

(No Model.)

4 Sheets—Sheet 1.

C. J. EHBETS.
GAS OPERATED MAGAZINE GUN.

No. 570,388.

Patented Oct. 27, 1896.

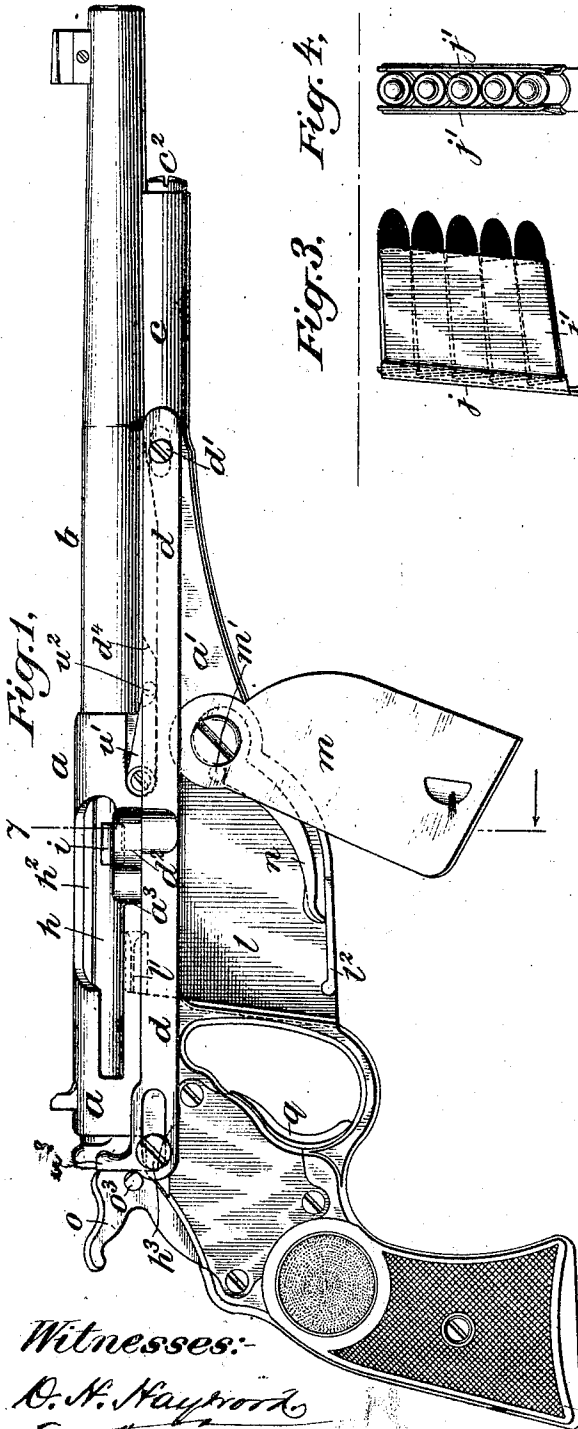


Fig. 3.

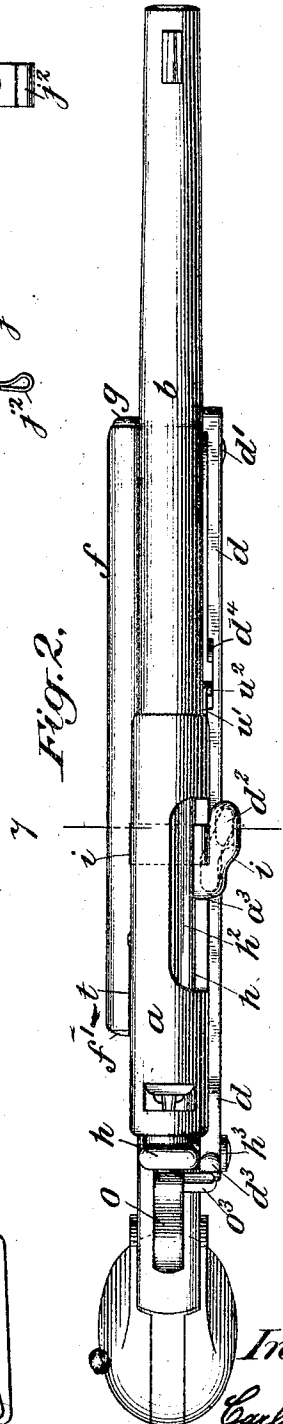
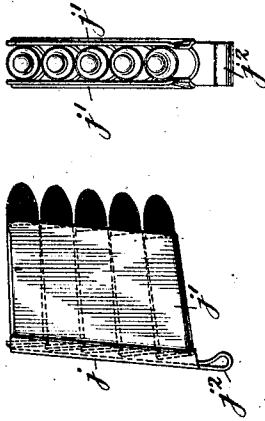


Fig. 2.

Fig. 2a.



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Fig. 5.

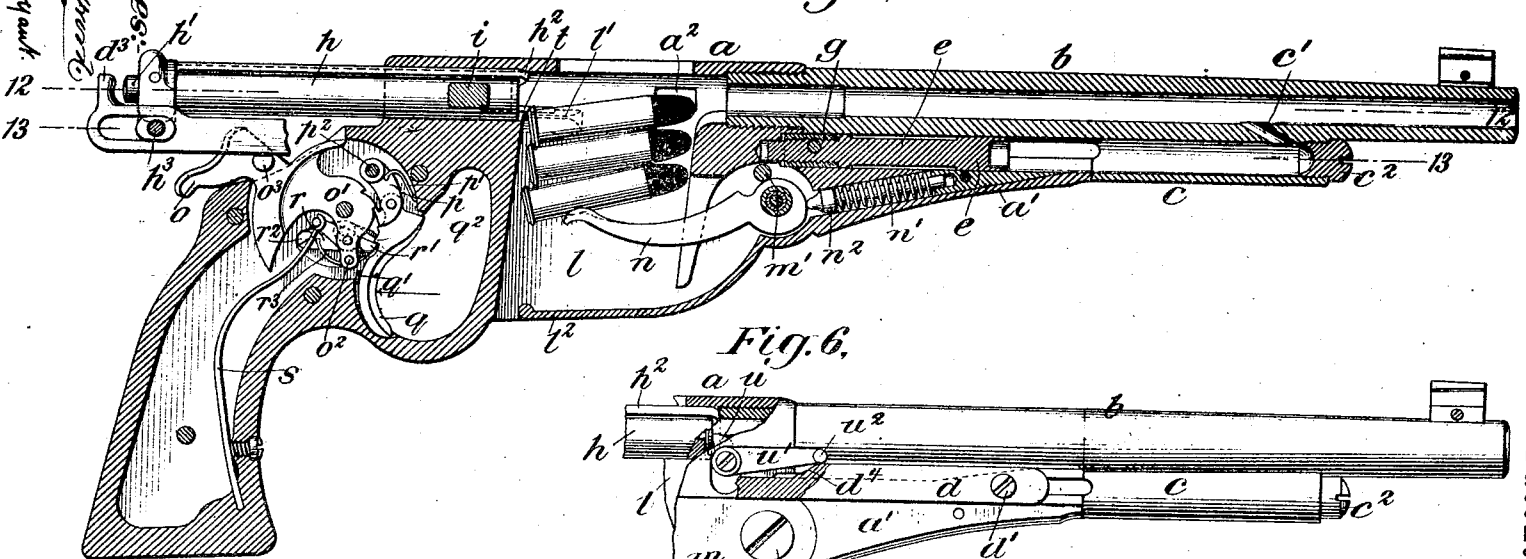
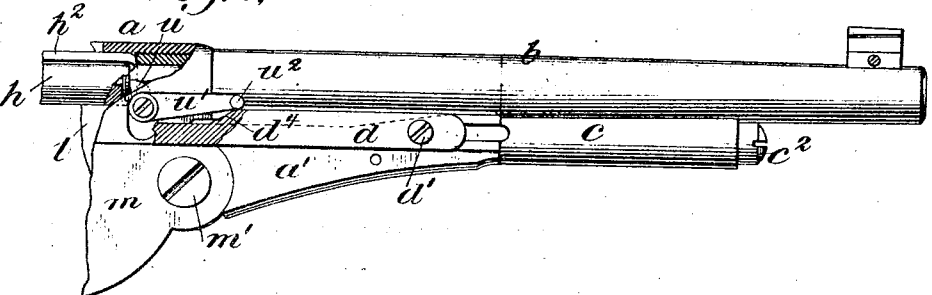


Fig. 6.



