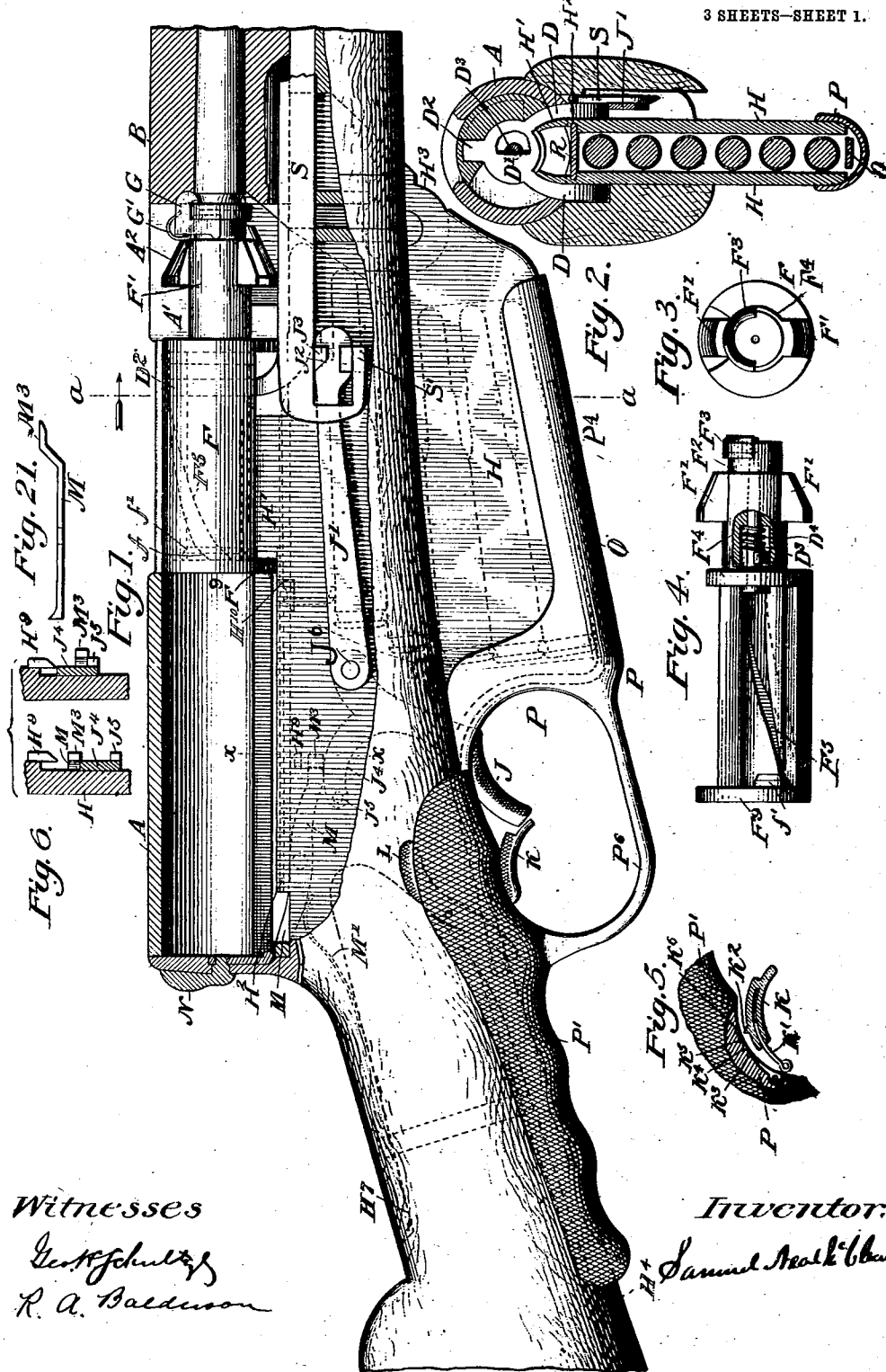


No. 816,591.

PATENTED APR. 3, 1906.

S. N. McCLEAN.
AUTOMATIC GAS OPERATED FIREARM.
APPLICATION FILED APR. 5, 1898.

3 SHEETS—SHEET 1.



Witnesses
George Schultz
R. A. Baldwin

Inventor:
Samuel McClean

No. 816,591.

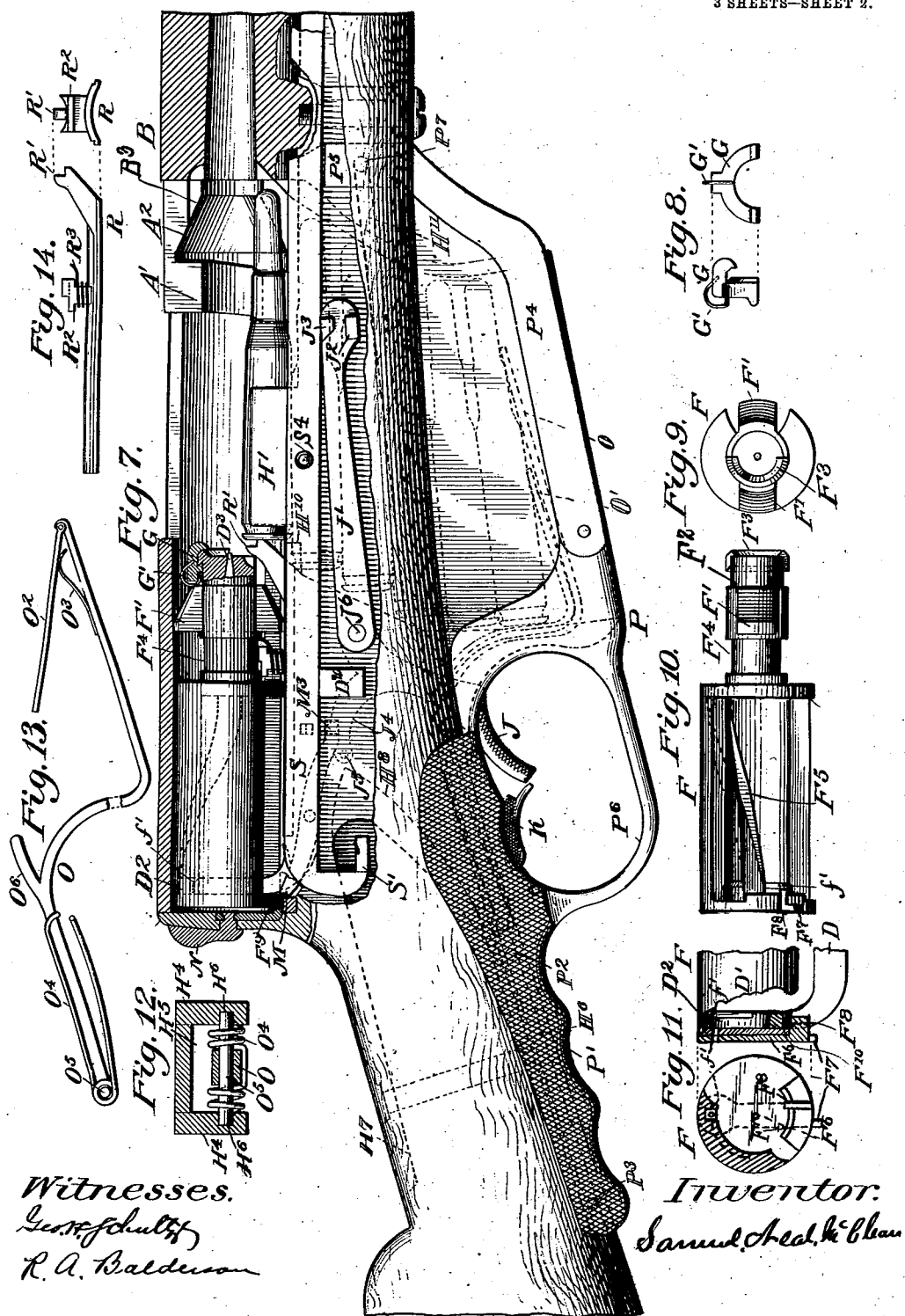
PATENTED APR. 3, 1906.

S. N. McCLEAN.

AUTOMATIC GAS OPERATED FIREARM.

APPLICATION FILED APR. 5, 1898.

