, when the return spring, 31, in the inside of the driving rod, 30, returns the bolt to its locked position. It will be readily understood that in the action as described the empty shell is ejected and a loaded one inserted leaving the gun in position to again be fired by releasing the trigger and again pulling it rearwardly.

The operation of the driving rod and its attachments is as follows: In normal position, the inclined or cam end of the trapezoid, 47, lies a short distance in front of the bottom face of the operating lever 50, and, therefore, when the rod, 30, is moved backward, the piece 51 at the end of the driving rod, 32, which couples the rod to the firing bolt, begins cocking the firing bolt slightly before the trapezoid, 47, and stud thereon act upon the base of the lever or handle, 50, and breech bolt, C, whereby as the breech bolt is revolved by the above mentioned devices, the firing bolt, 54, is moved slightly away from, or in advance of the cocking cam, C' which greatly reduces the power necessary to turn and unlock the bolt. The part, 53, which presses against the head of the firing bolt, 54, to cock the piece slightly in advance of the cocking cam when the bolt has reached its most rearward movement, would if the spirally-disposed slot, 49, which is cut in the shell of the bolt were true, say 45° angle on both sides, press with the full tension of the main spring against the whole driving rod and attachments, and force the inwardly projecting stud 48, of the trapezoid, 47, out of the bolt-slot, thus sticking the return of the bolt, as the driving-rod and its attachments would be forced out of alignment. But by making the slot slightly widening toward the lower end, a slight lost motion is provided and the firing pin comes forward, slightly, before the bolt starts to return. The slot in the bolt being of a steeper pitch in its forward wall the stud which operates in the slot can thus move forward until the lug on the bottom of the firing bolt contacts with and rests against the end of the breech bolt.

When the driving rod is pushed backward, as stated above, the firing pin is moved slightly in advance of the cocking cam, at the same time the entering point of the wedge of the trapezoid, 45, is lifting up the lever, 50, of the bolt and when it has ceased its action the inwardly projecting stud of the trapezoid completes the work thus begun, and the bolt is revolved its full 90° being forced backward to the end of its stroke by the power of the springs 18 and 19, acting against the large casing, the contact being made by the spring-pressed latch pivoted to the plug in the end of the casing.

When the coupling-pin, 36, which is transversely situated in the enlarged end of the rearwardly extending part of the V-shaped piece, 22, which anchors the attachment to the receiver, is in its normal position; i. e., not forced or pulled up in the longitudinal slot in the operating rod, 30, and thus between the bifurcated parts of the piece, 39, against which the driving rod-spring, 31, presses, the gun may be fired and the operation will be one-half automatic, the empty shell will be ejected and the bolt left in its rearward position, ready to be pushed home and locked by hand. The advantage of this action is this: When the magazine is charged with cartridges and the usual cut-out lever, L, on the left side of the receiver is turned down, the breech-bolt will be stopped short of its full stroke, that is, will not be forced backward far enough to allow the cartridges in the magazine, G, to be fed up and one be brought in front of the bolt head; the magazine, therefore, cannot be used unless the cut-out lever is raised. In this position then, the gun is a single-fire half-automatic arm, and a cartridge may be taken from the belt or pocket, laid in front of the bolt, and pushed in by hand. In the other position, when the cut-out lever is turned up and the transverse coupling pin, 36, is pulled up, the gun is automatic, the breech-bolt being unlocked, then pushed backward to extreme limit, the empty shell ejected, the bolt forced forward by the spring, 31, in the driving rod, 30, a new shell fed from magazine and the breech bolt closed and locked.