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Fig. 10.

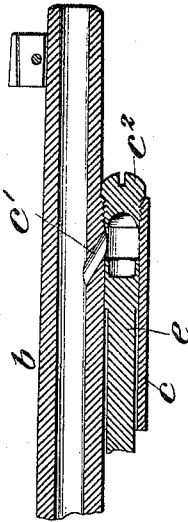


Fig. 11.

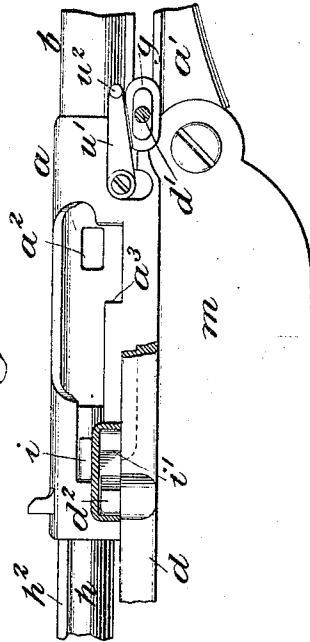


Fig. 8.

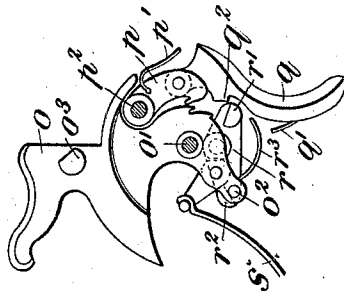


Fig. 9.

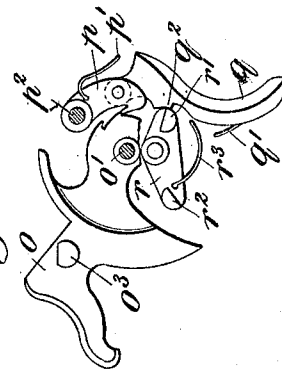
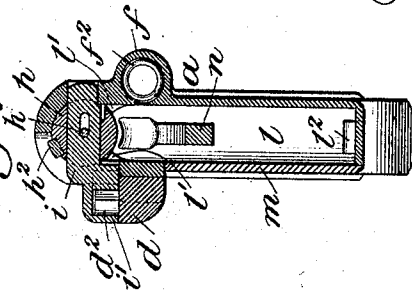


Fig. 7.



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(No Model.)

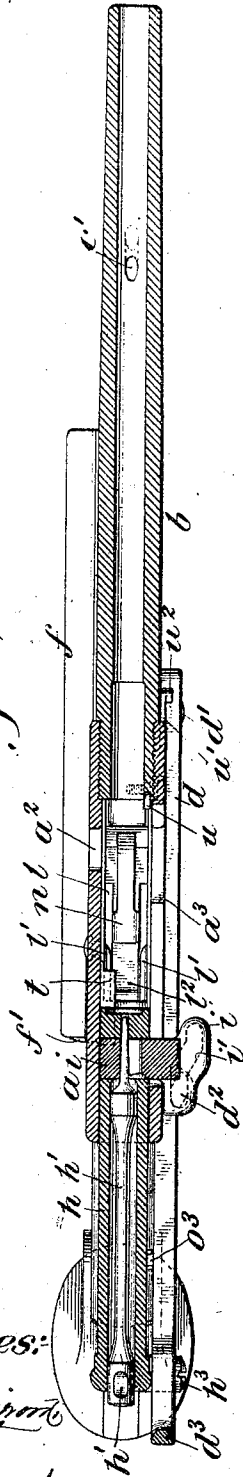
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Fig. 12.

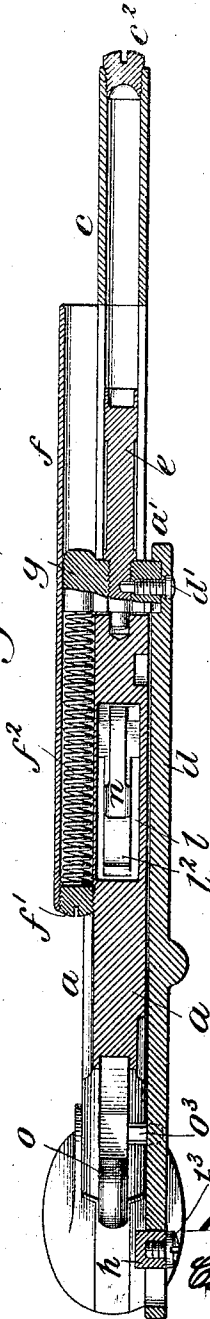


Witnesses:

C. H. Mayhew

Jas. L. Bryant.

Fig. 13.



Inventor:

Carl J. Ehbets.

UNITED STATES PATENT OFFICE.

CARL J. EHBETS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE COLT'S PATENT FIRE ARMS MANUFACTURING COMPANY, OF SAME PLACE.

GAS-OPERATED MAGAZINE-GUN.

SPECIFICATION forming part of Letters Patent No. 570,388, dated October 27, 1896.

Application filed October 29, 1894. Serial No. 527,328. (No model.)

To all whom it may concern:

Be it known that I, CARL J. EHBETS, a citizen of the United States, and a resident of the city and county of Hartford, State of Connecticut, have invented certain new and useful Improvements in Breech-Loading Firearms, of which the following is a specification, reference being had to the accompanying drawings, forming part hereof.

My invention relates to breech-loading firearms, and is particularly adapted for automatic magazine-pistols. According to my invention the extraction and ejection of the empty cartridge-shell after each shot and the recharging of the arm with a new cartridge ready for firing may be performed as long as cartridges are supplied.

One of the objects of my invention is to utilize the expansive force of the gases of the explosion and also the blows struck by a jet of such gases when escaping from a narrow opening in a gun-barrel to operate the breech mechanism, and to attain this object I provide an inclined vent in rear of the muzzle, leading from the bore of the barrel to a cylinder alongside of the barrel, in which cylinder reciprocates a piston connected to the breech mechanism.

