

M. F. SMITH.
GAS OPERATED FIREARM.
APPLICATION FILED APR. 27, 1904.

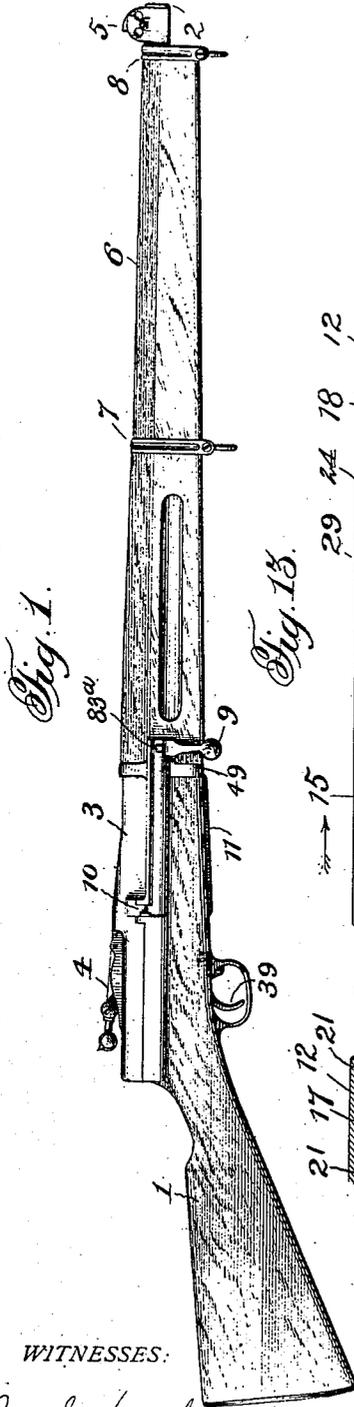


Fig. 1.

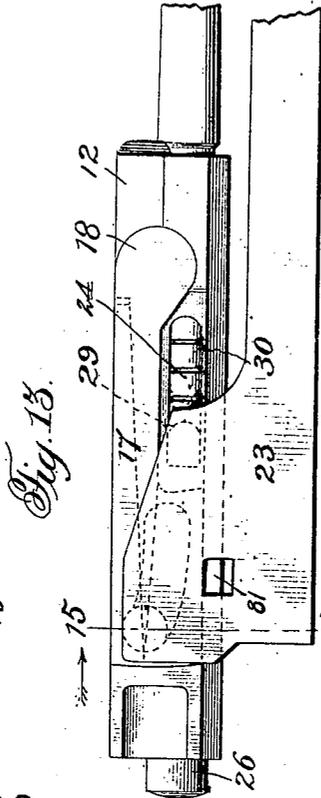


Fig. 13.

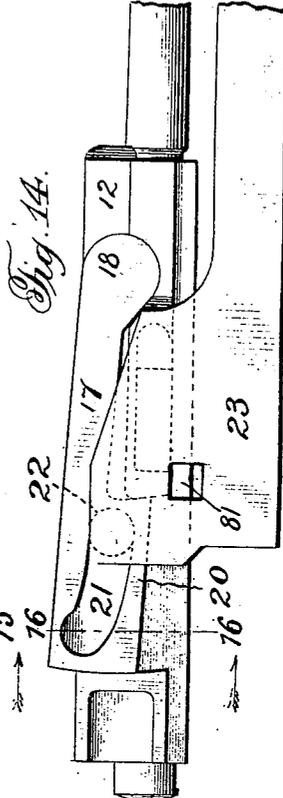


Fig. 14.

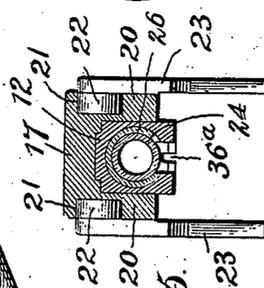


Fig. 15.

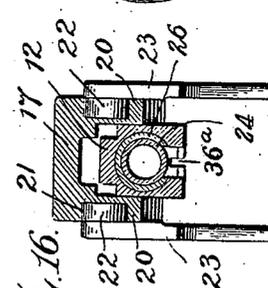


Fig. 16.