When the transverse coupling pin, 36, is in its downward or depressed position and the bolt stop, L, is turned so that the bolt may be removed from the receiver, the bolt and driving rod, 30, may be pulled out for inspection, and the driving-rod removed from the bolt. This is very important in case of a shot striking the automatic attachment, as the driving-rod could be quickly removed and the breech-bolt pushed back into the receiver, thus having the original hand-operated gun. In the return movement of the bolt it is turned to its locked position by the inwardly projecting stud acting upon the forward wall of the spiral slot, as will be well understood by those acquainted with guns of the type shown. It is also important that the mechanism which compresses the power springs, 18 and 19, operates forwardly by expansion of the gases, leaving the energy stored in the springs for retracting the gun action, as the recoil of the gun is thereby greatly reduced. It will, also, readily be seen that the pressure exerted to rotate and reciprocate the breech-bolt is at all times constant, and the power springs may be timed so that the bolt will not move backward with undue force, thus breaking the

rear bolt-stop and endangering the person firing the gun. 65

In all other guns of the automatic type the speed of the operation of the breech-bolt is subject to the variations of pressure generated by the powder charge, which varies as much as 15% below to 15% above service requirements. 70

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:— 75

1. An automatic gun having a bolt mechanism including a reciprocating breech-bolt and means for imparting a rotary movement thereto; a mechanism operated forwardly by the gases of discharge; said bolt mechanism 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; and means for coupling the bolt-mechanism with the means for storing the power of said charge substantially coordinately with the exhaust of the gases and permitting the stored energy to impart reciprocal and rotatory movement to the breech bolt. 80 85 90

2. In a gun, the combination with a reciprocating breech-bolt and means for imparting a rotary movement thereto; of an automatic attachment for the gun, said attachment comprising a slide-mechanism operable forwardly by the gases of discharge; a compression motor connected to said 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 attachment for fixing it to the breech-bolt, and an automatically engageable and releasable latch and catch mechanism between the gas-operating slide mechanism and the operating rod. 95 100 105

3. An automatic gun having a reciprocatory breech bolt means for imparting rotary movement to said bolt, means normally disconnected with the breech bolt and operated in a forward direction by the gases of discharge, a motor actuated by said forwardly-operating means and storing energy during the discharge of gases, and means automatically coupling the bolt with the motor coordinately with the exhaust of the gases. 110 115

4. In an automatic gun, the combination of means operated by the gases of discharge, a breech-bolt mechanism maintained uncoupled from the gas-operated means until the bullet leaves the muzzle of the gun, said mechanism including a reciprocating breech-bolt and means for imparting rotary movement thereto; a motor normally coupled to the gas-operated means and actuated thereby to store power for subsequent reciprocation and rotation of the breech-bolt; and means 120 125

for connecting the breech bolt with the motor coördinate with the exhaust of the gases and the release of the power of the motor.

5. An automatic gun having a slidable casing operable in a forward direction by the gases of discharge; a breech bolt mechanism, said mechanism comprising a reciprocating breech-bolt and means for imparting rotary movement thereto; and means including a power spring and a fixed stop in the range of action of the casing for storing an equal amount of energy for rotating and reciprocating the breech bolt regardless of the different pressures generated by the combustion of the powder charge.

6. An automatic gun having a reciprocatory and rotatory breech bolt, a slidable casing operated in a forward direction by the gases of discharge, and mechanism between the bolt and casing for storing an equal amount of energy for rotating and reciprocating the breech bolt in one direction regardless of the different pressures generated by the combustion of variable powder charges.

7. An automatic gun having in combination a sliding member subjected to and actuated by the gases of discharge; a motor member connected with the sliding member and storing power derived from the gases of discharge, said sliding member holding the motor in check until the expansion of the gases is completed and the power of the stored energy overcomes the pressure of the gases on the sliding member; a breech-bolt mechanism removed from the direct pressure of the gases of discharge, said mechanism including a reciprocating breech-bolt and means for imparting a rotary movement thereto; and means for automatically coupling the bolt mechanism with the motor coördinately with the release of the gas pressure on the sliding member.

8. In an automatic gun, the combination with a reciprocatory breech-bolt; means for imparting rotary movement to said bolt; a slide operated in one direction by the gases of the exploded charge, said bolt being normally uncoupled from said slide and being directly unaffected by the gas-pressure, a mechanism intermediate of the slide and breech bolt and normally disconnected from the latter, and connected to the slide so as to store the energy of the gases of the exploded charge, and hold said energy stored while the bullet is in the gun; and means for automatically coupling the breech bolt with the intermediate mechanism substantially coördinately with the exhaust of the gases and the release of the stored energy.