Another object of my invention is to prevent any part of the force of the gases entering the cylinder through the vent from going to waste through joints liable to leak from the expansion and contraction unavoidable in firearms, and I attain this object by the construction hereinafter fully explained, by which the cylinder has no openings except at its ends and the vent connecting it with the bore of the barrel; and while its rear is closed by the piston the front end is sealed by a plug, which acts as a gas-check and against which the gases are directed from the vent, so that their effect will be to expand the plug before expanding the cylinder, thus keeping the cylinder tight even while exposed to the varying conditions of expansion and contraction from heating and cooling unavoidable in firearms. By thus utilizing all the force of the gases entering the cylinder through the inclined vent I am enabled to place the vent near the muzzle, whereby I obtain the greatest effect of the gases on the projectile

before the projectile in passing opens the vent to the gases. At the same time I insure the safety of the arm, as the bullet must have escaped from the muzzle before the breech can be unlocked and opened.

Another object of my invention is to provide improved means for storing up energy during the opening movement to be used for the return or closing movement; and I attain this object without lengthening the arm by providing a longitudinally-arranged tube alongside of the barrel and frame for the reception of a spiral spring or its equivalent, and I arrange this tube and spring on one side of the frame and a connecting-rod joining the piston and breech mechanism on the other side of the frame. This construction has the further advantage of symmetrically placing the weight of the parts and of disposing them symmetrically in relation to the piston.

Another object of my invention is to enable the short violent action of the gases against the piston to first unlock the breech and then to open it, and I attain this object by the construction hereinafter shown, by which the piston and the parts between it and the breech-bolt or breech-piece are of such weight that after being started by the gases their momentum will cause them to complete their movement, unlock the breech, and carry the breech mechanism rearward.

Another object of my invention is to positively control the firing of the arm and insure that not more than one shot will follow each pull of the trigger, although the automatic action is so rapid that it makes the arm ready again for firing before the finger can release the trigger.

According to my invention improved means are provided for unlocking the breech-bolt or breech-piece, starting the empty cartridge-shell backward out of the barrel, moving the breech-bolt or breech-piece rearward and completely extracting and discharging the empty cartridge-shell, cocking the hammer or firing mechanism, bringing another and loaded cartridge into position to engage with the breech-bolt or breech-piece, returning the breech-bolt or breech-piece to closed position, and placing the loaded cartridge within the barrel and locking the breech, so that the arm is

ready to be discharged by again pulling the trigger.

The accompanying drawings illustrate an embodiment of my invention.

5 Figure 1 is a side elevation of a pistol, showing the magazine open ready to receive a charge of cartridges. Fig. 2 is a plan view of the same. Fig. 2^a is a detached plan view of the connecting-rod and shows also in section the end of the lock-bolt and cam-groove therein. Fig. 3 is a side elevation, and Fig. 4 an end elevation, of a cartridge holder or case charged with cartridges and ready for insertion into the magazine. Fig. 5 is a longitudinal vertical section of the pistol, showing the breech mechanism open or in extreme rearward position. Fig. 6 is a side elevation of the pistol-barrel and a portion of the receiver, partly in section to more clearly show the shell-starter. Fig. 7 is an enlarged transverse section of the pistol, taken on a plane passing vertically through the magazine, as indicated by the line 7 7 of Figs. 1 and 2, showing the magazine closed and empty. Fig. 8 is a detached enlarged longitudinal vertical section of the hammer, sear, trigger, and adjacent parts, with the hammer down. Fig. 9 is an enlarged view similar to Fig. 8, except that the hammer is shown fully cocked and the movable fulcrum of the trigger in operative position, so that the hammer will be released on pulling the trigger; and the lower part of the hammer is here broken away to more clearly show the trip-lever carrying the movable fulcrum. Fig. 10 is a detached longitudinal vertical section showing the gas-operated piston in normal or forward position. Fig. 11 is a side elevation of the receiver and some adjacent parts, with the connecting-rod partly broken away and the end of the lock-bolt in section through the cam-groove. Fig. 12 is a longitudinal horizontal section taken on a plane coincident with the axis of the barrel, as indicated by the line 12 12 of Fig. 5. Fig. 13 is a longitudinal horizontal section taken on a plane coincident with the axis of the piston-cylinder, as indicated by the line 13 13 of Fig. 5.

The receiver *a* is shown as in a piece including the frame for the handle or grip-stock and the frame for the firing mechanism, as well as the magazine and other parts. The barrel *b* is secured to the receiver in the usual manner, as by screwing its butt-end into said receiver, and beneath the barrel and integral therewith is the cylinder *c*, terminating rearwardly just in front of an extension *a'* of the frame, which extension *a'* is bored or has a cylindrical opening formed therein in continuation of the bore of the cylinder *c*, so that the complete piston-cylinder comprises two parts, one integral with the barrel and the other integral with the receiver. This construction is in accordance with my entire invention, but my invention may be partly embodied by making the piston-cylinder in one separate piece throughout its length or in one

piece integral either with the frame alone or with the barrel alone or otherwise. The vent or aperture *c'* in rear of the muzzle extends downwardly and forwardly from the bore of the barrel and opens into the cylinder *c*. This inclined vent or opening *c* is so located that its prolongation would fall entirely within the front opening of the cylinder *c*, and this front opening of the cylinder *c* is closed by a plug *c²*, preferably a screw-plug, and the inner face of this plug *c²* is made concave, and the location of this inner concave face in relation to the inclined vent *c'* is such that the gases of explosion deflected by the vent *c'* will be caused to strike upon the concave face and to be reflected by said concave face in lines directly rearward in said cylinder *c*. By reason of the location of this inclined vent or aperture *c'* it may be bored by a boring-tool inserted through the front opening of the cylinder *c*, and thus the formation of this vent does not require the making of any additional openings in the barrel or cylinder, and by reason of the inclination and direction of this vent toward the opening in the front of the cylinder *c* the plug closing said front opening may be readily located so as to provide a proper reflecting-surface for effectively reflecting in the desired direction, that is to say, rearwardly in the cylinder *c* and directly against the face of the piston, the gases of explosion which enter the cylinder through the vent *c'*. The shape of the plug *c²* also serves the purpose of closing the cylinder in a perfectly gas-tight manner at its front end, as the thin edge of the plug around the concavity readily yields to the pressure and acts as a gas-check, and the jet of heated powder-gases or products of the explosion which enters the cylinder from the barrel is directed against said plug *c²* by the vent *c'* and strikes the plug and expands the concave surface of the plug and thus makes the joint gas-tight.

The gas-operated piston *e* is fitted in the piston-cylinder, its front face being normally located just in rear of the point where the gas-vent *c'* opens into the cylinder *c*, as shown in Fig. 10, and its rear end extending into the part of the piston-cylinder formed by the extension *a'* of the frame. The front face of the piston *e* is preferably made concave, with thin edges, so as to form a gas-check, as shown. At one side of the piston-cylinder, the left side, as shown in the drawings, is located the tube or case *f* for the retracting-spring *f²*. This tube or case *f* is preferably integral with the part including the receiver, as shown, and, as shown, terminates at its forward end alongside of the forward end of the extension *a'*, and may be extended rearwardly to any desired length for the purpose of containing a spring of desired length and strength, as it is alongside of and clear of all parts of the breech mechanism. The rear end of the tube *f* is shown as closed by a screw-plug *f'*, and this screw-plug permits of a fine adjustment of the retracting-spring *f²*,