3 SHEETS—SHEET 2.

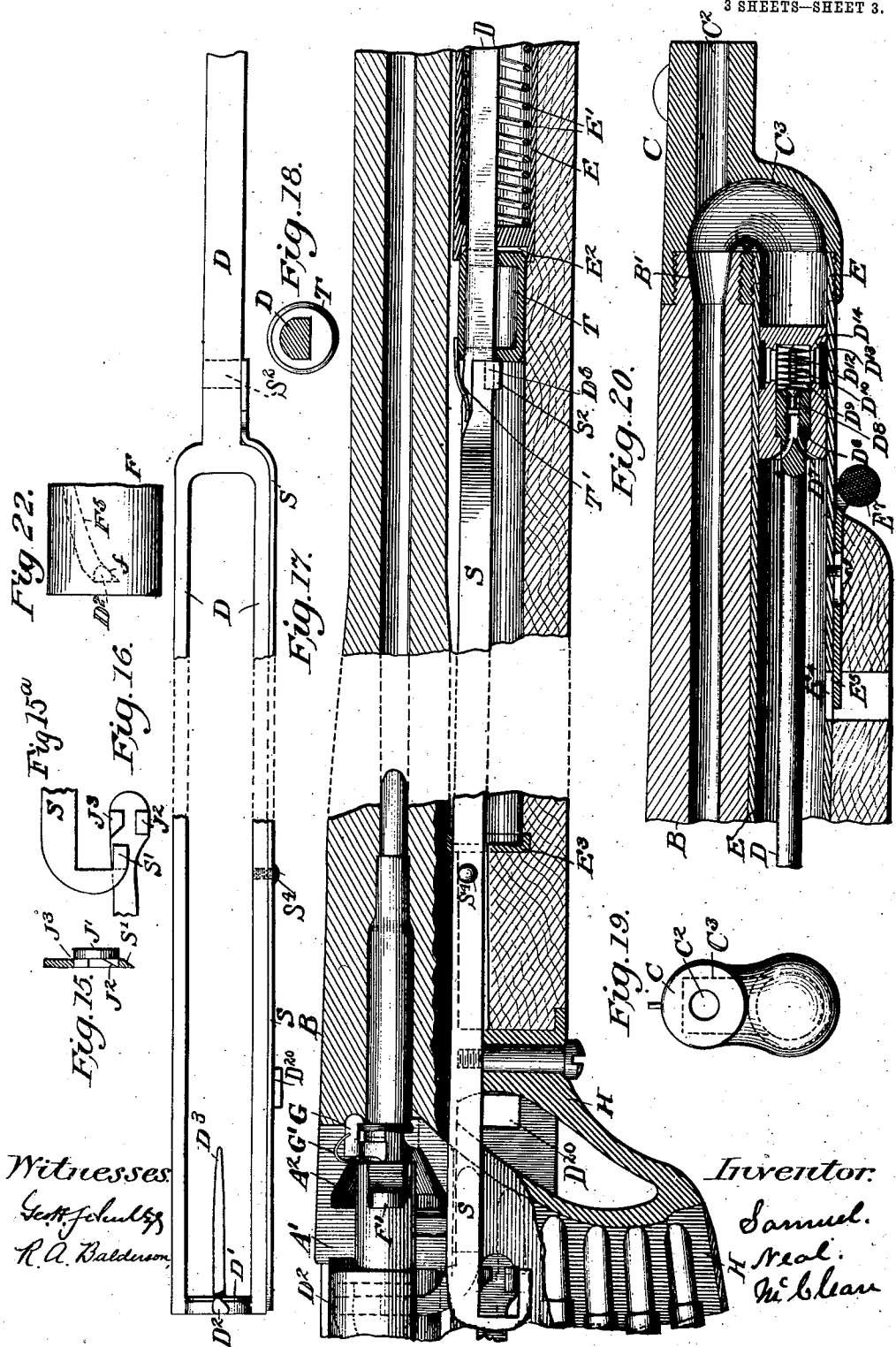


No. 816,591.

PATENTED APR. 3, 1906.

S. N. McCLEAN.
AUTOMATIC GAS OPERATED FIREARM.
APPLICATION FILED APR. 5, 1898.

3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

SAMUEL N. McCLEAN, OF WASHINGTON, IOWA, ASSIGNOR TO THE
McCLEAN ARMS AND ORDNANCE COMPANY, OF CLEVELAND,
OHIO, A CORPORATION OF NEW JERSEY.

AUTOMATIC GAS-OPERATED FIREARM.

No. 816,591.

Specification of Letters Patent.

Patented April 3, 1906.

Application filed April 5, 1898. Serial No. 676,520.

To all whom it may concern:

Be it known that I, SAMUEL N. McCLEAN, a citizen of the United States, residing at Washington, in the county of Washington and State of Iowa, have invented certain new and useful Improvements in Breech-Loading and Discharge-Actuated Firearms; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to breech-loading and discharge-actuated firearms or automatic and semi-automatic firearms.

The purpose of my invention is to produce a strong, light, cheap, simple, durable, accurate, and easily-manufactured discharge-actuated firearm embodying certain improvements in controlling and utilizing the force of the discharge to operate the arm and certain details of improvement in connection with the construction, operation, and combination of the operating parts of the arm.

Recognizing the fact that the frame of the gun is the basis of its accuracy, especially for long-range shooting, and that the manner in which the frame sustains the strain of firing is intimately related to both the accuracy and durability of the arm, I have devised in accordance with this principle a weapon in which the strain of the discharge shall be received in the line of greatest strength, resisted by the shearing, crushing, and elastic strength of the metal, distributed equally on every part of the arm and limited to the least possible area, and in which the plan of the operating parts is not cut away or the strength and symmetry of the frame destroyed. Recognizing also the fact that the merits of a mechanical construction reside primarily and largely in the mechanical movements of which it is composed and that few and simple movements are usually associated with few and simple parts, I have devised a weapon in which the movements involved in handling the ammunition form a basis of the gun's construction, and the movements involved in passing the ammunition through the arm, and in the construction,

action, and combination of the operating parts, are the most direct, simple, and positive attainable.

A further generic object of my invention is to control both the initial and terminal motions of the discharge-actuating force to either increase or diminish the actuating force in such manner as the construction, action, and safety of the operating parts shall require and to provide a system of companion and coacting cams and cam-guides to govern positively the action and combination of the operating parts.

Finally, there are certain details of improvement in the operating parts of the invention which are more fully set forth in the accompanying drawings and specification, and inasmuch as the invention defined and set forth in the several improvements described in the specification and drawings is of such a nature that several modifications of the same may be made without in the least departing from the spirit of the invention I do not limit myself to the precise form shown and described.

In the accompanying drawings, which are hereby made a part of this specification, Figure 1 is a broken central longitudinal section of the receiver and barrel, showing the right side wall of the stock broken away and removed, the operating parts being shown in elevation in position for the trigger to be pulled to fire the gun. Fig. 2 is a transverse section on the line *a a*, Fig. 1, of the receiver, stock, and magazine of the firearm, showing an end view of the slide *D*. Fig. 3 is a front end view of the breech-bolt. Fig. 4 is a plan view of the breech-bolt looking up into its under side as shown in Fig. 1, illustrating the bolt-locking guide *F*. Fig. 5 is a broken detail of the handle *P*, showing the trigger-lock in section detached and the means by which it is held in position. Fig. 6 is a broken section of the side wall of the magazine, taken on the lines *z z*, Fig. 1, showing the trigger *J* and detent or dog *M* in first and second positions of rest or positions respectively for single firing and single loading. Fig. 7 is a longitudinal central section of the barrel and receiver, showing the operating parts in elevation in their second or rear position and the right-hand side of the stock-wall broken away and removed. Fig. 8 is a detail side

view and an end view of the shell-extractor and its spring tension. Fig. 9 is an end view of the breech-bolt. Fig. 10 is a bottom plan view of the breech-bolt, showing the bottom side of the bolt as illustrated in Fig. 7. Fig. 11 is a rear end view of the breech-bolt, showing the latch F^8 and a broken side view of the bolt, showing the latch F^8 in section and its manner of engagement with the slide D. Fig. 12 is a transverse section of the tailpiece of the magazine H, showing the groove in which the handle P is guided and the cartridge-lifter O, pin O^5 , groove H^6 in which it is guided, and the spring O^4 . Fig. 13 shows a modified form of the cartridge-lifter O in side elevation. Fig. 14 is a side and end view of the cartridge feed and ejecting device R. Fig. 15 is a vertical cross-section of the trigger and sear as shown in Fig. 1 in its first position for single firing. Fig. 15^a is a broken side elevation of the same parts in their third position for automatic firing. Fig. 16 is a plan view of the slide D and sear S. Fig. 17 is a broken central longitudinal section of the barrel, forestock, part of the magazine, tube E, and cylinder T, showing the right half of the said parts removed and showing the operating parts in elevation. Fig. 18 is a front end view of the cylinder T with the drive-rod D in cross-section. Fig. 19 is a front end view of the barrel. Fig. 20 is a central longitudinal section of the barrel, gas-chamber, gas-cylinder, piston-head, and forestock. Fig. 21 is a detail plan view of the sear M. Fig. 22 is a top view of the rear end of the breech-bolt.

Similar letters of reference refer to similar parts throughout the specification, and for convenience of description the different parts of the same piece and of intimately-correlated pieces have been designated by the same reference-letter, the exponent above the letter being changed to indicate the particular feature of the part to which the letter is applied.

The receiver may be of any desired form to adapt it to the bolt-action with which it is intended to be used; but for the purpose of attaining certain manufacturing and military advantages I have invented a certain type of receiver in which the barrel may be integrally formed with the receiver or fixedly attached to the same in the usual manner. The receiver which I have invented is formed to have a certain specific relation to the bolt-action and cartridge-feed device and is formed to sustain the strain of the discharge in the line of greatest strength to limit it to a small area immediately behind the barrel and to secure the best relation of the bolt-action and receiver. I construct the walls of the receiver with their greatest strength and thickness at the point of greatest strain without increasing the outside diameter of the receiver or materially decreasing the strength of the breech-bolt. Such a receiver may be turned

from a round bar of metal and is provided with the usual bolt-chamber, having an opening on its upper side to permit the insertion and removal of the cartridges and an opening on its under side to permit the movement and action of the operating device. The part of the bolt-chamber in front of the locking-lugs is internally beveled or funnel-shaped to afford additional thickness and strength of the receiver-walls at their point of greatest strain. Immediately at the end of the cartridge-chamber the receiver is formed with a straight or shouldered part to afford a bearing for the extreme forward end of the bolt, and it is also cut out to afford a path of movement for the extractor at the end of the bolt-chamber. The bolt-action in order to conform to this construction is formed with a companion beveled or funnel-shaped forward end.

The forward end of the barrel is formed with a funnel-shaped opening at the end of the bore of the barrel to afford certain advantages in utilizing the gases of discharge to operate the arm.

The weapon is formed to be actuated either by hand or by the gases of discharge and is provided with a gas-actuating chamber, (denoted by the reference-letter C.) This chamber is preferably located at or near the forward end of the barrel. It may be integrally formed with the barrel; but I prefer to form the chamber separately, and it is illustrated in Fig. 20 as being screwed onto the forward end of the barrel. This chamber preferably extends from the front to one side of the bore of the barrel and is constructed to afford a certain yielding and sufficient operating-pressure of the gases of discharge within the chamber. This result may be attained by forming the end of the bore funnel-shaped and by forming the chamber of constantly-increasing cross-sectional area from the end of the funnel-shaped end of the bore to the action, so that the passage for the gas from the barrel to the action shall be of constantly-increasing size, so as to secure a reduction in the pressure of the gases within the chamber. The anterior wall of the chamber is preferably formed on an arc of a circle and contains an opening C^2 in line with the bore of the barrel. This opening forms a continuation of the barrel, and its diameter is such as to permit the passage of the projectile, and it may have any desired length to afford the required operating pressure of the gases within the chamber. This chamber is connected with the operating parts to actuate the same, and, as illustrated in Fig. 20, I have shown connected with it a cylinder or tube E, which, in effect, constitutes a part of said gas-chamber.