9. In an automatic gun, a reciprocable breech-bolt, means for imparting rotary movement thereto, a gas-operated mechanism exposed to the gases of the exploded charge, and moved in a forward direction

thereby and without imparting gas pressure to the breech-bolt; a spring motor connected to said mechanism and placed under compression thereby, and operating expansively in a rearward direction; and means for coupling the spring-motor to the breech-bolt whereby the energy stored in the motor is utilized to reciprocate and rotate said bolt.

10. An automatic gun having a reciprocable breech-bolt, means for imparting rotary movement thereto and a slide mechanism normally disconnected from the bolt and operated by the gases of the exploded charge; means intermediate of the slide mechanism and the bolt and conserving the energy of the gas during the forward movement of the slide mechanism; and means for communicating the conserved energy to the breech-bolt for reciprocating and rotating the latter.

11. In an automatic gun, the combination with the barrel, a reciprocable breech-bolt, means for imparting rotary movement to the bolt, of a casing, a closed sleeve extension thereof, and means slidably connecting it with the barrel, a tube rigid with said sleeve extension and ports connecting the interior of the tube with the gun barrel, said casing being movable in a forward direction by the gases of the exploded charge; means including a power-spring within the casing and held relative to the movement thereof, and adapted to be compressed during the forward movement of the casing and the expansion of the gases, and means for coupling the power spring to the breech bolt during the forward movement of the casing, whereby said spring operates expansively to retract and rotate the breech bolt.

12. In an automatic gun, the combination with the barrel and the breech bolt, of a slidably mounted casing, a tubular extension of the front end thereof, a tube within the front extension of the casing and inclosing a gas-chamber which is in open communication with the bore of the barrel, a rod extending through the rear of the casing and means connecting the same to the breech-bolt, power springs encircling the rod between the forward end of the rod and the rear end of the casing, said springs adapted to be compressed when the casing is moved forward by the gases of discharge, and means for coupling the casing to the breech bolt substantially coördinately with the exhaust of the gases of discharge, whereby the energy of the power springs is utilized to reciprocate and rotate the breech bolt.

13. An automatic gun having a reciprocatory breech-bolt, means for imparting a rotary movement to said bolt, means normally disconnected with the breech bolt and operated in one direction by the gases of the exploded charge, a bolt-impelling motor con-

connected to the first named means and adapted to store the energy of said gases during the generation thereof, and means for automatically coupling the breech bolt to the motor thereof, said means comprising a catch carried by the gas-operated means and a member carried by the bolt and adapted to be maintained in engagement with the catch during the rearward opening movement of the bolt.

14. An automatic gun having a reciprocary breech-bolt, means for imparting a rotary movement to said bolt, means normally disconnected with the breech bolt and operated in one direction by the gases of the exploded charge, a bolt impelling motor connected to the first-named means and adapted to store the energy of said gases during the generation thereof, and means for automatically coupling the breech-bolt to the motor thereof, said means comprising a pivoted spring pressed catch carried by the gas-operated means, a member carried by the bolt and positioned to be engaged by said catch on the forward movement of the gas-operated means, whereby the motor and bolt are coupled together during the exhaust of the gases of discharge, and the motor furnishes the power to operate the bolt reciprocally and turnably.

15. An automatic gun having a reciprocary and rotatory breech bolt, means normally disconnected with the breech bolt and operated in one direction by the gases of the exploded charge, a bolt impelling motor connected to the first-named means and adapted to store the energy of said gases during the generation thereof, and means for automatically coupling the breech bolt to the motor thereof, said means comprising a pivoted spring pressed catch carried by the gas operated means, a member carried by the bolt and positioned to be engaged by said catch on the forward movement of the gas-operated means, whereby the motor and bolt are coupled together during the exhaust of the gases of discharge and the motor furnishes the power to operate the bolt reciprocally and turnably and means for releasing the catch from its engagement with the said bolt member.