and the spring may be delicately adjusted, so as to form a yielding stop to the rearward movement of the piston *e*. A longitudinal slot is formed in the wall between the tube *f* and the piston-cylinder, and to the rear end of the piston *e* a cross-head *g* is fastened, as shown, by screwing the cross-head over the rear portion of the piston, or in some constructions this cross-head may be made integral with the piston. The cross-head *g* extends in one direction, or to the left, as shown, through the slot in the left wall of the piston-cylinder, and extends into and fits within the tube *f*, so as to form a follower for the retraction-spring *f*², and extends in the opposite direction, or to the right, as shown, through the slot in the right wall of the piston-cylinder, providing a place for attachment of a connecting-rod, whereby the movements of the piston are communicated to the breech mechanism. This connecting-rod *d* is connected at its front end to the portion of the cross-head *g* protruding to the right from the piston-cylinder, the connecting part being preferably a screw, such as *d'*, which passes through the connecting-rod *d* and through the cross-head *g* and enters the piston *e*, so as to tightly lock all of these parts together. It will be noted that the follower part of the cross-head *g*, or the part thereof which slides within the tube *f*, acts as a guide, tending to prevent any other than longitudinal movement of the cross-head, and thus the front end of the connecting-rod is guided so that it will move only in longitudinal direction. The connecting-rod *d* extends rearwardly on the right of the receiver and is connected at its rear end to the rear end of the breech-bolt *h*, said breech-bolt having a projecting part which enters a slot in the rear end of the connecting-rod *d*, whereby some longitudinal play is permitted between the connecting-rod and the breech-bolt for the purposes hereinafter described, while the breech-bolt and connecting-rod support each other vertically and laterally, a suitable holding device, such as the screw *h*³, with a large head overlapping the edges of said slot, being secured within the projection of the breech-bolt. A finger-piece *d*³, shown extending upward at the rear end of the connecting-rod *d*, is preferably provided for convenience in moving the rod by hand.

The breech-bolt *h* is fitted so as to reciprocate longitudinally in a recess in the receiver, and, as shown, is of cylindrical form, with an extension at its rear end. Within this breech-bolt a firing-pin *h'* is fitted, said firing-pin being suitably located, so as to be struck by the hammer when the breech-bolt is closed, and a spring-extractor *h*² of usual construction is attached to this breech-bolt in such a manner that longitudinally it is fixed to the breech-bolt, but that radially and outward it can yield, so as to engage with the head of a cartridge in the barrel when the breech-bolt is closed or in extreme forward position, when

the hook on the front end of the extractor will be forced over and in front of the flange of the cartridge-shell, so as to grasp the latter and hold it against the front face of the breech-bolt.

The means for locking the breech-bolt when in extreme forward or closed position comprises a lock-bolt *i*, which is arranged transversely near the front end of the breech-bolt and is shown as fitted in a horizontal mortise in the breech-bolt and at right angles to the axis of the breech-bolt, and when the breech-bolt is forward and the breech fully closed this lock-bolt *i* protrudes from the left side of the breech-bolt into a corresponding recess or mortise *a*², formed in the left wall of the receiver, while the right end of the lock-bolt, which protrudes a considerable distance from the breech-bolt, has an angular part which fits in front of a shoulder *a*³ of a seat formed in the right wall of the receiver. The recess or mortise *a*² and the seat and shoulder *a*³ are particularly shown in Fig. 11, while the breech-bolt is shown in closed and locked positions in Figs. 1 and 2. The breech-bolt is thus rigidly and positively locked by engaging projections or shoulders at both sides, and its locking device is located near its front end, so that the breech-bolt may be of light weight and yet be of ample strength to resist recoil. It is not only possible by reason of this construction to make the breech-bolt extremely light, but also to reduce the size and weight of the receiver, as the rear parts of neither bolt nor receiver have to sustain the shock of the explosion, and the lightness of the breech-bolt and lock-bolt enables the momentum of the piston and cross-head and connecting-rod to readily overcome the inertia of the breech-bolt and lock-bolt after the piston and cross-head and connecting-rod have moved a considerable distance, while the breech-bolt has remained stationary. The firing-pin *h'* is shown as passing through a slot in the lock-bolt *i*, (see Figs. 7 and 12,) and this slot is beveled, so that when the lock-bolt is fully home, which is only true when the breech-bolt is fully locked in closed position, the firing-point can reach the primer of the cartridge, but when the lock-bolt is drawn to the right the beveled rear shoulder of the slot works against the enlarged body of the firing-pin and forces the firing-pin backward. Thus the firing-pin cannot reach the primer of the cartridge unless the breech-bolt is fully locked in closed position.

The right-hand end of the lock-bolt *i* has formed therein a cam slot or groove *i'*, in which fits a cam-pin *d*², (see especially Fig. 2^a,) which cam-pin projects upward from the connecting-rod *d* and is shown as integral with the connecting-rod or may be rigidly secured thereto. It is evident that this construction may be modified without departing from my broad invention by forming the cam slot or groove upon the connecting-rod and the cam-pin upon the lock-bolt or otherwise

providing a cam pin and slot connection. This cam-groove v' of the lock-bolt z is at its front end and rear end parallel to the longitudinal direction of movement of the connecting-rod d , but the central part of this cam-groove inclines inward from the front to the rear. The shape of the cam-pin d^2 is preferably that of a rhomboid of which the ends are rounded with its inclined faces parallel to the inclined portion of the cam-groove, so that the cam-pin d^2 will equally well fit the longitudinal parts of the groove and the inclined parts of the groove. With the rhomboidal form of pin as above described the inclined parallel faces of the pin and groove come in contact in the operation of the arm, and thus the impact of the pin is received by broad bearing-surfaces. This cam-groove and cam-pin are so shaped that the rearward movement of the connecting-rod d , causing the cam-pin d^2 to move rearwardly in the cam-groove v' , will move the lock-bolt to the right and cause it to be withdrawn from the mortise a^2 and the shoulder a^3 , and thereby the breech-bolt will be unlocked. As the forward part of the cam-groove v' is parallel to the direction of movement of the rod d , the first part of the rearward movement of the connecting-rod and of the cam-pin d^2 causes no movement whatever of the lock-bolt, the object of this being to permit the gas-piston and connected parts to yield more readily, so that the gases of explosion will more rapidly overcome the inertia of these parts and so that these parts will readily acquire momentum at the beginning of their movement. After the withdrawal of the lock-bolt z , the cam-pin moves rearward in the longitudinal rear part of the cam-groove, this provision for lost motion between the breech-bolt and its actuating means permitting the empty cartridge-shell to be started out of the barrel in the manner herein after described, and then reaches the rear end of the cam-groove and, acting through the lock-bolt, causes the breech-bolt to move rearward with the connecting-rod. A suitable slot or opening is formed in the right wall of the receiver a to permit the lock-bolt z in its open position to move freely backward and forward with the breech-bolt, and this opening widens upward at the front of the receiver, so as to permit of the insertion or ejection of cartridges or cartridge-shells therethrough.

It will be observed that in the construction above described the breech-bolt h is connected to the rod d at two points, the indirect cam pin and slot connection being located near the front end of the breech-bolt and the direct slotted connection being located at or near the rear end of the receiver. When the breech-bolt is moved rearward by the connecting-rod, this rearward motion may be communicated to the breech-bolt at both these points, so as to prevent any possibility of oblique thrust, or reliance may be placed upon

the connections at either point for transmitting the motion.