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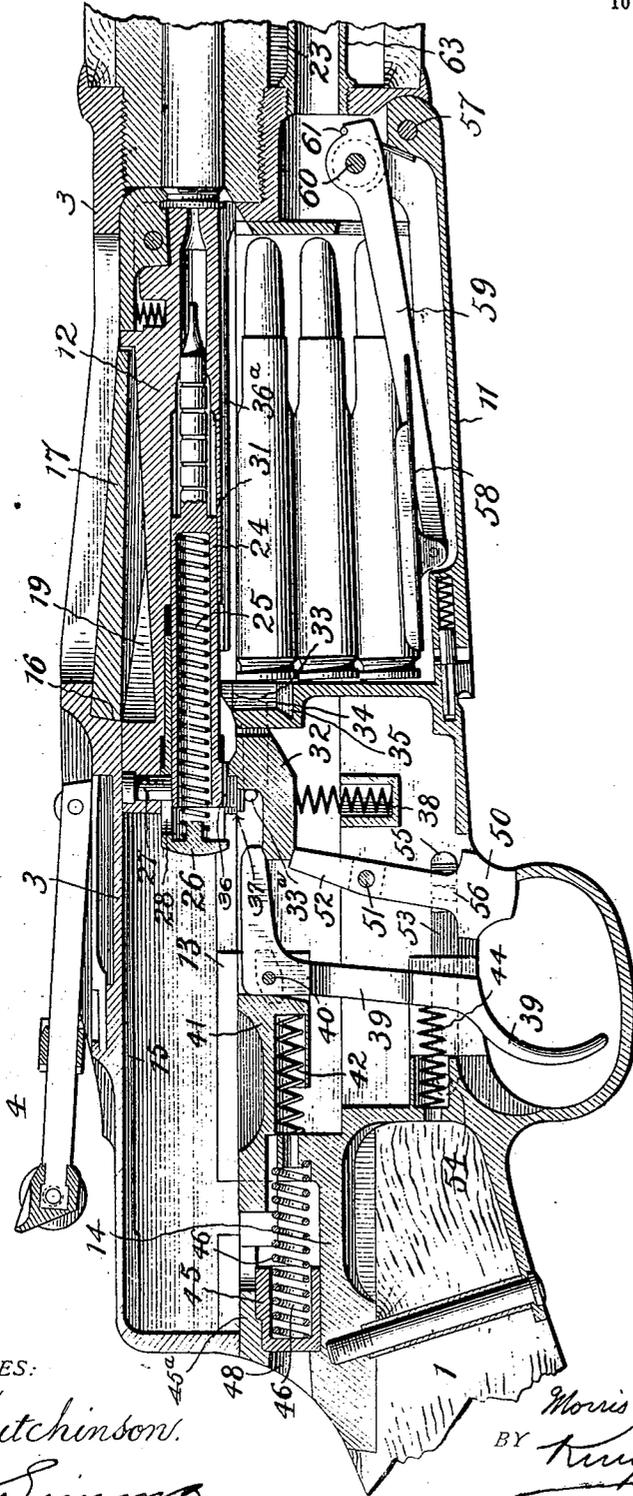
No 817,198.

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10 SHEETS—SHEET 2.