16. An automatic gun having a reciprocary breech bolt, means for imparting rotary movement thereto, means normally disconnected with the breech bolt and operated in one direction by the gases of the exploded charge, a bolt-impelling motor connected to the first named means and adapted to store the energy of said gases during the generation thereof, and means for automatically coupling the breech bolt to the motor thereof, said means comprising a catch carried by the gas-operated means and a member carried by the bolt and adapted to be maintained in engagement with the catch during

the rearward opening movement of the bolt, and a cam-faced lug disposed in the range of action of the catch and adapted to trip the same to cause it to release its engagement with said bolt member substantially coördinately with the completion of the rearward movement of the bolt.

17. In an automatic gun, the combination with the barrel and the breech bolt, of a slidably mounted casing having a tubular extension of the front end, a sleeve fixed to the barrel and having a lug projecting from its under side, said casing being cut away on the upper side of its front portion to form a shoulder adapted to abut against the front wall of said lug, and said tubular extension adapted to screw into engagement with the front end of the casing, said lug having an internally threaded bore and having a port made transversely through it and connecting with the similar port leading into the bore of the barrel, a tube threaded into engagement with the bore of said lug and contained within said tubular extension of the casing and adapted to form a chamber for the gases of discharge, a screw plug closing the rear end of the slidable casing, a rod extending through said casing and through and beyond said plug, means for fixing the rear end of the rod to a stationary portion of the gun, a stop at the front end of said rod, and power springs surrounding the rod and having their opposite ends abutting the plug and said front stop, said casing adapted to be moved forwardly by the gases of the exploded charge to compress said springs and to store energy therein for subsequently reciprocating and rotating the breech bolt.

18. In an automatic gun, the combination with the barrel and the breech bolt, of a slidably mounted casing having a tubular extension of the front end, a sleeve fixed to the barrel and having a lug projecting from its under side, said casing being cut away on the upper side of its front portion to form a shoulder adapted to abut against the front wall of said lug, and said tubular extension adapted to screw into engagement with the front end of the casing, said lug having an internally threaded bore and having a port made transversely through it and connecting with the similar port leading into the bore of the barrel, a tube threaded into engagement with the bore of said lug and contained within said tubular extension of the casing and adapted to form a chamber for the gases of discharge, a screw plug closing the rear end of the slidable casing, a rod extending through said casing and through and beyond said plug, means for fixing the rear end of the rod to a stationary portion of the gun, a stop at the front end of said rod, and power springs surrounding the rod and having their opposite ends abut-

ting the plug and said front stop, said casing adapted to be moved forwardly by the gases of the exploded charge to compress said springs and to store energy therein for subsequently reciprocating and rotating the breech bolt and said rod having a shoulder intermediate of its ends against which the inner face of the screw plug strikes to limit the compression of said springs.

10 19. In an automatic gun, the combination with the barrel and the breech bolt, of a slidably mounted casing having a tubular extension of the front end, a sleeve fixed to the barrel and having a lug projecting from its under side, said casing being cut away on the upper side of its front portion to form a shoulder adapted to abut against the front wall of said lug, and said tubular extension adapted to screw into engagement with the front end of the casing, said lug having an internally threaded bore and having a port made transversely through it and connecting with the similar port leading into the bore of the barrel, a tube threaded into engagement with the bore of said lug and contained within said tubular extension of the casing and adapted to form a chamber for the gases of discharge, a screw plug closing the rear end of the slidable casing, a rod extending through said casing and through and beyond said plug, means for fixing the rear end of the rod to a stationary portion of the gun, a stop at the front end of said rod, and power springs surrounding the rod and having their opposite ends abutting the plug and said front stop, said casing adapted to be moved forwardly by the gases of the exploded charge to compress said springs and to store energy therein for subsequently reciprocating and rotating the breech bolt, and said rod having a shoulder intermediate of its ends against which the rear plug contacts to limit the compression of the springs whereby said springs store an equal amount of energy for rotating and reciprocating the breech bolt regardless of the different pressures generated by the gases of the exploded charge.