The shell-starter comprises a vertical arm u and a horizontal arm u' and is provided at the right side of the receiver near the rear end of the barrel in such position that its vertical arm u will be in front of the head of a cartridge-shell within the barrel. The exterior horizontal arm u' has a projecting part or pin u^2 , which lies in a groove in the connecting-rod d , and this groove in the connecting-rod d has an inclined forward portion or cam-surface d^4 , which is so located that it comes against the pin u^2 just after the breech-bolt has been unlocked, and, moving upward the end of the horizontal arm u' of the shell-starter, moves backward the inner vertical arm u , and thus with considerable force, by reason of the leverage of the long horizontal arm, starts the cartridge or cartridge-shell backward out of the barrel, and as the breech-bolt is now unlocked the breech-bolt will be carried backward a short distance with the shell and the shell will remain always in the grasp of the extractor h^2 , as the flange of the shell is firmly held between the hook of the extractor and the face of the breech-bolt. The inner face of the connecting-rod has also a suitable recess for clearance of the lower arm u' , but this latter recess performs no other function.

The magazine l for cartridges is arranged beneath the receiver and comprises a vertical pocket, which opens upward into the receiver, and this magazine l is permanently closed at one side, the left side, as shown, while at its right side, as shown, it has a movable cover m , which cover is pivoted to the receiver beneath the barrel and may be swung to open position, as indicated in Fig. 1, to permit the charging or filling of the magazine with cartridges. The cartridges may be inserted one at a time or otherwise by hand, but the magazine may be very readily charged by a holder (shown in Figs. 3 and 4) comprising an end wall j and side walls j' , said side walls being suitably grooved for the reception of the heads of the cartridges and said holder being open at the top for the insertion of the cartridges in filling the holder and having suitable inward projections at the rear of its side walls to prevent the cartridges from falling out downwardly. This holder is also provided with a downwardly-extending handle j^2 . The bottom of the magazine l has an opening extending across the rear end and partly forward along either side wall, so that the bottom wall comprises a tongue l^2 , (see especially Fig. 13,) and this opening in the bottom of the magazine is so shaped that after the filled case or holder has been inserted into the magazine and the cover m moved into closed position, so that the cartridges will be securely held in the magazine, the holder may be withdrawn by pulling upon the handle j^2 and the holder will pass outward through the slot in

the bottom of the magazine, leaving the cartridges in the desired position in the magazine.

The device for moving the cartridges upward in the magazine consists of a pivoted carrier or cartridge-lifter n , which is shown as pivoted upon the same center as the cover m , and this carrier has a partly eccentric or cam-shaped hub, against which bears the piston-follower n^2 of a spiral or helical spring n' , located in a recess in the forward extension a' of the receiver, and thus this lifter or carrier n tends to press the cartridges upward. A projection or pin m' , extending inwardly from the cover m , serves to turn the carrier down into lower position when the cover is opened, as seen in Fig. 1, but when the cover is closed the carrier is released and if there are any cartridges within the magazine the carrier will bear upward against the lower wall of the lowermost cartridge. The opening from the magazine to the recess in the receiver for the breech-bolt is of full width in front, but for some distance from the rear it is narrower, the receiver being provided with ribs $l' l'$, and when the breech-bolt is moved to the rear the carrier will raise the cartridges until the head of the topmost cartridge is stopped by the ribs $l' l'$, as seen in Fig. 5. This will cause the topmost cartridge to assume an inclined position with the bullet nearly in line with the rear of the barrel, while the head protrudes upward in the path of the front of the breech-bolt, so that when the breech-bolt is moved forward it carries the cartridge forward into the barrel. When the cartridge is in the chamber of the barrel and the breech-bolt is closed and locked, the head of the cartridge is in the grasp of the extractor-hook h^2 . In this position the shell, after firing, is supported, and in the opening movement of the breech-bolt the cartridge-shell is started rearward with the breech-bolt by the cartridge-starter, and remains thereafter firmly supported between the front of the breech-bolt and the hook of the extractor, and is so carried rearward by the breech-bolt until the cartridge-head strikes against an inward projection or ejector t in the receiver, which ejector acts in the usual manner to cause the shell to be thrown outward or ejected through the opening in the receiver.

The hammer o is hung upon a pivot o' at the rear of the receiver, and is actuated to strike the firing-pin and explode the cartridge by the mainspring s , which mainspring engages with a stirrup pivoted to the hammer in the usual manner.

The sear p is hung on a pin p^2 in front of the hammer and is constructed so as to engage with the hammer, and, as shown, the hammer is provided with two notches, one the half-cock and the other the full-cock notch, and the sear-nose is in form of a hook fitted to engage with either one of these notches, and the half-cock notch is undercut as usual, so that the sear-nose cannot be

pulled out by the trigger when engaged by this notch.

The full-cock notch of the hammer is so constructed that the sear-nose may be pulled away from it, so as to release the hammer. The trigger q is hung upon the sear and is shown as pivoted at the lower front part thereof. The sear has a spring p' , which urges its nose toward the hammer, and the trigger has a spring q' , which tends to press the lower part of the trigger forward. A movable fulcrum is provided for the trigger and a tripping device is provided for removing this fulcrum when the hammer falls, and after the fulcrum of the trigger has been removed the action of the trigger is reversed and the pressure upon the trigger tends to hold the sear-nose more tightly in engagement with the notch of the hammer. The object of this construction is to prevent a second discharge or firing of the gun after the trigger has been pulled to cause one discharge and before the trigger has been released, so that each discharge may be controlled by the trigger. The movable fulcrum is so constructed that after it has been removed from engaging position by the fall of the hammer it remains in such position until after the hammer has been moved back and the trigger released and then immediately is restored to engaging position. This movable fulcrum is shown as part of a pivoted trip-lever r , being a projection r' at the front end of said trip-lever, and this movable fulcrum or projection r' when in upper or engaging position stands closely in rear of an engaging shoulder q^2 of the trigger, and the trip-lever is provided with or engages with a spring r^2 , which tends to hold the movable fulcrum r' in upper position, so that the fulcrum r' is normally engaged, and when not engaged will move into position to engage with the trigger as soon as it is permitted to do so. The trip-lever is provided at its rear end with another projection r^2 , which is in rear of and in the path of an engaging part of the hammer, said part of the hammer being shown as a small stud o^2 , projecting from the hammer at its left side at a point beyond the pivot where the stirrup is hung to the hammer. This stud o^2 is so located that just before the hammer reaches its lowest position this stud o^2 strikes against the rear projection r^2 of the trip-lever and moves the projection rearward and upward and thus slightly turns the lever, thereby moving the movable fulcrum r' downward below the engaging shoulder q^2 of the trigger, and when the hammer comes to rest in lower position the movable fulcrum is alongside of a recess in the trigger below the engaging shoulder q^2 , as shown in Fig. 8, so that the trigger if pulled will swing rearward on its pivot in the sear without touching the movable fulcrum. Thus the movable fulcrum r' is removed from engaging position by the fall of the hammer, and, further, when the hammer is moved backward or cocked, and there-

by the stud o^3 is caused to release the projections r^3 , the spring of the trip-lever cannot restore the fulcrum of the trigger while the trigger remains in pulled position, as shown in Fig. 5, as the movable fulcrum is then prevented by the engaging shoulder of the trigger from rising into upper position, but as soon as the trigger is released and thereby the engaging shoulder q^3 of the trigger is moved forwardly by the trigger-spring q' , so as to be out of the path of the movable fulcrum r' , the trip-lever spring will act to throw the movable fulcrum r' upward into engaging position, as shown in Fig. 9, and the pulling of the trigger will now cause the hammer to be released.

After a shot has been fired the automatic mechanism acts very quickly to cock the hammer and eject the empty shell and place a loaded cartridge within the barrel, and these operations usually take place before the operator has had time to release the trigger after pulling it for the shot just discharged, and it is therefore necessary in order to properly control each shot that at the completion of these operations the continuance of the holding of the trigger in pulled position shall not cause the hammer to be released.