The weapon is automatically operated by means of the discharge-actuated slide D. This slide has at its forward end a piston

which is movable in the tube E, and the rearward end of the slide is connected with the bolt-action to control its reciprocating, locking, and firing action. This operating-slide is actuated by the gases of discharge in one direction and by the resistance of the coiled spring E', preferably located in the tube E, in the other direction. The piston-head on the end of the slide D has preferably a movable and an immovable part. The movable part of the head is formed with a chamber D⁹, in which the end of the slide D has a certain limited movement to afford an air-pressure for the purpose of preventing the escape of the actuating-gas past the said piston-head. This air-chamber D⁹ in the piston-head is provided with openings D¹², which communicate with an air-chamber surrounding the piston-head. On the outer side of the air-chamber the piston-head is formed thin and yielding to afford an air-cushion in checking the passage of the gas past the cylinder-head. This part of the piston-head is preferably formed of a thin band of elastic material D¹⁴, Fig. 20, on the outer side of which is located a band of yielding material D¹³, Fig. 20, to afford a yielding pressure against the tube in which the piston is reciprocated. The air-chamber D⁹ in the piston is provided with a spring D¹⁰ to exert a yielding pressure or tension between the end of the slide D and the piston-head. The immovable part D⁶ of the piston-head has an opening D⁷ through its rear end leading from the chamber D⁹, in which is located a valve D⁸, which is set to close the chamber in an advance movement of the slide D and to open it by a reverse movement of the slide, thus affording an air-pressure within the chamber D⁹ to operate as a gas-check. The operating-slide D is also provided at a point in rear of the spring E with a cylinder T, slidably mounted on and having close frictional engagement with the said slide, the cylinder having its respective ends beveled to engage cups or dash-pots E² and E³, Fig. 17, located in the path of its terminal, forward, and rearward movements. The operating-slide is also provided with a sear S, pivoted to the slide at S⁴, which engages with the said movable cylinder T to prevent the slide from moving forward far enough to explode the cartridge until the sear has its end S² raised so as to partially enter the cylinder T, which is accomplished by depressing the rear end of the sear through the medium of the trigger.

The slide D has on its under side a recess D⁵, in which a lateral lug S² on the forward end of the sear S and below the line of the lower edge of the main portion of the sear is received. The upper edge of the end of the sear directly above the lug S² is cut away, as shown in Fig. 17. A spring T', carried by the cylinder T, normally presses the forward end of the sear S downward, so that the lug S²

will be below the plane of the lower edge of the slide D and will engage the rear end of the cylinder T. When the forward end of the sear is thrown upward by the depression of its rear end, as hereinafter described, the lug S² will enter the recess D⁵ in the slide D and will no longer engage the rear end of the cylinder T. The rod D will then move forward a short distance through the cylinder T, carrying the part S² of the sear S nearly, but not entirely, within the cylinder, the forward movement of the rod and sear being arrested by the contact of the rear end of the rod D with the firing-pin when said pin is carried by the breech-block, or if the pin is carried by the rod D, as in Fig. 16, then the forward movement of the rod will be arrested by the contact of the firing-pin with the cartridge. Upon the rearward movement of the rod D under the influence of the gases of discharge the frictional contact between the part S² of the sear and the cylinder T due to the spring T' causes the cylinder to move rearward with the rod D till the dash-pot E³ is reached, when the cylinder's rearward movement is gently arrested, and the slight further rearward movement of the rod D and sear S withdraws the part S² from the cylinder and permits it to fall behind the cylinder upon the forward movement of the parts.

The tube E is provided on its under side with an opening E⁴, Fig. 20, to afford an exit for the gas at or near the terminal part of the movement of the piston. The size of this opening may be adjusted by a slide E⁵, attached to and movable on the tube E and having a thumb-piece E⁷, by which it may be shifted.

The bolt-action may have any required form to adapt it to the type of breech-bolt-locking action with which it is intended to be used. The preferred form of the bolt-action is that of a reciprocating and rotating breech-bolt. It has a body part, a bolt-head, and the usual locking-lugs. The bolt-head is preferably formed integrally with the body part of the bolt and is provided with the usual locking-lugs F', which are beveled or chamfered to fit the forward end of the bolt-chamber, which is made of beveled shape to afford additional thickness and stiffness of the side walls of the receiver at the point of greatest strain. The locking-lugs A' of the receiver are formed with a double cam, the initial part of the cam-face of the lug on both its front and rear sides having an increased pitch to afford an increased movement of the bolt to both seat and extract the cartridge. The body part of the bolt is provided with a cam-guide F⁶, which partially encircles the bolt and is preferably located on the inner side of the body part of the bolt. Referring to Figs. 1, 4, 10, 11, and 22, it will be seen that this cam-guide is in the form of a slot F⁵, Figs. 1, 7, and 22, in the body part of the bolt

extending longitudinally thereof at an acute angle to the bolt's axis with a substantially uniform pitch, except at its front and rear ends. At its front end the walls of the slot 5 extend in a straight front and rear direction substantially parallel with the bolt's axis, while at the rear end the obliquity of the slot to the axis of the bolt is increased, as will be understood by inspecting the part marked *f* 10 in Fig. 22. Referring to Figs. 1 and 10, the breech-bolt is shown with an interior circumferential groove formed around the upper portion of its rear end, which groove has a beveled forward shoulder *f'*. A beveled 15 shoulder *F*¹⁰, substantially parallel with the shoulder *f'*, is formed in the lower rear end wall of the bolt, as shown in Fig. 10. The combined effect of the beveled shoulder *F*¹⁰ and the increase *f* in the pitch of the cam *F*⁵ 20 is to shift the bolt and raise the rear part of the slide *D* until it is to the rear of and in engagement with the shoulder *f'*, thereby forming a latching engagement between the bolt and slide so long as the parts are retained in 25 this relation. The bolt is also provided with a latch *F*⁶, which is preferably attached to the rear end of the bolt, as illustrated in Fig. 11, and has a lug *F*⁸, which projects into the path of the operating-slide, and a companion lug 30 *F*⁷, which is located to be engaged by a lug *H*¹⁰ on the upper side and rear end of the gun-frame, Figs. 1 and 7. The neck of the breech-bolt is provided with a groove or shouldered part *F*⁴ to engage with the magazine-feed and 35 ejecting device *R*, as hereinafter set forth. The forward end of the bolt is provided with an extractor-seat *F*², which has a beveled flange *F*³ to afford a latched relation of the breech-bolt and extractor, which flange is 40 partly cut away to afford a convenient method of assembling and disassembling the extractor. The body part of the breech-bolt is cut out to permit the magazine to project up into the receiver (see Fig. 2) and to allow the 45 rotating movement of the breech-bolt without interfering with the magazine and to permit the action of the operating-slide.

The rear part of the operating-slide *D* is forked or double to permit its arms (illustrated in Fig. 16) to be reciprocated on either 50 side of the cartridge-magazine. The rear end *D'* of the slide *D* projects up into the breech-bolt, Figs. 2 and 16, and has a cylindrical shape to conform to the shape of the chamber formed in the body part of the breech-bolt 55 in which the part *D'* is reciprocated. The upper forward edge of this part *D'* is chamfered or beveled to form a companion to the bevel *f'* and on its under rear side is provided with a beveled part to engage with its companion 60 shoulder *F*¹⁰, Fig. 11. The upper end of the part *D'* is provided with a pin *D*³, Figs. 1, 7, 22, which has a beveled side to engage with the diagonal part of the guide *F*⁵ and afford 65 a latched engagement of the slide *D* with the

breech-bolt. The groove *F*⁵ is formed with a straight part at its forward end to permit the terminal firing movement of the slide *D* after the locking movement of the bolt is complete.

The cartridge-magazine is preferably formed 70 from a single piece of material and contains a chamber for the reception, retention, and release of the cartridges. This chamber conforms in general to the shape of the cartridges and has on its upper side inwardly-turned 75 wings *H'*, Figs. 1, 2, and 7. These magazine-wings project up into the receiver, and their upper ends converge to exert a yielding and retaining tension against the topmost cartridge in the magazine. These wings are suf- 80 ficiently distant from each other to allow the under lug on the breech-bolt to be reciprocated between them and rise up into the receiver far enough to allow the cartridge to be readily pushed by the breech-bolt from the 85 magazine into the bore of the barrel.

For the purpose of attaining an advantageous cartridge-feeding action in passing the cartridges from the magazine into the barrel I have interposed between the magazine and 90 bolt-action a cartridge-feeding slide *R*, Fig. 14, which controls both the cartridge feeding and ejecting action of the arm. This slide is reciprocated in guide-grooves *H*², Figs. 1 and 2, which are located in the side walls of the 95 magazine. Its forward end *R'* is formed to engage with the rear end of the cartridge, and it has a projection or lug *R*², which engages with the groove *F*⁴ of the breech-bolt. This lug *R*² carries a spring *R*³, the ends of 100 which also engage with the breech-bolt to exert a yielding tension from the breech-bolt against the cartridge-feeding slide. The forward end of the cartridge-feed is beveled to form a companion bevel with the forward 105 end of the breech-bolt, and its under side is beveled to cause the cartridge to be advanced up into a position in front of the cartridge-feeding slide when the slide is in its rearward position and when the cartridge rises to the 110 topmost part of the magazine.

The cartridges are elevated in the magazine by the cartridge-levers *O* and *O'*, Fig. 7. These levers are spring-actuated and are pivotally supported in the handle *P*. The rear 115 side of the magazine is slotted to permit the lifting movement of the levers and to allow the rearward movement of the handle to depress and withdraw the levers after the magazine is empty. The shoulder *H*⁸, Fig. 7, 120 formed in the gun-frame beneath the rear-portion of the receiver, is located in the path of the rearward movement of the levers to cause these levers to be depressed by the rearward movement of the handle. This depression 125 of the levers *O* *O'* by coming in contact with shoulder *H*⁸ when the handle is withdrawn brings the ends of the levers below the level of the lowermost cartridge in the magazine, and as the handle is slid forward the 130

ends of the levers pass under the lowermost cartridge and as soon as they are entirely freed from the restraining action of the shoulder H^b they tend to rise under the influence of their spring and at the proper time act to elevate the cartridges into the receiver. The lever O' has the same general form as the lever O and has the pivot on which it turns arranged in the handle P to the rear of the magazine. As shown in Fig. 7, both these levers have the same pivot; but this is not essential. The lever O' is shorter than the lever O and bears upon the body portion of the lowermost cartridge, while the lever O bears upon the projectile. By the action of the two levers the cartridges are maintained in parallel position as they are fed upward. Instead of the lever O' , I may use, as shown in Fig. 13, a lever O^2 , pivoted to the forward end of the lever O and pressed upward by the spring O^3 . The lever O is actuated by the spring O^4 , which is supported on the pivot O^5 , and is adjusted to exert a yielding tension between the lever O and the track H^6 of Figs. 12 and 7, in which the pivot O^5 , on which the lever O is supported, is guided. The lever O is provided on its upper side with an arm or finger O^6 , which as the lever O reaches the end of its upward movement is projected into the path of the detent or dog M to engage the projection M^3 on said detent, to release the same from the trigger and permit it to rise into engagement with the bolt after the last cartridge has been fired, and thus leave the breech open for the insertion of a single cartridge or to indicate that the magazine is empty.