20. In an automatic gun, the combination of the barrel and the breech bolt, of a sleeve fixed to the barrel and having a bottom lug said lug having an internally threaded bore, a tube having its rear end threaded to said bore, said tube, the lug, and the under side of the barrel having registering gas ports, a slidably mounted casing and a tubular extension of the front end thereof, adapted to abut against said lug, said front extension inclosing and being slidably mounted relative to said tube and said tube having a nickel sleeve at its front end with expansible walls adapted to form a gas tight joint with the inner walls of said extension and to serve as a scraper therefor, a plug closing the rear end of the slidable casing, a rod ex-

tending through said casing and plug and having means for fixing its rear end to a fixed part of the gun, said rod having a collar or stop at its front end and having a shoulder intermediate of said ends against which the plug is adapted to contact, and power springs within the casing and surrounding said rod and adapted to be compressed when the casing is moved forward under the influence of the gases of the exploded charge.

21. In an automatic gun, the combination with the barrel and the breech bolt, of a slidably mounted casing, a tubular extension of the front end thereof, a tube within said front extension and inclosing a gas chamber which is in open communication with the bore of the barrel, a rod extending through the rear of the casing, means connecting the rear end of the rod with the fixed part of the gun, power springs inclosing the rod and confined between the front end of said plug and the front end of the rod, said springs adapted to be compressed when the casing is moved forwardly by the gases of the exploded charge, and means for coupling the casing to the breech bolt substantially coördinately with the exhaust of the gases of discharge, said means including a pivotally mounted spring-pressed latch carried by the casing, a slidably mounted rod arranged parallel with the casing, and with which the latch is adapted to engage on the forward movement of the casing whereby the casing and rod are coupled together during the return movement of said casing, an extension of said slidable rod and means connecting the rear end of said extension with the firing bolt, means for releasing the latch from its engagement with said slidable rod, a spring within the slidable rod for returning the rod to normal position and moving the breech bolt in a forward direction.

22. In an automatic gun, the combination of a bolt mechanism, a mechanism operated forwardly by the gases of the exploded charge, said bolt mechanism being normally uncoupled from the gas operated mechanism whereby it is devoid of gas pressure, power springs intermediate of the bolt mechanism and the bolt operated mechanism for storing the energy of the exploded charge, and means for coupling the bolt mechanism with the power springs substantially coördinately with the exhaust of the gases to permit the stored energy of the springs to impart a reciprocable movement to the breech bolt in a rearward direction and to turn said bolt, said last-named means including a slidably mounted spring-pressed rod arranged parallel with the gun barrel and having its rear end connected with the bolt mechanism of the gun, latching means carried by the gas operated mech-

anism and adapted to engage said rod on the forward movement of said mechanism whereby said mechanism and rod operate together in a rearward direction, and means for automatically tripping the latching mechanism to cause it to release the slidable rod at substantially the termination of the rearward movement of the breech bolt.

23. In an automatic gun, the combination of means operated by the gases of the exploded charge, 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 rearward reciprocation and rotation of the breech bolt and means for connecting the breech bolt with the motor coördinately with the generation of the gases and the release of the power of said motor, said last-named means comprising a slidably-mounted spring-pressed rod arranged parallel with the barrel of the gun, coupling means between the gas operated means and the slidable rod and adapted to couple the two when the gas operated means is moved forwardly by the gases of the exploded charge, said slidable rod and gas operated means moving together in a rearward direction during the exhaust of the gases and a cam member carried by the slidable rod and normally disposed proximate to the lever of the bolt and adapted to be forced under said lever to thereby raise the same and unlock the breech bolt to allow the same to be moved rearwardly.