With the improved mechanism above described all the operations of preparing the arm for being discharged are performed whether or not the trigger has been released, but the arm will not be again fired until the trigger has been released and again pulled, and thus the most perfect control is exercised, and the shots will be fired just as rapidly or as slowly as is desired, every pull of the trigger causing a discharge of the weapon. It will also be noted that by this improved mechanism the movable fulcrum of the trigger causes the action of the trigger to be reversed, so that after the movable fulcrum has been removed from engaging position the pulling of the trigger positively tends to move the sear-nose toward the hammer, thus assisting the action of the sear-spring, and there is therefore no possibility of accidental release of the hammer before the trigger is again pulled.

The hammer o has near its upper end a projection or stud o^3 , which extends from its right side, and which, when the breech-bolt is closed, stands against the rear end of the connecting-rod d . When the connecting-rod d moves rearward, it works against the stud o^3 , and thus moves the hammer rearward and finally brings the hammer to full-cock, as shown in Fig. 5. The rod d holds the hammer at full-cock until the rod moves forward a sufficient distance to release the stud o^3 , and the rear end of the rod d remains in the path of the stud o^3 , so that the hammer in falling cannot reach the firing-pin until the rod has completed its forward movement.

I will now describe the operation of the mechanism shown embodying my invention.

After the magazine has been filled with cartridges, as may be readily done by opening the cover m and inserting a filled cartridge-holder and then closing the cover and withdrawing the cartridge-holder, another cartridge may be inserted through the top opening of the receiver, and for the purpose of inserting this additional cartridge it is only necessary to open the breech, as may be very readily done by grasping the finger-piece d^3 of the connecting-rod d and drawing the connecting-rod to the rear. The additional cartridge may be then inserted through the top opening of the receiver into the recess in front of the breech-bolt and the connecting-rod d released, and thereupon the retraction-spring f^2 , which was compressed by the rear movement of the connecting-rod, will react and force the cross-head and piston and rod to their forward positions, and the cartridge will now be carried into the barrel and the breech-bolt locked in closed position. This operation will leave the magazine fully charged and there will be an additional cartridge in the barrel. The rearward movement of the connecting-rod d also will have moved the hammer back into fully-cocked position and the arm is now ready for firing. The pulling of the trigger will now cause the hammer to be released, and the falling hammer will strike the firing-pin h' and the firing-pin will explode the cartridge. The falling hammer also removes the fulcrum r' from behind the trigger, so that the trigger no longer tends to move the sear away from the hammer; but if the trigger is still held pulled the trigger tends to move the sear toward the hammer and thus to assist the action of the sear-spring p' in tending to throw the sear into engagement with the hammer, and therefore when the hammer is again brought to full-cock, whether or not the operator has released the trigger, the hammer will be caught by the sear and held at full-cock. When the bullet in its passage through the barrel has passed the vent c' , the portion of the gases of explosion deflected through this vent and reflected by the concave face of the plug c^2 exerts its force on the piston e and forces the piston e and the cross-head g and the rod d rearward against the tension of the retracting-spring f^2 , and the rod forces the hammer o rearward against the tension of the mainspring s . The cam-pin d^3 travels for a short distance in the cam-slot of the lock-bolt i without causing any movement of the lock-bolt or doing any work, and thus the gases of explosion are enabled to readily overcome the inertia of the piston and cross-head and rod. When the cam-pin enters the inclined part of the groove, it withdraws the lock-bolt from the receiver, thus unlocking the breech-bolt, but as the rear part of the cam-groove as well as the front part thereof is parallel to the direction of movement of the rod and cam-pin the rod d continues its movement for some distance independently of the breech-bolt after unlocking the breech-

bolt. During the rearward movement of the rod d above described, while the cam-pin is moving in the first parallel portion of the groove and while it is moving in the inclined portion of the groove and withdrawing the lock-bolt and while it is moving in the rear parallel portion of the groove, the slotted connection between the breech-bolt and the rod d at the rear permits the rod to thus move without imparting movement to the breech-bolt. While the cam-pin moves in the rear parallel part of the groove the inclined recess or cam-surface d^4 of the connecting-rod d raises the horizontal arm u' of the shell-starter and thus moves the vertical arm u so as to start the cartridge-shell rearward out of the barrel. As the breech-bolt is now unlocked, it yields to the effort of the starter, and for some small distance the breech-bolt is pushed to the rear by the action of the arm u of the starter against the cartridge-head, while the extractor h^2 retains its hold on the head of the cartridge-shell. At about the completion of the operation of the shell-starter the cam-pin d^2 arrives at the end of the cam-groove and now causes the lock-bolt and through it the breech-bolt to move rearward, and the breech-bolt and rod d now move rearward together and the breech is fully opened, the cartridge-shell ejected, and the hammer brought to full-cock. As the breech-bolt moves clear of the rear of the magazine the carrier n raises the column of cartridges in the magazine, presenting the topmost cartridge for entrance into the chamber. The rearward movement of these parts is limited by the horizontal slot in the right side of the receiver in which the lock-bolt i travels, and this movement may be checked by the spring f^2 , the tension of which may be adjusted by turning the screw-plug f' more or less into to the tube f , and the spring may be caused to present an elastic stop to the rearward movement of the cross-head. The reaction of the spring f^2 again returns the cross-head and piston and rod and breech-bolt and locks the breech-bolt by the lock-bolt, and the pistol is again ready for firing, the breech-bolt having in its forward movement pushed the upper cartridge into the barrel. This automatic action takes place very quickly, usually before the operator has released the trigger; but the pistol is not again fired until the operator releases the trigger and again pulls it for the purpose of firing the next shot. When the trigger is again pulled, another shot will be fired and the operations above described repeated, and thus a shot will be fired every time the trigger is pulled as long as cartridges are supplied.

It is of course evident that parts of my invention are applicable to non-automatic firearms, as, for instance, if the gas-cylinder and piston are omitted the connecting-rod may be operated by hand, and parts of my invention may be used separately or in combination with other parts than those above described, and various modifications may be made in the con-

struction of the parts above described without departing from my invention. It is also evident that other gas-operated devices than a piston and cylinder may be employed for utilizing the gases of explosion in connection with parts of my invention.

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

1. In a breech-loading firearm, the combination with the barrel and a cylinder located alongside of said barrel, of an inclined vent leading from the bore of said barrel into said cylinder, said inclined vent being so located that its outward prolongation would extend through the end opening of the cylinder, a plug closing the end opening of said cylinder, said plug having a concave inner surface, whereby gases are directed by said inclined vent against said concave surface of the plug, and are reflected by said surface, and a movable device for utilizing the force of the gases thus reflected, substantially as set forth.

2. In a breech-loading firearm, the combination with the barrel, of a cylinder located alongside of said barrel and integral therewith, and an inclined vent leading from the bore of said barrel into said cylinder, said inclined vent being so located that its outward prolongation would extend through the end opening of the cylinder, and a plug closing the end of said cylinder whereby gases are deflected by said inclined vent against the inner surface of said plug and are reflected rearwardly by said inner surface of the plug, and a piston in said cylinder in rear of said vent, substantially as set forth.