While I do not contemplate the use of the handle P for the purpose of taking the place of the gas-operated piston for actuating the slide to throw back the breech-bolt after the gun has been fired, the weapon to this extent being intended to be a gas-operated gun only, it is of importance that the gun be capable of being hand-actuated for the purpose of withdrawing a cartridge which for any reason has failed to be exploded, as well as when the weapon is used for single firing to let down the breech-bolt onto a cartridge without exploding it, and to subsequently draw back the firing devices into such position that the cartridge may be exploded by pressing the trigger—in other words, for cocking and uncocking the weapon. So, too, if by any mischance the gas-chamber should be detached from the gun or be so injured as to necessitate a hand operation, the fact that the weapon is capable of hand operation may be of importance. The handle P is provided to afford a means of operating the weapon by hand. This handle has a reciprocating movement on the under side of the stock and is guided in a way or groove H^5 , Fig. 12; which is formed in the tailpiece of the frame.

In the side wall of this groove H^5 guide-grooves H^6 are provided, which control the reciprocating movement of the handle by means of the lugs P^2 and P^3 . The body part P' of the handle conforms to the shape of the hand and forms a trigger-guard P^6 and has a forward-projecting arm which forms a magazine cover or door.

The cartridge-lifting levers may be engaged by and moved with the handle in its backward and forward movements, whereby the magazine is opened, the lifting-levers withdrawn and the magazine then closed, and the lifting-levers again restored to operative position, or the handle may be operated independently of the cartridge-lifting levers. For this purpose a spring-pressed dog L , having a thumb-piece and an inwardly-projecting lateral arm, is pivoted in the handle with its spring acting to normally hold the lateral arm out of engagement with the lever O , but upon pressing the thumb-piece of the dog L against the tension of its spring the lateral arm engages the lever O , and the latter will then partake of the movements of the handle.

The handle P is connected with the operating-slide by an arm P^4 , which projects into the path of and engages with the slide D to reciprocate it. This arm P^4 is preferably hinged to the handle P and has a lug P^5 , which projects into the path of the lug D^{20} of the slide D , preferably carried by the sear S . This arm is provided with a pin or lug P^7 , which plays in the guide-groove H^{11} .

By pressure on the trigger the person operating the weapon controls the action of the weapon, whether used for single firing or automatic firing. By pressing the trigger sufficiently to move it through a portion only of the arc through which it is capable of moving, which movement for convenience I term its "initial" movement, the firing mechanism is released, causing the cartridge previously inserted in position to be exploded. The gases of discharge acting through the mechanism already explained will then cause the breech-bolt to be thrown back, ejecting the empty shell to open the breech for the insertion from the magazine of another cartridge. The slide will then move forward, advancing the cartridge into the firing-chamber, closing the breech, and holding the parts in firing position.

By pressing the trigger sufficiently to move it through a greater portion of the arc through which it is capable of moving, which movement I term for convenience its "intermediate" or "second" movement, the firing mechanism is released to explode the cartridge already in position. When the trigger has been given movement to this extent, the gases of discharge acting through the mechanism already explained will cause the breech-bolt to be thrown back, ejecting the

empty shell, and holding the breech-bolt in its rearmost position to permit a cartridge to be inserted by hand.

By pressing the trigger sufficiently to move it through the full arc through which it is capable of moving, and this for convenience I term its "terminal" or "final" movement, the cartridge already in the position to be exploded will be exploded, and the gases of discharge will cause the breech-bolt to be thrown back, ejecting the empty shell, another cartridge to be fed up from the magazine, inserted in the firing-chamber, and exploded, this action continuing so long as the trigger is kept in this position until the supply of cartridges is exhausted. When the last cartridge has been fired, the finger O⁶ on the lever O will be in position to cause, through the parts with which it coöperates, the breech-bolt to be retained in open position to indicate that the magazine is exhausted of cartridges or to permit the introduction by hand of another cartridge.

In using the weapon for single firing or for firing and loading by hand the trigger after being pressed to the required position should be released, while for automatic firing it should be pressed to the full limit of its movements and there held as long as it is desired that the automatic action shall continue.

In order to stop the movement of the trigger at the desired point, I provide the trigger cut-off K, as hereinafter described. The weapon is discharged by the force of the terminal movement of the actuating-spring E, exerted through the slide D, and the firing action is accomplished by the engagement of the trigger with the sear S to release it from the cylinder T, and thus permit the terminal movement of rod D. The trigger J is pivotally supported at J⁶ against the side walls of the gun-frame and in its preferred form does not partake of the movement of the handle. It has an arm J', Figs. 1, 7, and 15. This arm is provided with cam-lugs J² and J³, which are located in the path of the terminal forward movement of the lug S' on the sear S. The rear end of the sear S extends downward, and the lower end of the downward extension projects a short distance forward in the form of a lug S', having its inner face beveled, said lug being in the longitudinal vertical plane of the lugs J² and J³. This lug S' has a flat upper face and is preferably triangular in cross-section, as shown in Fig. 15. The upper lug J³ is wedge-shaped, with the thin edge of the wedge to the rear, as shown. The lugs J² and J³ are spaced a sufficient distance apart to permit the lug S' to pass between them. When the gun is cocked and ready to be fired by pulling the trigger, the lug S' rests with its upper face in contact with the lower face of the lug J², so that pressure on the trigger sufficient to depress the forward end of the arm J' will, by the action

of the lug J² on the lug S', depress the rear end of the sear S. When the trigger is moved through the full arc through which it is capable of moving, the lug J³ will be brought into the path of the lug S', (see Fig. 15^a), so that as the sear moves forward the lug S' will be depressed by the wedge shape of the lug J² and will pass forward between the lugs J² and J³.

The trigger J is spring-controlled and is provided with an arm J⁴, which projects rearwardly into the path of the loosely-pivoted detent or dog M. This arm J⁴ is provided with a lug J⁵, which also engages with the pivoted detent or dog. The detent M is pivotally supported against the side wall of the frame and is controlled by the spring M'. Its forward end M³, Figs. 1 and 21, is offset from the main body and is beveled or cam-shaped on its forward end to allow the detent or dog M to be disengaged from the trigger by the terminal movement of the cartridge-lifter.

The trigger cut-off K is formed on an arc of a circle which corresponds to the shape of the trigger guard or handle. It is controlled by a spring K', which is fixedly attached to the handle P and is movable in a chamber also formed on an arc of a circle in the cut-off K. This cut-off K is provided with a lug K², and the handle P is provided with a series of companion notches K³ K⁴ K⁵ K⁶ to lock the trigger against action and stop it in any one of the three parts of its movement, as hereinafter set forth.

The extractor G is movably retained in engagement with the breech-bolt and does not partake of the rotation of the bolt. It enters into a semilatched relation with the breech-bolt and cartridge when advancing the same and a locked relation with the same parts when withdrawing the cartridge. It is spring-actuated and in its preferred form is illustrated in Figs. 1, 7, and 8. The extractor is preferably carried by the breech-bolt in advance of the locking-lugs of the bolt, although it may be carried behind the locking-lugs of the bolt. The extractor-seat in the bolt, as before stated, is formed with a beveled flange to permit a limited latching movement of the extractor, and the extractor has a latching end to engage with the flange or groove of the cartridge and is preferably integrally formed with a collar part, which has a companion bevel to engage with the cartridge-seat in the bolt-head. This collar part of the extractor partially encircles the bolt to cause the extractor to pull from the center line of the bolt and to permit the rotating movement of the bolt. The rear side of the collar part is cut out to permit the latching movement of the extractor, and the spring by which the extractor is actuated is preferably carried by the extractor and formed to exert a yielding tension between the extractor and the bolt-head, and the bolt-head is provided with a notch or depression to afford a semi-

latched engagement of the extractor with the bolt-head.

The firing-pin D^3 (illustrated in Figs. 4 and 7) is preferably a plunger which is retracted by the spring D^4 . It has a lug integrally formed with it, against which the force of the spring is exerted to withdraw its striking-point from the cartridge, and the chamber in the bolt-head is cut out to permit the firing-pin to be assembled at a point beyond its working path of movement. It is obvious, however, that the firing-pin may be either a loose plunger or it may be integrally formed on the front side of the part D' of the operating-slide D , as illustrated in the broken section of the same parts in Fig. 2 and in Figs. 16 and 17.

For the purpose of affording a convenient and rapid method of disassembling the breech-bolt I have devised a hinged and locked relation of the receiver and frame, in which one member of the hinge is either fixedly or integrally formed with the frame, and when pivotally connected they permit a sufficient movement to allow the operating-slide to be depressed out of the path of the bolt and the bolt-action either withdrawn or inserted. The receiver and frame are locked together by means of a rotating lock or latch N , Figs. 1 and 7, which is preferably located in the frame-wall in front of the rear end of the receiver and engages with the receiver to lock and release it. It has a thumb-piece and a latching end which projects into the receiver. The hinged connection of the frame and receiver is illustrated in Fig. 1 and denoted by the reference-letter H^3 .