Fig. 2



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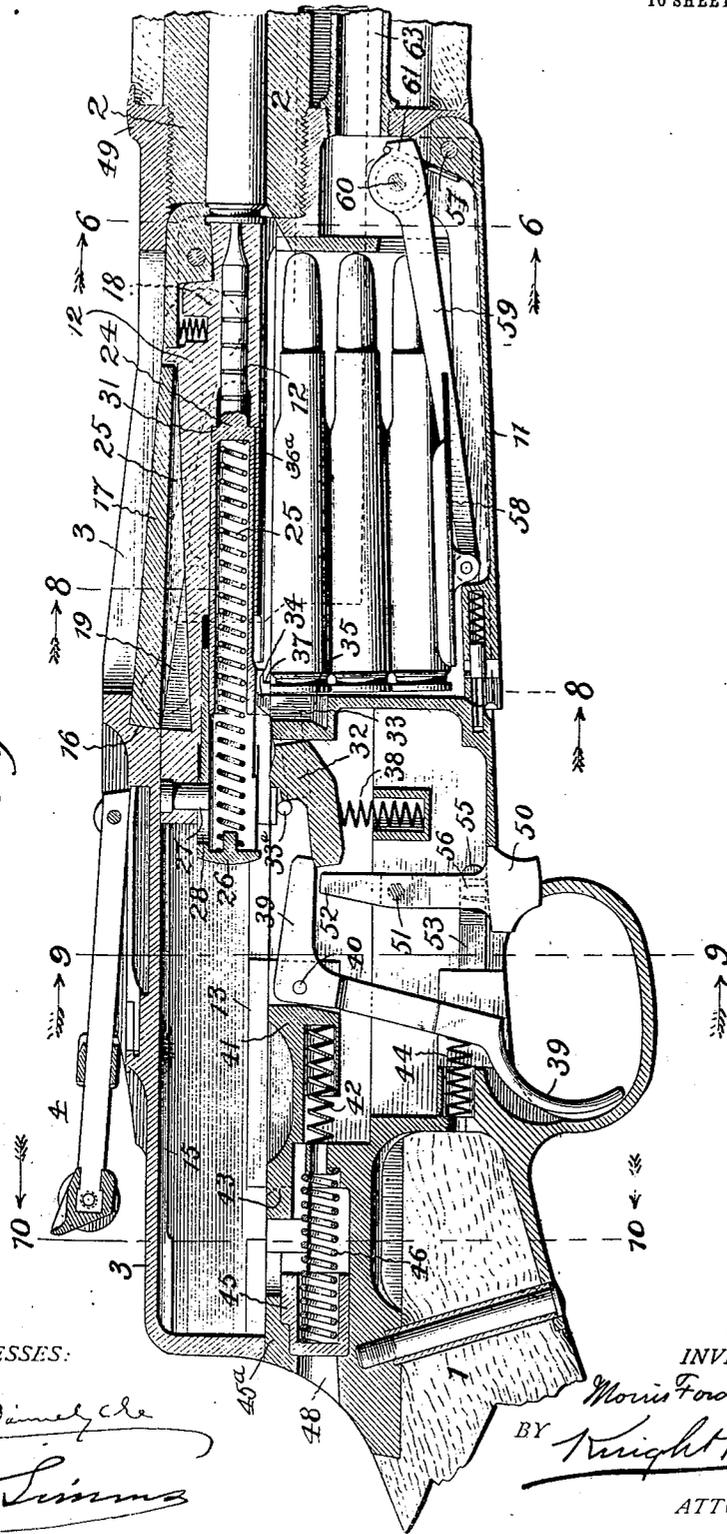
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Fig. 5.