3. In a breech-loading firearm, the combination with the barrel and receiver, of a breech-bolt, a lock-bolt for locking said breech-bolt in closed position, a longitudinally-moving actuating-rod, and a cam slot and pin connection between the lock-bolt and rod, whereby the said rod in its rearward movement will first move the lock-bolt out of locking position and thus unlock the breech-bolt, and in its further rearward movement the said rod acting through the cam slot and pin and lock-bolt will move the breech-bolt rearward; and the forward movement of the rod will move the lock-bolt and breech-bolt forward and then actuate the lock-bolt and lock the breech-bolt in forward and closed position, substantially as set forth.

4. In a breech-loading firearm, the combination with the barrel having an aperture in rear of the muzzle and with a suitable receiver, of a breech-bolt, a lock-bolt for locking said breech-bolt in closed position, a longitudinally-moving rod, and a cam slot and pin connection between the lock-bolt and rod, whereby the said rod in its rearward movement will first move the lock-bolt out of locking position and thus unlock the breech-bolt, and in its further rearward movement the said rod acting through the cam slot and pin and lock-bolt will move the breech-bolt rearward; and the forward movement of the rod

will move the lock-bolt and breech-bolt forward and then actuate the lock-bolt and lock the breech-bolt in forward and closed position; and means operated by the gases escaping
 5 through said aperture in the barrel for causing the rearward movement of the rod and suitable retracting means for returning said rod to forward position, substantially as set forth.

10 5. In a breech-loading firearm, the combination with the barrel and receiver, of a breech-bolt, a longitudinally-moving rod having a slotted connection with said breech-bolt near the rear end of the breech-bolt, a lock-
 15 bolt for locking said breech-bolt in closed position, said lock-bolt being located near the forward end of said breech-bolt and a cam slot and pin connection between the rod and lock-bolt, whereby said lock-bolt is moved
 20 out of locking position during the first part of the rearward movement of the rod and while the slotted connection between the rod and breech-bolt permits the rod to move independently of the breech-bolt, and the
 25 breech-bolt after having been thus unlocked is moved rearward by the rod, substantially as set forth.

6. In a breech-loading firearm, the combination with the barrel having an aperture in
 30 rear of the muzzle, and with a suitable receiver, of a breech-bolt, a longitudinally-moving rod having a slotted connection with said breech-bolt, a lock-bolt for locking said breech-bolt in closed position, and a cam slot
 35 and pin connection between the rod and lock-bolt, whereby said lock-bolt is moved out of locking position during the first part of the rearward movement of the rod and while the slotted connection between the rod and
 40 breech-bolt permits the rod to move independently of the breech-bolt, and the breech-bolt after having been thus unlocked is moved rearward by the rod, and means operated by the gases escaping through said aperture in
 45 the barrel for causing the rearward movement of the rod, substantially as set forth.

7. In a breech-loading firearm, the combination with a barrel having an aperture in
 50 rear of the muzzle, and with a suitable receiver, of a breech-bolt, a cartridge-extractor upon said breech-bolt, a longitudinally-moving rod connected with said breech-bolt so as to move independently thereof at the beginning of its rearward movement, a lock-bolt
 55 for locking said breech-bolt in closed position, said lock-bolt being connected to said rod so that said rod in the first part of its rearward movement moves said bolt out of locking position and thus unlocks the breech-bolt, and
 60 a shell-starter actuated by said rod to engage the cartridge-shell in the barrel and start the said shell rearward after the breech-bolt has been unlocked and before the breech-bolt is moved rearward by the rod, whereby suc-
 65 cessively the breech-bolt is unlocked, then the empty cartridge-shell is started rearward carrying with it the breech-bolt and remaining

in the grasp of the extractor thereon, and then the breech-bolt is moved rearward by the rod and the cartridge-shell completely withdrawn
 70 from the barrel; and means operated by the gases escaping through said aperture in the barrel for causing the rearward movement of the rod, substantially as set forth.

8. In a breech-loading firearm the combination with the barrel and receiver, of a breech-bolt, a cylinder alongside of and below the barrel, a vent leading from the bore of the barrel into said cylinder, a piston in
 80 said cylinder in rear of said vent, a retracting-spring on one side of said piston and connected to said piston and a longitudinally-moving rod on the other side of said piston also connected to said piston, said rod being
 85 also connected to the breech-bolt, whereby the rearward movement of said piston by the gases of explosion and the forward movement of said piston by the retracting-spring cause the breech-bolt to be moved rearward and forward,
 90 substantially as set forth.

9. In a breech-loading firearm, the combination of a spring-actuated hammer, a sear adapted to engage with the hammer when the
 hammer is cocked, a trigger loosely connected to the sear, and a movable fulcrum for the
 95 trigger, and a tripping device actuated by the hammer whereby in its fall the hammer removes the fulcrum of the trigger, substantially as set forth.

10. In a breech-loading firearm, the combination of a spring-actuated hammer, a sear adapted to engage with the hammer when the
 hammer is cocked, a trigger loosely connected to the sear, a normally-engaged movable fulcrum for said trigger and a tripping device
 105 actuated by said hammer whereby in its fall the hammer removes the fulcrum of the trigger, said trigger holding the removed fulcrum out of engaging position until the trigger is released, substantially as set forth.
 110

11. In a breech-loading firearm the combination of a spring-actuated hammer, a sear adapted to engage with the hammer when the
 hammer is cocked, a trigger loosely connected to the sear, a normally-engaged movable fulcrum for said trigger and a tripping device ac-
 115 tuated by the hammer whereby in its fall the hammer removes the fulcrum of the trigger, said trigger holding the removed fulcrum out of engaging position until the trigger is released, and means actuated by the discharge of the arm for cocking the hammer, substantially as set forth.
 120

12. In a breech-loading firearm the combination of a spring-actuated hammer, a sear
 125 hung upon a pivot and adapted to engage with the hammer when the hammer is cocked, a trigger hung upon the sear, a trip-lever having a fulcrum for the trigger, said trip-lever normally tending to hold said fulcrum in po-
 130 sition to engage with the trigger, and said hammer and trip-lever having engaging parts whereby in its fall the hammer actuates the trip-lever and removes the fulcrum of the

trigger, and a shoulder upon said trigger for holding said movable fulcrum out of engaging position until the trigger is released, substantially as set forth.

13. In a breech-loading firearm the combination with the barrel and receiver, of a breech-bolt, a lock-bolt for locking said breech-bolt in closed position, said lock-bolt extending transversely through said breech-bolt and carried by said breech-bolt and protruding into a recess in the wall of the receiver at one side of the breech-bolt, and having an angular part locked by a shoulder of the receiver at the opposite side of the breech-bolt, said receiver having a longitudinal slot in its wall contiguous to said shoulder whereby said breech-bolt is rigidly supported at both sides against recoil, and means for actuating said lock-bolt and breech-bolt, substantially as set forth.

14. In a breech-loading firearm the combination with the barrel and receiver of a breech-bolt, a longitudinally-moving rod, a lock-bolt for locking said breech-bolt in closed position, said lock-bolt extending transversely through said breech-bolt and carried by said breech-bolt and protruding into a recess in the wall of the receiver at one side of the breech-bolt and having an angular part locked by a shoulder of the receiver at the opposite side of the breech-bolt, said receiver having a longitudinal slot in its wall contiguous to said shoulder whereby said breech-bolt is rigidly supported at both sides against recoil, and a cam slot and pin connection between the lock-bolt and the longitudinally-moving rod, substantially as set forth.