The operation is as follows: Supposing the parts to be in position (illustrated in Fig. 1)—that is to say, with a cartridge in position to be fired—with the breech-bolt locked in position closing the breech and with the firing mechanism in position on being released to cause the cartridge to be fired, the weapon is discharged by a pull of the trigger, which effects the release of the operating-slide and discharges the weapon by the force of the terminal movement of the operating-slide effected by means of the actuating-spring. The weapon will be then operated to be recharged by the force of the actuating-gas. The operation of the gas actuating device is as follows: When the bullet has traversed the bore of the barrel and passes into the funnel-shaped opening at the end of the barrel, the actuating-gas escapes past the end and sides of the projectile into the actuating-chamber gradually and in a small quantity into the gas actuating-chamber. The funnel-shaped end of the barrel and the gradually-increasing diameter of the chamber permit a constantly-increasing quantity of gas to escape around the projectile into the gas actuating-chamber, thus causing a constant increase of the gas-pressure within the cham-

ber to start the operating movement of the arm by means of a gradually-increasing pressure. By varying the length of the funnel-shaped end of the bore the pressure of the operating-gases within the actuating-chamber may be varied as may be necessary to afford any required intensity of the gas-pressure. As the forward end of the projectile passes into the opening C^2 in the gas-chamber it will partially or entirely close this opening and will prevent the escape of the gas from the chamber to an extent depending upon the size of the opening and cause any required increase in the operating-pressure of the gases within the chamber. The length of time the pressure of the gas within the chamber is continued will depend upon the length of part C^2 of the gas-chamber. The gas actuating-chamber itself may be of any required size to catch either a larger or smaller quantity of the gas. It is thus apparent that the operating pressure of the gases within the chamber may be controlled to start the pressure gradually, to continue it for any required length of time, and to cause the pressure within the chamber to have any required amount of operating force and to either accelerate or diminish this force. The pressure of the gas in the chamber against the operating parts may be controlled by means of the slide or valve E^5 of Fig. 20, which, as above described, may be operated by hand to either partially or entirely open or close the opening E^4 into the cylinder E , thus permitting the gas to escape freely from the cylinder near the terminal part of the rearward movement of the actuating-slide. The piston-head or end of the slide D being in the forward end of the gas-tube E , as illustrated in Fig. 20, the force of the gas operating against the end of the piston or slide causes it to traverse the tube E and its rear end D^2 to traverse the cam-track F^5 in the breech-bolt, bringing the pin D^2 into the rear part of the cam-groove F^5 , causing its beveled side to engage with the beveled side at the rear end of the groove F^5 and bringing the rear end of the slide D into engagement with the cam-shoulder F^{10} on the rear end wall of the breech-bolt, the cam action of which shoulder causes the part D' to rise into engagement with the beveled face f' and depresses the latch F^6 and allows it to reengage with the part D' , as illustrated in Fig. 11, thus causing the operating-slide to assume a locked or latched engagement with the breech-bolt by means of the cam-lug F^{10} and the cam-shoulder f' , also the diagonal relation of the pins D^2 with the track in which it is reciprocated. The initial part of the rearward movement of the operating-slide causes the breech-bolt to rotate and brings its locking-lugs into the space between the locking-lugs A' of the receiver, and the locking-lug on the under side of the bolt is at this time

brought into its path of movement between the wings H' of the magazine. The farther movement of the slide D carries the breech-bolt back in the receiver to a point sufficiently distant from the end of the barrel to permit the cartridge in the magazine to rise up into engagement with the wings H' of the magazine, bringing its rear end into the path of the breech-bolt and its forward end into line with the bore of the barrel. The reverse movement of the bolt is accomplished by the force of the spring E', exerted against the forward end of the slide D, and the action of this spring causes the slide D to advance the breech-bolt in a direct line until its locking-lugs have reached a point opposite the cam part of their companion lugs on the side walls of the receiver, at which time the lug F' of the latch F⁶ has engaged with the lug H¹⁰ of the magazine, Fig. 7, and caused the lug F⁸ on the latch to be swung out of engagement with the operating-slide D, thus releasing the slide D and permitting it to traverse the cam part of the guide F⁵ and causing the locking-lugs on the breech-bolt to traverse the cam-face of the locking-lugs on the receiver and turn the bolt to its locked position, firmly seating the cartridge in its chamber. The locking-lugs on the receiver have a double cam-face on either side, which causes the initial part of the rotating movement of the breech-bolt to advance the cartridge more rapidly and the terminal part of its rotating movement to seat it with great power. The operating-slide controls both the reciprocating and locking movement of the bolt, the locking movement being effected by the cam F⁶ and the reciprocating movement being controlled by the cam F¹⁰ on the rear end of the bolt and the latch F⁶, and the locking-action of the bolt is timed by the tripping of this latch. The cam-guide F⁶ in the breech-bolt has a straight part at its forward end to permit a terminal firing movement of the operating-slide after the locking action of the bolt is complete, thus making it impossible to discharge the arm in any other than the full-locked position of the bolt. For the purpose of checking the terminal movement of the operating-slide by means of an air-cushion the cylinder T is formed to have a slight movement on the slide D. The rear end of this cylinder is engaged by the lug S² on the front end of the sear S, the front end of the sear being normally pressed downward to bring the lug into position to engage the cylinder by the spring T'. The beveled ends of this cylinder T, by coming in contact with the cups E² and E³, cause the terminal movement of the slide D to be stopped on an air-cushion on both its advance and rear movements, and the beveled shape of the cylinder T causes the air-pressure to check it by an increasing resistance. The rear end of the sear S being in engagement with the lug J² of the trigger J, the dis-

charge of the arm is effected by the pull of this trigger, the arm J', through its lug J² depressing the rear end of the sear S, causing the forward end of the sear to rise against the pressure of the spring T', raising the lug S² out of engagement with the cylinder T and permitting the slide D to complete its forward movement. The operation of the trigger and the parts through which the various operations of loading and firing are controlled by it is as follows: When the lug K² of the trigger cut-off is in the notch K⁶, the end of the cut-off is against the rear side of the trigger in its forward position, preventing the trigger from being moved, and thus locking the weapon out of action. When the lug K² is in the next notch K⁵, a limited movement of the trigger is permitted. This, which I term the "initial" or "first" movement of the trigger is sufficient, the parts being in the firing position, in which they are shown in Fig. 1, to cause the forward end of the sear S to be raised out of engagement with the cylinder T, permitting the operating-slide to be driven against the end of the firing-pin to discharge the weapon. At the same time the arm J⁴ of the trigger will raise the forward end of the detent or dog M sufficiently to depress its rear end below the path of the lug F⁹ of the breech-bolt. The operating-slide will be actuated by the gases of discharge and by the spring E' to throw back the breech-bolt, and a cartridge having been fed up from the magazine to force the cartridge into the breech. The pull on the trigger being released it will rise and the sear S will be engaged by the lug J², extending above the lug S', and the parts will come to rest in the position shown in Fig. 1, ready to fire on again pressing the trigger. When the trigger cut-off is moved so that the lug K² rests in notch K⁴, it will permit a more extended movement of the trigger, and this movement I term its "second" movement. When the trigger is pressed, it will first operate to release the operating-slide to permit it to strike the firing-pin and discharge the weapon. Its continued movement will lift the forward end of the detent or dog M against the face of the lug H⁹, by which it is deflected out of engagement with the upper face of the arm J⁴. The spring M' will then lift the rear end of the detent or dog M into the path of the lug F⁹ on the breech-bolt to catch the breech-bolt and hold it in its rearmost position, as shown in Fig. 7. The front end of the detent or dog M, having been deflected, as described, will when thrown downward by the action of the spring M' be held deflected by the side of the arm J⁴ and will not be raised as the arm returns to position on the release of the trigger. As the arm J⁴ returns to position, however, it will cease to hold the end of the detent or dog deflected and it will again be in position to be raised by the said arm. A cartridge having

been placed in the receiver, the trigger is again pressed, lifting the forward end of the detent or dog M to release the breech-bolt, which is moved forward by the action of the spring E' to advance the cartridge into the breech, lock the breech-bolt, and permit the terminal movement of the slide to fire the weapon. The third action of the trigger is permitted by moving the trigger cut-off K back until the lug K² rests in the notch K³, thus permitting a complete or third movement of the trigger, in which the initial part of the trigger movement frees the slide to discharge the arm, and the terminal part of the trigger's movement brings the cam-faced lug J³ into the path of the movement of the lug S' of the sear S, and the engagement of the lug J⁵ on the arm J⁴ with the detent or dog M retains it permanently out of action as long as the trigger is held and permits the sear S to be continuously tripped by the cam-faced lug J³ until the magazine is empty, at which time the upward movement of the cartridge-lifting lever O in the magazine brings the arm O⁶ of Fig. 13 into engagement with the cam-lug or end M³ of the detent or dog M. (Shown in Figs. 21 and 7.) The action of the arm O⁶ against the beveled end M³ of the detent or dog M causes it to be deflected beyond the end of the lug J⁵ on the trigger and forced upward to one side of said lug J⁵ (but not so far as to catch beneath it) by the pressure of spring M', exerted on the dog M to elevate it into engagement with the breech-bolt, thus locking the breech-bolt in its rear position by means of the engagement of the cartridge-lifting lever O with the detent to allow the magazine to be refilled with cartridges, at which time the release of the trigger permits it to again engage with the detent M and disengage it from the breech-bolt, swinging the lug J³ again into the path of the sear S and continuously tripping it with each successive discharge until the magazine is empty.

In regard to the bolt locking or latching action of the slide D with the breech-bolt and with the receiver it is apparent that the beveled face f' and the diagonal part f of the groove F⁵ cause the operating-slide D to exert a forward pressure, and a locking pressure on the breech-bolt during the initial part of the unlatching movement of the slide D from the breech-bolt, and during the initial part of the locking action of the breech-bolt with the receiver also that the same parts exert a latching pressure between the breech-bolt and operating-slide at the terminal part of the locking movement of the breech-bolt, and at the beginning of its rearward movement. It is further apparent that the pitch of the cam f' and the cam F¹⁰ may be made steep enough to afford any required pressure of the operating-slide to terminate the advance movement of the breech-bolt at a fixed

point and to bring the locking-lugs of the breech-bolt and the locking-lugs of the receiver into positive engagement at a fixed point in both the locking and unlocking action of the operating-slide. The locking-lug F⁸ of the bolt-timing latch F⁶ may be beveled on its anterior side, as illustrated in Fig. 11, to afford a cam-pressure of the latch against the operating-slide during the terminal part of the unlocking action of the operating-slide with the breech-bolt and to continue this pressure during the initial part of the locking action of the breech-bolt with the receiver.