24. In an automatic gun, the combination with a reciprocatory and rotatory breech bolt, of slidably mounted means normally disconnected from the breech bolt and operated in a forward direction by the gases of the exploded charge, a power-spring mechanism actuated by the first-named means and adapted to store energy during the generation of gases, and means for automatically coupling the gas operated means with the breech-bolt, said last means comprising a fixed guide, a rod slidably mounted therein, having its rear end connected to the breech bolt, coacting coupling members on the slidable rod and the gas operated means adapted to engage on the forward movement of the gas operated means, a spring acting on the slidable rod and compressed during the rearward movement thereof, and adapted to return and close the breech bolt, and means for automatically uncoupling the rod and gas operated mechanism at substantially the completion of the rearward opening movement of the breech bolt.

25. In an automatic gun, the combination with a reciprocatory and rotatory breech bolt said bolt having an operating hand-lever, of a slidable casing operated in a forward direction by the gases of the exploded

charge, a power-spring mechanism placed under compression by the forward movement of the casing, a spring-pressed rod arranged to slide parallel with the movement of the casing, and having its rear end attached to the breech bolt, said rod having a cam the point of which operates under the hand lever of the breech bolt to initially raise the same and unlock the bolt, a spring pressed latch on the slidable casing adapted to engage the slidable rod on the forward movement of the casing, to allow the casing and rod to be moved together rearwardly by the action of the power spring mechanism, and means for tripping the latch to release the slidable casing from its engagement with the slidable rod.

26. In an automatic gun, the combination with the receiver having a slot in the side of its rear end, and a breech bolt having a hand lever, of a slidable-casing operated in a forward direction by the gases of the exploded charge, a motor actuated by the casing to store energy during the generation of gases, and to release its energy during the exhaust of said gases, a slidably mounted spring pressed rod and means for automatically coupling and uncoupling it to the slidable casing, and a trapezoidal-shaped cam-member operating inside of the receiver to ride under the hand-lever of the bolt to thereby lift the same and unlock the bolt, and having a part extending transversely through the slot thereof and connected to the slidable rod.

27. In an automatic gun, the combination with the receiver having a slot in the side of its rear end, and a breech bolt having a hand-lever, of a slidable-casing operated in a forward direction by the gases of the exploded charge, a motor actuated by the casing to store energy during the generation of gases, and to release its energy during the exhaust of said gases, a slidably mounted spring pressed rod and means for automatically coupling and uncoupling it to the slidable casing, and a trapezoidal-shaped cam-member operating inside of the receiver to ride under the hand lever of the bolt to thereby lift the same and unlock the bolt, and having a part extending transversely through the slot thereof and connected to the slidable rod, and an arm on the rear end of the slidable rod and extending diagonally toward the axis of the bolt and connected to the firing bolt of the latter.

28. In an automatic gun of the character described the combination of a breech bolt, a slidable casing operated forwardly by the gases of the exploded charge, a power spring mechanism connected to the casing and placed under compression during the forward movement thereof, and operating expansively in a rearward direction to impart reciprocatory and rotatory movement to the

breech bolt, a slidably mounted rod and means connecting it to the breech bolt, means automatically coupling it to the slidable casing during the forward movement of the latter, means for uncoupling the rod and casing during the rearward movement of the latter, a spring within the slidable rod, a bearing block against which the rear end of the spring seats, a guide for the slidable rod, and a coupling pin movably mounted in the guide and adapted to engage and release the bearing block.

29. In an automatic gun of the character described the combination of a breech bolt, a slidable casing operated forwardly by the gases of the exploded charge, a power spring mechanism connected to the casing and placed under compression during the forward movement thereof, and operating expansively in a rearward direction to impart reciprocatory and rotatory movement to the breech bolt, a slidably mounted rod and means connecting it to the breech bolt, means automatically coupling it to the slidable casing during the forward movement of the latter, means for uncoupling the rod and casing during the rearward movement of the latter, a spring within the slidable rod, a bearing block against which the rear end of the spring seats, a guide for the slidable rod and a coupling pin vertically in said guide, said pin having a spaced member and said bearing block having a slitted rear end to receive the spaced member of the pin to detachably hold the block to allow the spring to be compressed as the rod is moved rearwardly, said spring operating to return and close the breech bolt.