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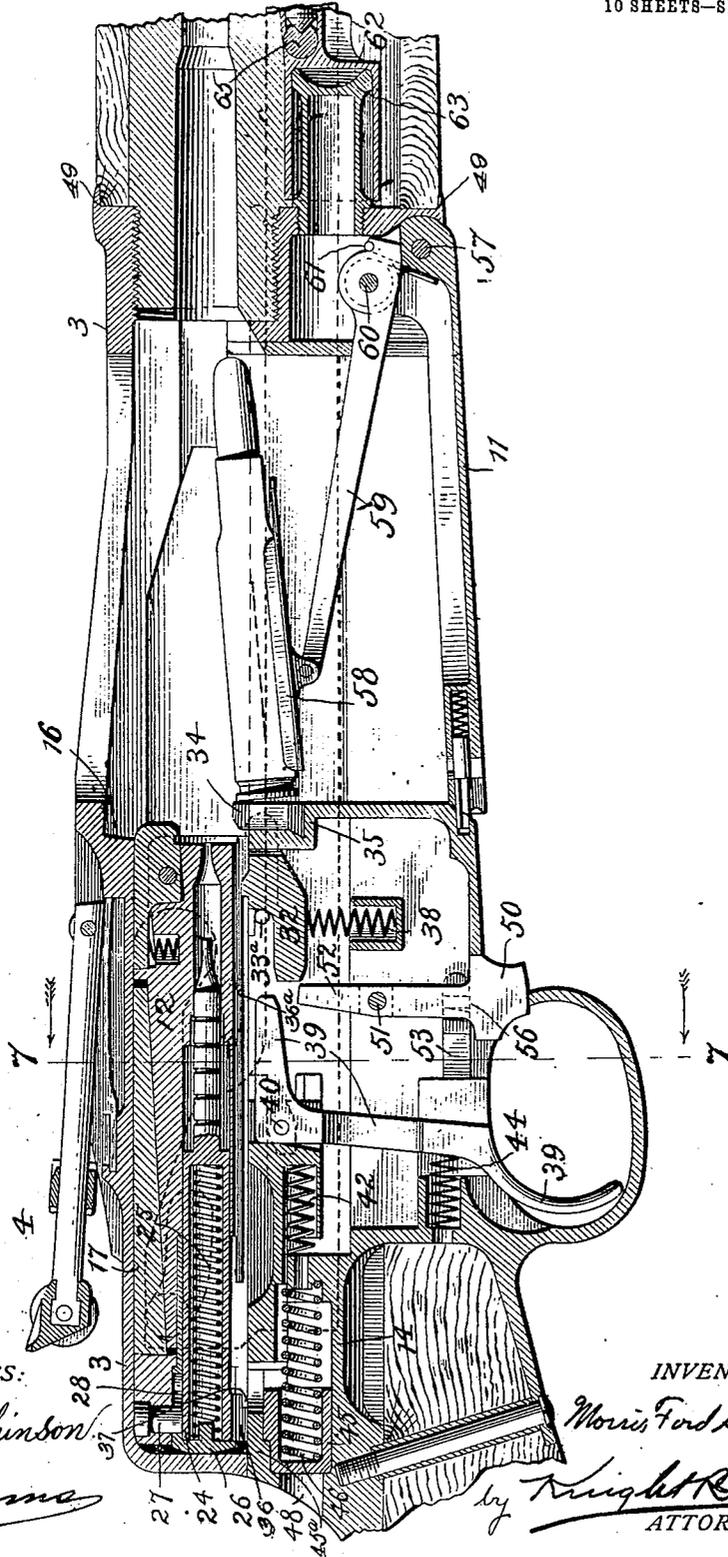
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10 SHEETS—SHEET 4.

Fig. 4.



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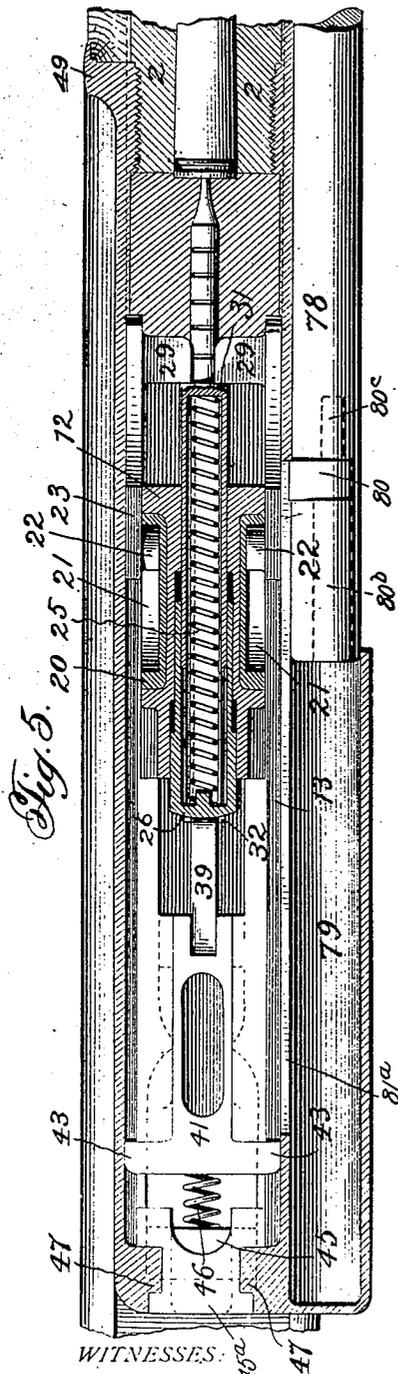


Fig. 5.