The operation of the gas-checking piston-head is as follows: When the movable part of the piston-head is actuated by the gases of discharge to operate the slide D, the rearward movement of the piston-head against the end of the slide causes an air-pressure within the piston-head and against the thin side walls of the piston-head, causing them to be adjusted closely against the side walls of the tube and to automatically prevent the escape of any of the operating-gas past the piston-head. This air-pressure is relieved at the terminal part of the movement of the slide D by the relief of the gas-pressure against the end of the cylinder, assisted by the force of the spring D¹⁰ and by the inertia of the terminal movement of the slide D, the movable part of the piston-head being checked slightly in advance of the terminal movement of the slide D. This action permits the air-chamber within the head to be opened by the valve D⁸ and the reverse or return movement of the piston-head to be accomplished without friction against the side walls of the tube.

The cartridges are elevated in the magazine through the medium of a spring-pressed lever and an auxiliary spring-pressed lever. In Fig. 7 these levers are shown as supported on a common pivot which is fixedly attached to and carried with the handle P, while in Figs. 1, 12, and 13 a modification is shown in which the auxiliary lever is pivoted to the forward end of the primary lever and forms a cartridge-shelf to maintain the required position of the cartridges. In Fig. 12 this lever is shown to be movably guided in the grooves H⁶, and the dog or latch L is pivotally supported in the handle to be moved by pressure of the thumb into engagement with the lever O and cause it to be guided with the handle and withdrawn from the magazine. The rearward movement of the lever O when in its upward position brings it into engagement with the shoulder H⁸, (illustrated by dotted lines in Fig. 7,) and the inclined shape of this shoulder causes the rearward movement of the handle to depress the lever in the magazine, bringing it down out of the magazine and into the position illustrated in Fig. 1 and withdrawing the magazine-door from over the magazine, thus open-

ing the magazine for the purpose of refilling it and permitting it to be closed by advancing the handle again to its forward position.

The weapon may be operated by reciprocating the handle P through the medium of an arm which projects into the path of the slide D and engages with it to reciprocate it. The handle may be guided in its reciprocating movements by the lugs P² and P³, which are guided in the grooves H^a. (Illustrated in Figs. 7 and 12.)

The shell-extractor is either inserted or removed from the breech-bolt by turning it to a point opposite the cut-out part of the bolt. In its preferred form the extractor is constructed to be carried vertically over the cartridge and to maintain this position during the reciprocating movement of the bolt by means of the latched engagement of its spring with the bolt-head. This spring may have a sufficient tension to maintain any required firmness in the engagement between the extractor and the breech-bolt, and the tension of the spring is sufficiently yielding to permit the beveled extremity of the extractor to engage with the groove of the cartridge. The engagement of the extractor with the groove B³ in the end of the receiver prevents the extractor from rotating with the bolt. The cam shape of the beveled flange F³ causes the extractor to maintain a locked engagement with the cartridge in withdrawing it and a yielding engagement in advancing it and permits a sufficient swinging movement of the extractor to allow it to engage with the flange or groove of the cartridge. Moreover, it will be observed that the movement of the motor-piston rearward acts, through the breech-block, to impart a forward and downward-turning movement to the extractor about its axis, and the more violent the action of the gases on the piston the firmer will be the engagement of the extractor with the cartridges. This operative relation between the piston and the extractor insures a grip on the cartridge by the extractor proportioned to the violence with which the piston is actuated rearward by the gases of discharge.

The firing-pin may be integrally formed with the slide D, as illustrated in Figs. 2 and 16, and when so formed it will be impossible to discharge the arm before the terminal locking action of the bolt. The preferred form of the firing-pin, which is illustrated in Fig. 4, may be assembled or disassembled by turning its retaining-lug to a point opposite the cut-out part in the bolt-head, through which it may be withdrawn. The spring D⁴ is preferably formed to have its projecting forward end engaged fixedly with the bolt-head and its rear end engaged with the firing-pin to retain it in its working path of movement and to cause a slight tension in turning the firing-pin to permit its removal from the bolt-head.

Having now fully described my invention and its mode of operation, what I claim as my invention, and desire to secure by Letters Patent, is—

1. In a firearm, a gun-barrel, a gas-chamber gradually expanding from the point where it enters the bore of the barrel, and a piston in the chamber.

2. In a firearm, a gun-barrel, a gas-chamber gradually expanding from its front end where it enters the bore of the barrel, and a piston in said chamber.

3. In a firearm, a gun-barrel, a gas-chamber having one portion parallel with the barrel, another portion constituting a prolongation of the bore of the barrel, and a curved portion through which the bore of the barrel communicates with said parallel portion, and a piston in said chamber.

4. In a firearm, a gun-barrel, a gas-chamber having a gradually-expanding portion communicating with the bore of the barrel, and a pressure-timing device, whereby the duration of pressure in said chamber is determined.

5. In a gun, the combination of a barrel and a reciprocatory and rotatory breech-block, a motor-piston actuated by the gases of discharge, and means operated by said piston for reciprocating and rotating said breech-block.

6. In a gun, the combination of a barrel and a reciprocatory and rotatory breech-block, a slide actuated in one direction by the gases of discharge and in the opposite direction by a spring and a cam engagement between the slide and breech-block for reciprocating and rotating said block.

7. In a gun, the combination of a barrel, and a reciprocatory and rotatory breech-block, having a cam-surface, with a slide actuated in one direction by the gases of discharge and in the opposite direction by a spring, and provided with a part operatively engaging said cam-surface for reciprocating and rotating said block.

8. In a gun, the combination of a barrel and a reciprocatory and rotatory breech-block, with a discharge-actuated slide and a cam engagement between said breech-block and slide for reciprocating and rotating said block.

9. In a gun, the combination of a barrel and a reciprocatory and rotatory breech-block having a cam-surface, with a discharge-actuated slide, having a part operatively engaging said cam-surface for reciprocating and rotating said block.

10. In a gun, the combination of a barrel, a reciprocatory and rotatory breech-block, a reciprocating motor-piston actuated rearward by the gases of discharge, and means operated by said piston for reciprocating and rotating said block.

11. In a gun, the combination of a barrel,

a reciprocatory and rotatory breech-block, a reciprocating piston actuated rearward by the gases of discharge, and a cam engagement between said piston and breech-block
5 for reciprocating and rotating said block.

12. In a gun, the combination of a barrel, a reciprocatory and rotatory breech-block provided with a cam-surface, a reciprocating piston actuated rearward by the gases of discharge and provided with a part operatively
10 engaging the cam-surface on the breech-block for reciprocating and rotating said block.

13. In a gun, the combination of a barrel,
15 and a gas-chamber having a portion communicating with the bore of the barrel, said portion having a gradually-increasing cross-sectional area from the bore outward.

14. In a gun, the combination of a gun-
20 barrel, and a gas-chamber of larger cross-sectional area than the bore of the barrel, but having a portion communicating with the bore of the barrel which is of gradually-increasing cross-sectional area from the bore to
25 the main portion of the chamber.

15. In a gun, the combination of a gun-barrel, and a gas-chamber of larger cross-sectional area than the bore of the barrel, and having a conical or funnel-shaped portion
30 communicating with the bore of the barrel with the main portion of the gas-chamber, with its larger end opening into the said main portion.

16. In a gun the combination of a barrel, a
35 gas-chamber having its front wall formed on the arc of a circle, the entrance of the chamber being located in front of the muzzle end of the barrel, and its other end being located to one side of the bore, and having an opening
40 in its front wall in line with the bore of the barrel for the passage of the projectile.

17. In a gun, the combination of a barrel, a gas-chamber of larger cross-sectional area than the bore of the barrel, having its front
45 wall formed on the arc of a circle, the entrance of the chamber being located in front of the muzzle end of the barrel and its end being located to one side of the bore, and having an opening in its front wall in line
50 with the bore of the barrel for the passage of the projectile, and a conical or funnel-shaped portion communicating with the bore of the barrel.

18. In a gun, the combination of a barrel,
55 a gas-chamber located at the muzzle end of the barrel and having a laterally-deflected portion communicating with the bore of the barrel, the gas-chamber being of gradually-increasing cross-sectional area from its entrance
60 throughout a portion of its length.

19. In a gun, the combination of a barrel, a gas-chamber located at the muzzle end of the barrel and having an opening there-
5 through for the passage of the projectile, and having a laterally-deflected portion commu-

nicating with the bore of the barrel, the gas-chamber being of gradually-increasing cross-sectional area from its entrance throughout a portion of its length.

20. In a gun, the combination of a barrel, a
70 gas-chamber located at the muzzle end of the barrel having a laterally-deflected conical or funnel-shaped portion communicating with the bore of the barrel, the gas-chamber being of gradually-increasing cross-sectional area
75 from its entrance throughout a portion of its length.

21. In a gun, the combination of a barrel, a gas-chamber located at the muzzle end of the barrel, having an opening therethrough for
80 the passage of the projectile, and having a laterally-deflected conical or funnel-shaped portion communicating with the bore of the barrel, the gas-chamber being of gradually-increasing cross-sectional area from its entrance
85 to the barrel throughout a portion of its length.

22. In a gun, the combination of a barrel, a laterally-deflected gas-chamber having its entrance in front of the bore of the barrel, an extension on the front wall of the chamber having an opening therethrough in line with the bore of the barrel and constituting an extension thereof, for the passage of the projectile, the gas-chamber being of gradually-in-
95 creasing cross-sectional area from its entrance to the barrel throughout a portion of its length.

23. In a gun, the combination of a barrel, a laterally-deflected gas-chamber, having its
100 entrance in front of the bore of the barrel, and a conical or funnel-shaped portion communicating with the bore of the barrel, and an extension on the front wall of the chamber having an opening therethrough in line with
105 and constituting an extension of the bore of the barrel for the passage of the projectile.

24. In a gun, the combination of a barrel, a laterally-deflected gas-chamber having its entrance in front of the bore of the barrel, a
110 conical or funnel-shaped portion whose entrance is in line with the bore of the barrel, and an extension on the front wall of the chamber having an opening therethrough in line with and constituting an extension of
115 the bore of the barrel for the passage of the projectile.

25. A gas-chamber located in front of the end of the bore of the barrel and having a funnel-shaped opening into the same, its ante-
120 rior side formed on an arc of a circle and perforated to permit the free passage of the projectile through the chamber, a gas-cylinder communicating with the said chamber, and a slide movable in the said cylinder and con-
125 nected to the bolt action.

26. In a gas-operated firearm a gas-cylinder and a slide movable in the said cylinder and connected with a reciprocating and rotating bolt action and having a piston-head
130

formed of a movable part and an immovable part containing an air-chamber and an opening into the same in which is located a conical valve to afford a gas-check by means of an air-pressure within the cylinder.