15. In a breech-loading firearm the combination with the barrel and receiver of a longitudinally-moving breech-bolt, a longitudinally-moving rod having a longitudinally-slotted connection with said breech-bolt near the rear end of said breech-bolt, a lock-bolt fitted transversely in said breech-bolt near the front end thereof, said lock-bolt extending into a recess in the wall of the receiver at one side of the breech-bolt and having an angular part locked by a shoulder of the receiver at the opposite side of the breech-bolt, whereby said breech-bolt is rigidly supported against recoil at points near the front end of the breech-bolt and at both sides thereof, and a cam slot and pin connection between the lock-bolt and longitudinally-moving rod, substantially as set forth.

16. In a breech-loading firearm the combination with the barrel having an aperture in rear of the muzzle and with a receiver, of a longitudinally-moving rod and means actuated by the gases of explosion escaping through said aperture in the barrel for actuating said rod, a longitudinally-moving breech-bolt, said breech-bolt having a longitudinally-slotted connection with said rod near the rear end of said breech-bolt, a lock-bolt fitted transversely in said breech-bolt near the front end thereof, said lock-bolt extending into a

recess in the wall of the receiver at one side of the breech-bolt and having an angular part locked by a shoulder of the receiver at the opposite side of the breech-bolt, whereby said breech-bolt is rigidly supported against recoil at points near the front end of the breech-bolt and at both sides thereof, and a cam slot and pin connection between the lock-bolt and longitudinally-moving rod, substantially as set forth.

17. In a breech-loading firearm the combination with the barrel and receiver of a cylinder located alongside of said barrel and a vent leading from the bore of the barrel to the cylinder, a piston in said cylinder in rear of said vent, and a power-storing device operating to return the piston to forward position after the piston has been moved rearward by the gases of explosion, a rod connected with said piston, a breech-bolt, said breech-bolt having a longitudinally-slotted connection with said rod near the rear end of said breech-bolt, a lock-bolt fitted transversely in said breech-bolt near the front end thereof, said lock-bolt extending into a recess in the wall of the receiver at one side of the breech-bolt and having an angular part locked by a shoulder of the receiver at the opposite side of the breech-bolt, whereby said breech-bolt is rigidly supported against recoil at points near the front end of the breech-bolt and at both sides thereof, and a cam slot and pin connection between the lock-bolt and said rod, substantially as set forth.

18. In a breech-loading firearm the combination with the barrel and receiver of a cylinder located alongside of said barrel and a vent leading from the bore of the barrel to the cylinder, a piston in said cylinder in rear of said vent, a retracting-spring on one side of said piston and connected to said piston and a rod on the other side of said piston also connected to said piston, a breech-bolt, said breech-bolt having a longitudinally-slotted connection with said rod near the rear end of said breech-bolt, a lock-bolt fitted transversely in said breech-bolt near the front end thereof, said lock-bolt extending into a recess in the wall of the receiver at one side of the breech-bolt and having an angular part locked by a shoulder of the receiver at the opposite side of the breech-bolt, whereby said breech-bolt is rigidly supported against recoil at points near the front end of the breech-bolt and at both sides thereof, and a cam slot and pin connection between the lock-bolt and said rod, substantially as set forth.

19. In a breech-loading firearm the combination with the barrel and receiver, of a cylinder located alongside of the barrel and a forwardly and downwardly inclined vent leading from the bore of the barrel to the cylinder, a piston in said cylinder in rear of said vent, a tube alongside of said cylinder, a retracting-spring within said tube, a cross-head upon said piston including a follower for said

spring, said follower extending within and guided by said tube, a rod joined to said cross-head at the side thereof opposite said retracting-spring, a breech-bolt, said breech-bolt 5 having a longitudinally-slotted connection with said rod near the rear end of said breech-bolt, a lock-bolt fitted transversely in said breech-bolt near the front end thereof, said lock-bolt extending into a recess in the 10 wall of the receiver at one side of the breech-bolt and having an angular part locked by a shoulder of the receiver at the opposite side of the breech-bolt, whereby said breech-bolt is rigidly supported against recoil at points 15 near the front end of the breech-bolt and at both sides thereof, and a cam slot and pin connection between the lock-bolt and said rod, substantially as set forth.

20 In a breech-loading firearm the combination with a frame including a receiver of a barrel secured thereto, a cylinder alongside of and below the barrel, the front portion of said cylinder being integral with the barrel and the rear portion of said cylinder being 25 integral with the frame, a piston fitted to slide in said cylinder, a tube alongside of the rear portion of said cylinder, a retracting-spring in said tube, a cross-head on said piston extending into said tube and constituting a fol- 30 lower for said spring, and a rod connecting said cross-head to the breech mechanism, substantially as set forth.

21. In a breech-loading firearm the combination with the barrel and receiver of a breech- 35 bolt, a cartridge-extractor upon said breech-bolt, a lock-bolt transversely fitted in said breech-bolt, a longitudinally-moving rod, a cam slot and pin connection between said rod and lock-bolt, a shell-starter engaging the 40 cartridge-shell in the barrel, and an arm of said shell-starter engaged by a cam-surface on said rod, substantially as set forth.

22. In a breech-loading firearm the combination with the barrel having an aperture in 45 rear of the muzzle, and with a suitable receiver, of a breech-bolt, a longitudinally-moving rod having a slotted connection with said breech-bolt whereby said breech-bolt and rod are held together vertically and later- 50 ally, a lock-bolt for locking said breech-bolt in closed position, said lock-bolt having a slot formed therein with an inclined portion, said slot also having a portion at its forward end parallel to the direction of move-

ment of the rod, a pin on said rod entering 55 said slot in the lock-bolt, a piston-cylinder arranged alongside of the barrel and a piston therein, said rod being connected at its forward end to said piston, substantially as set 60 forth.

23. In a breech-loading firearm the combination with the barrel and receiver of a breech- 60 bolt, a transverse lock-bolt in said breech-bolt, a cartridge-extractor upon said breech-bolt, a longitudinally-moving rod, a cam slot 65 and pin connection between said rod and lock-bolt, said breech-bolt having a slotted connection with said rod near the rear ends of said rod and breech-bolt, a shell-starter en- 70 gaging with the cartridge-shell in the barrel and an arm of said shell-starter engaged by a cam-surface on said rod, a longitudinally-arranged cylinder alongside of the barrel, a vent leading from the bore of the barrel into 75 said cylinder, and a piston in said cylinder in rear of said vent, said piston being connected to said longitudinally-moving rod, substantially as set forth.

24. In a breech-loading firearm the combination with a receiver of a barrel secured 80 thereto, a cylinder alongside of said barrel, the front portion of said cylinder being integral with said barrel and the rear portion of said cylinder being integral with the receiver, a piston fitted to slide in said cylinder, a tube 85 alongside of the rear portion of said cylinder, a retracting-spring in said tube, a cross-head on said piston extending into said tube and constituting a follower for said spring, a rod 90 connected to said cross-head at the side opposite the said tube, a breech-bolt, a transverse lock-bolt in said breech-bolt, a cartridge-extractor upon said breech-bolt, a cam slot 95 and pin connection between said rod and lock-bolt, said breech-bolt having a slotted connection with said rod near the rear ends of said breech-bolt and rod, and a shell-starter engaging the cartridge-shell in the barrel, and an arm of said shell-starter engaged by a cam-surface on said rod, substantially as 100 set forth.

This specification signed and witnessed this 25th day of October, A. D. 1894.

CARL J. EHBETS.

In presence of—
JAS. T. BRYANT,
W. J. MALONEY.