Fig. 11.

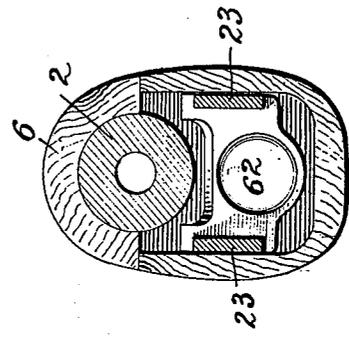
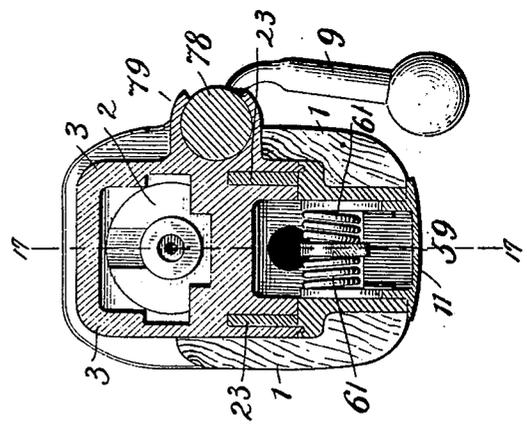


Fig. 6.



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Fig. 10.

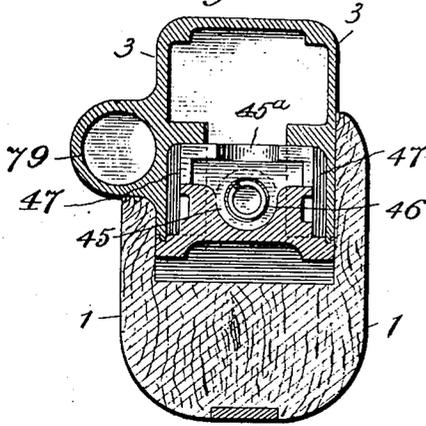


Fig. 7.

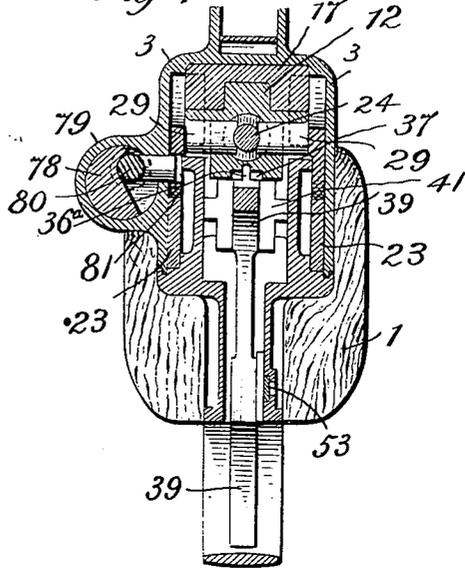


Fig. 9.

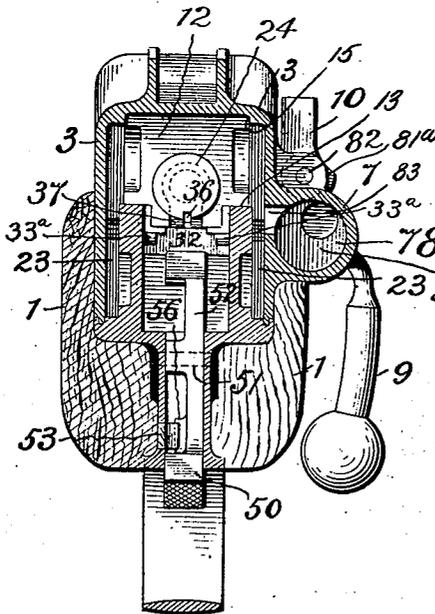
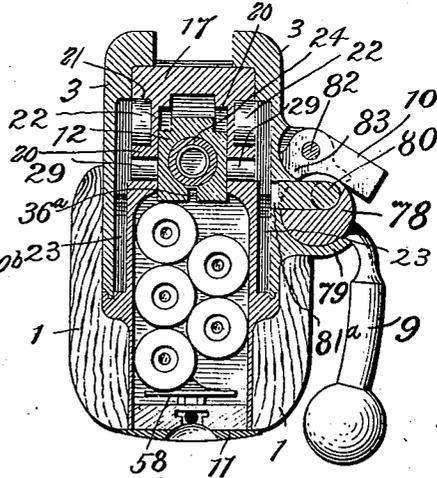