27. In a gas-operated firearm the combination of a cylinder and a piston movable within the same, the said piston formed of a movable part and an immovable part and containing an air-chamber, the sides of which are formed to yield against the cylinder to afford a gas-check caused by an air-pressure within the cylinder, a spring located within the chamber in the cylinder, and a valve to open and close the chamber in the cylinder, and connection between the said cylinder and the operating parts.

28. A gas-chamber located in front of the bore of the barrel formed on an arc of a circle perforated to permit the free passage of the projectile and having a constantly-increasing diameter, a gas-cylinder connected with the said chamber, a slide having a piston-head and movable in said cylinder and connected with the bolt action.

29. A reciprocating breech-bolt having a spiral cam-guide which has a diagonal part at its rear end, and locking-lugs on the forward end of the bolt, a receiver having companion locking-lugs and a discharge-actuating slide engaging with the said bolt-guide, a latch carried by the bolt and engaging with the said slide and with the receiver to lock and release the slide.

30. A gas-actuated slide, a spring to resist the movement of the said slide, a breech-bolt connected to the said slide, a sear carried by the said slide, and a trigger engaging the sear to discharge the weapon by the forward terminal movement of the slide.

31. In a gun, the combination of a barrel, a slide actuated in one direction by the gases of discharge and in the other direction by a spring, a sear carried by said slide, and yielding means cooperating with the sear to check the terminal movement of the slide.

32. In a gun, the combination with a barrel, a slide actuated rearwardly by the gases of discharge and actuated forwardly by a spring, a sear carried by said slide and yielding means cooperating with the sear to check the slide before it completes its forward movement.

33. A discharge-actuated slide, a spring to resist the movement of said slide, a piston carried by said slide, a dash-pot in the path of said piston to afford an air-cushion in checking the terminal movement of the slide and connection between the said slide and the bolt action.

34. A discharge-actuated slide, a spring to resist the movement of the said slide in one direction, a piston carried by and movable on said slide, a sear carried by said slide and engaging the said piston, a cylinder located

in the path of the said piston to afford an air-cushion in checking the terminal movement of the slide, means releasing the said sear releasing the slide from the piston to permit a terminal firing action of the slide and a bolt action connected to said slide.

35. A reciprocating and rotating breech-bolt having a groove formed to receive, retain and release a shell-extractor, the said groove cut out to permit the extractor to be assembled at a point beyond its working path of movement, and a shell-extractor forming a segment of a collar and a spring carried by the extractor.

36. A reciprocating and rotating breech-bolt having an extractor-seat forming a groove partially encircling the neck of the bolt, the said groove cut out to permit the extractor to be assembled at a point beyond its working path of movement, the anterior side of the extractor-seat having a beveled flange, a shell-extractor having a collar part forming a segment of a circle and the anterior side of the collar being beveled to fit movably under its companion bevel in the extractor-seat about the bolt, and a spring to exert a tension on the extractor.

37. A reciprocating and rotating breech-bolt having an extractor-seat formed with a beveled flanged bearing, an extractor having a companion beveled bearing and a spring carried by the said extractor and exerting a yielding tension against the bolt-head and a depression in the bolt-head and engaging the spring to afford a semilatched condition of the extractor with the bolt.

38. A reciprocating and rotating breech-bolt having an extractor-seat partially encircling the bolt and formed with a beveled flange, the said seat cut out to permit the extractor to be assembled at a point beyond its working path of movement, a shell-extractor having a collar part and a companion bevel to movably retain it in combination with the bolt, a spring carried by the extractor and exerting a yielding tension between the bolt and the extractor, a latching depression in the bolt-head engaging the said spring and a receiver having a groove engaging the extractor at the limit of its forward movement and preventing it from rotating and governing its latching engagement with the bolt.

39. A receiver formed integrally with the barrel having a guiding-path for the bolt and locking-lugs near the forward end of the receiver, the forward end of the chamber in the receiver being beveled and having a conical shape to afford additional thickness and strength of the receiver-walls, and a breech-bolt movable in the said receiver and having locking-lugs which are provided with a companion bevel to afford additional strength to the bolt action.

40. A receiver having a guideway for a re-

reciprocating and rotating bolt and cam-locking lugs, a reciprocating and rotating breech-bolt having companion locking-lugs, a cartridge-magazine having cartridge-retaining wings which project up into the receiver, the locking-lugs of the bolt movable between the wings of the magazine, and the body part of the bolt cut away to permit a rotating, locking action of the bolt.

41. A receiver having a guideway for a reciprocating and rotating breech-bolt and locking-lugs, a reciprocating and rotating breech-bolt having companion locking-lugs and a body part of the bolt provided with a cam-track, a cartridge-magazine having cartridge-retaining wings extending up into the receiver, the locking-lug of the breech-bolt movable between said wings, and the body part of the bolt cut out to permit a rotating, locking action of the bolt, and an actuating-slide engaging the cam-guide in the breech-bolt and a spring-actuated lifter located in the magazine.

42. A receiver having a guideway for a reciprocating and rotating breech-bolt and locking-lugs, a reciprocating and rotating breech-bolt having companion locking-lugs and a body part of the bolt provided with a cam-track, a cartridge-magazine having cartridge-retaining wings extending up into the receiver, the locking-lug of the breech-bolt movable between said wings, and the body part of the bolt cut out to permit a rotating, locking action of the bolt, and an actuating-slide engaging with the cam-guide in the breech-bolt, a spring-actuated lifter located in the magazine, and a firing-pin.

43. A firing action comprising a discharge-actuated slide, a spring to resist the rearward movement of said slide, a reciprocating breech-bolt operated by said slide, a sear engaging said slide, a trigger engaging the said sear and an additional sear also engaging the slide and engaged by the trigger.

44. In a firearm, a trigger action comprising a primary sear, a secondary sear, a trigger in position to consecutively operate said sears, and a cut-off adjustable to stop the trigger after it has tripped either sear.

45. In a firearm, capable of single or automatic firing, the combination of a breech-block, with means engaging and retaining said block in open or loading position, a sear retaining the firing action when the breech-block is closed, a trigger in operative relation with said means and sear, and capable of operating the same by a single or by successive pulls and a trigger check or cut-off determining such operation.

46. A trigger action comprising a primary sear, an auxiliary sear and a trigger cut-off engaging with the trigger, the cut-off permitting a limited movement of the trigger to control the single firing action, an additional movement of the trigger to control the load-

ing action and a terminal movement of the trigger to control the automatic action, a cartridge-magazine, a spring-pressed cartridge-lifter in the magazine, a reciprocating breech-bolt, a sear engaging the breech-bolt at the terminal part of its rearward movement and located in the path of the movement of the said cartridge-lifter and engaged by it to effect the engagement of the sear with the breech-bolt.

47. A reciprocating breech-bolt, a receiver carrying the bolt, a cartridge-magazine, a cartridge-lifter carried by the magazine, a sear engaging the breech-bolt at the terminal part of its rearward movement and located in the path of the movement of the cartridge-lifter and engaged by the lifter to effect its engagement with the bolt, and a trigger engaging the said sear to release it from the bolt.

48. A cartridge-magazine, a cartridge-lifter movable in the magazine, a spring to exert a yielding tension against the lifter, a handle movable in a guideway located in said magazine, and means causing the lifter to move with the handle.

49. A cartridge-magazine having a guideway or groove, a sliding handle movable in the said guideway, a cartridge-lifter pivotally supported and movable in the said guideway, a spring carried by the cartridge-lifter and exerting a yielding tension upon it, the forward end of the said guideway being beveled or flared and the said handle carrying a pawl which engages with the said lifter to depress the lifter by reciprocating the handle.

50. In a magazine-gun the combination of a magazine, a reciprocating breech-bolt above the magazine, a slide movable in guideways in said magazine and having a part engaging the upper cartridge in its forward movement, and operative connections between the slide and bolt.

51. In a magazine-gun, the combination of a magazine, a reciprocating bolt above the magazine, a slide movable in guides in the magazine, a cartridge-engaging arm on the slide projecting upward in front of the bolt, connections between the bolt and slide and a cartridge-extractor carried by the bolt.

52. In a magazine-gun, the combination of a magazine a reciprocating bolt above the magazine, a slide having lost-motion connections with the bolt and movable in guideways in the magazine, an arm or part on said slide projecting upward in front of the bolt, and a cartridge-extractor carried by the bolt.

53. A receiver, a breech-bolt carried by the receiver, a cartridge-magazine having a guide-groove, a cartridge-feed and cartridge-ejector movable in the said guide to feed and eject the cartridges.

54. In a firearm, a reciprocating breech-bolt having a groove or seat, a cartridge-ejector engaging with the said groove, and a spring exerting a yielding tension against the ejector, the said ejector having a limited

movement to permit the rearward terminal movement of the bolt to eject the shell.

55. A barrel and receiver having a bracket which forms one member of a hinge, a stock-frame having a companion member for the hinge, a reciprocating breech-bolt carried by said receiver, a gas-actuated slide engaging the breech-bolt, a pawl or latch engaging with the receiver to lock it against the frame and the said slide depressible out of the path of the bolt to permit the bolt to be quickly disassembled.

56. In a firearm a receiver, a reciprocating breech-bolt having a bolt-locking cam and a latching-cam, a bolt-latch carried by the bolt and an operating-slide engaging said cams to govern and time the reciprocating latching and locking action of the bolt.

57. In a firearm a receiver for the breech-bolt, a breech-bolt having a bolt-locking cam-guide and a latching-cam, a latch carried by the bolt and provided with a latching-lug, the said lug having a cam-face and an actuating-slide engaging with the said breech-bolt and with the said cams and bolt-latch to govern and time the latching action of the slide with the breech-bolt and the locking action of the bolt with the receiver.

58. In a firearm a receiver, a reciprocating breech-bolt movable in the receiver, a discharge-actuated slide engaging with the breech-bolt to reciprocate and lock it a sear controlling said slide and a trigger engaging the sear whereby the loading and firing action of the arm may be controlled.

59. In a firearm, the combination of a gas-actuated slide, a spring to resist the movement of the slide, a breech-bolt connected to the slide, a sear carried by the slide provided with a lug, an arm having lugs arranged in the vertical plane of the lug carried by the sear but in different horizontal planes, and means for moving the arm to cause either of said lugs at will to cooperate with the lug on the sear to trip the sear and permit the discharge of the weapon by the terminal movement of the slide.