30. In a gun having a reciprocatory and rotatory breech bolt, a spring pressed horizontally slidable rod, a loose bearing block within the rod and forming a seat for one end of the spring, a vertically slidable coupling pin adapted to be moved into and out of engagement with the bearing block to thereby control the action of the spring and to make the breech bolt automatic or non-automatic at pleasure; a power spring mechanism placed under compression by the gases of the exploded charge and operating expansively in a rearward direction, and means for connecting and disconnecting the power-spring mechanism with the slidable rod.

31. In a gun having a reciprocatory and rotatory breech bolt, a spring pressed horizontally slidable rod a loose bearing block within the rod and forming a seat for one end of the spring, a vertically slidable coupling pin adapted to be moved into and out of engagement with the bearing block to thereby control the action of the spring and to make the breech bolt automatic or non-automatic at pleasure; a power spring mechanism placed under compression by the gases of the exploded charge and operating ex-

pansibly in a rearward direction, and means for connecting and disconnecting the power spring mechanism with the slidable rod, said coupling pin serving as a stop for ejected shells and having a cam-shaped face and notch and said bearing block having a slot to receive the pin and having a lug to enter said notch.

32. In a gun of the character described, a reciprocatory and rotatory breech bolt having a spirally arranged slot in its circumference with the walls of the slot arranged at different angles whereby the slot increases in width toward the lower end, in combination with a horizontally slidable member having a transverse lug operating in said slot, and a hand-lever fixed to the bolt, said slidable member having an inclined front end the point of which is adapted to ride under the lever to raise the same slightly in advance of the action of the projection against the walls of the spiral slot.

33. In a gun, the combination with the breech-bolt and the firing bolt thereof, of a slidably mounted rod arranged parallel with the breech bolt, and an arm fixed to the rear of the rod and extending diagonally and having its outer end inclosing the firing bolt just in advance of the head thereof, said inclosing portion being cut away on one side and said firing bolt having a companion part flattened, whereby the arm and firing bolt are detachably connected one with the other.

34. In a gun, the combination with the receiver thereof and the bolt mechanism, of a spring-pressed sear-bar pivotally mounted at the front portion and having a sear at the rear end, a horizontal spring pressed pin slidably mounted in the lower front portion of the sear-bar, and provided with a notch, and a spring-pressed pivoted trigger located between the front and rear ends of the sear bar, and having a projection to engage the notch of the spring-pressed pin whereby when the trigger is pulled rearwardly the sear bar is first depressed and then released from engagement with the trigger.

35. In an automatic gun, the combination with the breech bolt having a cocking cam on its rear end, a firing bolt having a lug to be engaged by said cam, a slidably mounted casing operated in a forwardly direction by the gases of discharge, a power spring mechanism connected to and compressed by the casing and adapted to store the energy of the exploded charge, a spring-pressed bolt-operating rod and means for coupling it to the power-spring mechanism substantially coördinately with the exhaust of the gases of discharge and release of the stored energy in the power-spring mechanism whereby the latter operates the bolt rearwardly, and an arm on the operating rod connected to the firing bolt and adapted to move the same

initially slightly in advance of the action of the cocking cam on the lug of said firing bolt, thereby removing excessive strain from the breech-bolt.

5 36. In a gun of the character described, a reciprocatory and rotatory breech bolt having a cocking cam on its rear end and a spiral slot in its circumference, said slot having its opposite walls arranged at different angles whereby the slot widens toward the lower end, in combination with a firing bolt
10 having a lug engaged by the cocking cam

and a rearwardly spring pressed rod having a member connected to the firing bolt and adapted to initially move the firing bolt 15 so that its lug moves slightly in advance of the engaging wall of the cocking cam and the strain on the breech bolt is relieved.

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

GRANT HAMMOND.

Witnesses:

C. W. FOWLER,
T. W. FOWLER.