60. In a firearm, the combination of a breech-bolt, a slide actuated in one direction by the gases of discharge, and actuated in the opposite direction by a spring, means for checking the terminal forward movement of the slide, a trigger carrying devices arranged in different horizontal planes, cooperating with devices carried by the slide, whereby the slide may be released or the checking of its terminal movement prevented at will.

61. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor mounted on said breech-block.

62. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor mounted on said breech-block.

63. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber and for returning and locking the same, and an extractor mounted on said breech-block.

64. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor mounted on said breech-block.

65. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block provided with a cam-groove therein, a reciprocating motor-piston with a stud or pin to engage in said cam-groove for first rotating to unlock and then withdrawing said breech-block, or vice versa, and an extractor mounted on said breech-block.

66. In a breech-loading gun, the combination with a barrel and a breech-block chamber, of a breech-block adapted to rotate and lock or unlock in and to move longitudinally into and out of said chamber, with a cam-groove on said breech-block, a reciprocating motor-piston provided with a pin passing into said breech-block and engaging said cam-groove, and an extractor mounted on said breech-block.

67. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, and means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, with a firing-pin secured to said piston and passing through said breech-block.

68. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in

the opposite direction, a breech-block, and means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, with a firing-pin secured to said piston and passing through said breech-block.

69. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, and a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber and for returning and locking the same, with a firing-pin secured to said piston and passing through said breech-block.

70. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, and a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, with a firing-pin secured to said piston and passing through said breech-block.

71. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block provided with a cam-groove therein, and a reciprocating motor-piston provided with a stud or pin to engage in said groove for first rotating to unlock and then withdrawing said breech-block, or vice versa, and a firing-pin secured to said stud or pin and mounted in said breech-block.

72. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block adapted to rotate and lock or unlock in and to move longitudinally into and out of said chamber, with a cam-groove on said breech-block, a reciprocating motor-piston provided with a pin passing into the breech-block and engaging said cam-groove, and a firing-pin secured to said pin and mounted in said breech-block.

73. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, means operated by said piston for first rotating to unlock and then withdrawing said breech-block, from said chamber, and for returning and locking the same, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor mounted on said breech-block.

74. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, means

operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor mounted on said breech-block.

75. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber and for returning and locking the same, a firing-pin mounted in said breech-block and secured to and movable with said piston, and an extractor mounted on said breech-block.

76. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor mounted on said breech-block.

77. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block provided with a cam-groove therein, a reciprocating motor-piston provided with a stud or pin to engage in said cam-groove for first rotating to unlock and then withdrawing said breech-block, or vice versa, a firing-pin mounted in said breech-block, and secured to and moving with said piston, and an extractor mounted on said breech-block.

78. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block adapted to rotate and lock or unlock in and to move longitudinally into and out of said chamber, with a cam-groove, on said breech-block, a reciprocating motor-piston provided with a pin passing into said breech-block and engaging said cam-groove, a firing-pin mounted in said breech-block, and secured to and moving with said piston, and an extractor mounted on said breech-block.

79. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, an extractor mounted on said breech-block, means for feeding the cartridges to the gun in front

of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

80. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, an extractor mounted on said breech-block, means for feeding the cartridges to the gun in front of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

81. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber and returning and locking the same, an extractor mounted on said breech-block, means for feeding the cartridges to the gun in front of said breech-block; and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

82. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, an extractor mounted in said breech-block and operated by said piston, means for feeding the cartridges to the gun in front of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

83. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block provided with a cam-groove therein, a reciprocating motor-piston provided with a stud or pin to engage in said cam-groove for first rotating to unlock, and then withdrawing said breech-block, or vice versa, an extractor mounted on said breech-block, means for feeding the cartridges to the gun in front of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

84. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block adapted to rotate and lock or unlock in and to move longitudinally

into and out of said chamber, with a cam-groove on said breech-block, a reciprocating motor-piston provided with a pin passing into said breech-block and engaging said cam-groove, an extractor mounted on said breech-block, means for feeding the cartridges to the gun in front of said breech-block and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

85. In a breech-loading gun, the combination with a motor-piston and mechanism for opening and closing the breech, of means for drawing the empty cartridge-case to the rear, and an ejector operated by said piston.

86. In a gun, a gas-chamber, a gas-tube communicating therewith, a driving-rod having a piston moving in said tube, a spring resisting the movement of said rod, a reciprocating breech-bolt having a cam-guide terminating in a straight part at its forward end, a firing-pin, and operative connections between the driving-rod and said cam-guide, whereby the bolt is actuated by the driving-rod and the gun is discharged by the terminal forward movement thereof.

87. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, an extractor pivoted on said breech-block and operated by said piston, and means restraining the extractor from turning with the breech-block.

88. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor pivoted on said breech-block and operated by said piston.

89. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor pivoted on said breech-block and operated by said piston.

90. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber and for returning

and locking the same, and an extractor pivoted on said breech-block and operated by said piston.

91. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor pivoted on said breech-block and operated by said piston.

92. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block provided with a cam-groove therein, a reciprocating motor-piston with a stud or pin to engage in said cam-groove for first rotating to unlock and then withdrawing said breech-block, or vice versa, and an extractor pivoted on said breech-block and operated by said piston.

93. In a breech-loading gun, the combination with a barrel and a breech-block chamber, of a breech-block adapted to rotate and lock or unlock in and to move longitudinally into and out of said chamber, with a cam-groove on said breech-block, a reciprocating motor-piston provided with a pin passing into said breech-block and engaging said cam-groove, and an extractor pivoted on said breech-block and operated by said piston.

94. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block having interrupted engagement in said chamber, a reciprocating motor-piston, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor engaging in a longitudinal groove in the receiver and revolubly connected to said breech-block, and operated by said piston.

95. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block having interrupted engagement with said chamber, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor engaging in a longitudinal groove in the receiver, and revolubly connected to said breech-block, and operated by said piston.

96. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block having interrupted engagement with said chamber, a reciprocating motor-piston, a cam engagement between

said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber and for returning and locking the same, and an extractor engaging in a longitudinal groove in the receiver and revolubly connected to said breech-block, and operated by said piston.

97. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, having interrupted engagement with said chamber, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, and an extractor engaging in a longitudinal groove in the receiver and revolubly connected to said breech-block, and operated by said piston.

98. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block provided with a cam-groove therein, and having interrupted engagement with said chamber, a reciprocating motor-piston provided with a stud or pin to engage in said cam-groove for first rotating to unlock and then withdrawing said breech-block, or vice versa, and an extractor engaging in a longitudinal groove in the receiver and revolubly connected to said breech-block, and operated by said piston.

99. In a breech-loading gun, the combination with a barrel and a breech-block chamber, of a breech-block adapted to rotate and lock or unlock in and to move longitudinally into and out of said chamber, with a cam-groove on said breech-block, a reciprocating motor-piston provided with a pin passing into said breech-block and engaging said cam-groove, and an extractor engaging in a longitudinal groove in the receiver and revolubly connected to said breech-block, and operated by said piston.

100. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor pivoted on said breech-block and operated by said piston.

101. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, means operated by said piston for first rotating to unlock and then withdrawing said breech-

block from said chamber, and for returning and locking the same, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor pivoted on said breech-block and operated by said piston.

102. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, a cam engagement between said piston, and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber and for returning and locking the same, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor pivoted on said breech-block and operated by said piston.

103. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor pivoted on said breech-block and operated by said piston.

104. In a breech-loading gun, the combination with a barrel and a breech-block chamber, of a breech-block provided with a cam-groove therein, a reciprocating motor-piston provided with a stud or pin to engage in said cam-groove for first rotating to unlock and then withdrawing said breech-block, or vice versa, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor pivoted on said breech-block and operated by said piston.

105. In a breech-loading gun, the combination with a barrel and a breech-block chamber, of a breech-block adapted to rotate and lock or unlock in and to move longitudinally into and out of said chamber, with a cam-groove on said breech-block, a reciprocating motor-piston provided with a pin passing into said breech-block and engaging said cam-groove, a firing-pin mounted in said breech-block and secured to and moving with said piston, and an extractor pivoted on said breech-block and operated by said piston.

106. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, an extractor pivoted on said breech-block and operated by said piston, means for feeding the cartridges to the gun in front of said breech-block, and

an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

107. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, means operated by said piston for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, an extractor pivoted on said breech-block and operated by said piston, means for feeding the cartridges to the gun in front of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

108. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block, a reciprocating motor-piston, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, an extractor pivoted on said breech-block and operated by said piston, means for feeding the cartridges to the gun in front of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

109. In a gas-operated breech-loading gun, the combination with a breech-block chamber, of a barrel, a cylinder connected to said barrel, a motor-piston mounted in said cylinder, a mainspring for moving said piston in the opposite direction, a breech-block, a cam engagement between said piston and said breech-block for first rotating to unlock and then withdrawing said breech-block from said chamber, and for returning and locking the same, an extractor pivoted on said breech-block and operated by said piston, means for feeding the cartridges to the gun in front of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

110. In a breech-loading gun, the combination with a barrel, and a breech-block chamber, of a breech-block provided with a cam-groove therein, a reciprocating motor-piston provided with a stud or pin to engage in said cam-groove for first rotating to unlock and then withdrawing said breech-block, or vice versa, an extractor pivoted on said breech-block and operated by said piston, means for feeding the cartridges to the gun in front of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

111. In a breech-loading gun, the combination with a barrel and a breech-block chamber, of a breech-block adapted to rotate and lock or unlock in and to move longitudinally

into and out of said chamber, with a cam-groove on said breech-block, a reciprocating motor - piston provided with a pin passing into said breech-block and engaging said cam-groove, an extractor pivoted on said breech-block and operated by said piston, means for feeding the cartridges to the gun in front of said breech-block, and an ejector operated by said piston in its rearward motion for ejecting the empty cartridge-cases.

112. In a breech-loading gun, the combina-

tion with a motor-piston and mechanism for opening and closing the breech, of means for drawing the empty cartridge-case to the rear, and an ejector longitudinally disposed to and operated by said piston. 15

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

SAMUEL N. McCLEAN.

Witnesses:

W. D. CONDIT,
WM. H. DE LACY.