Fig. 8.



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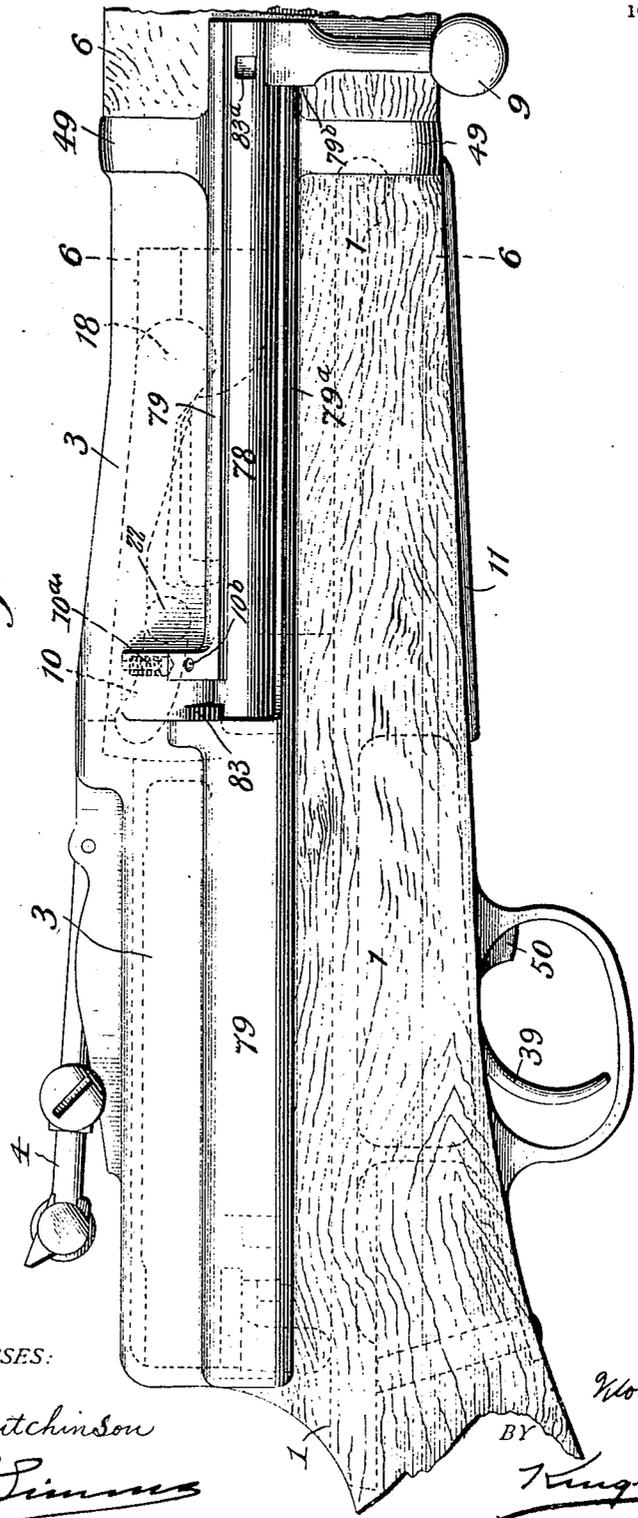
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10 SHEETS—SHEET 7.

Fig. 12



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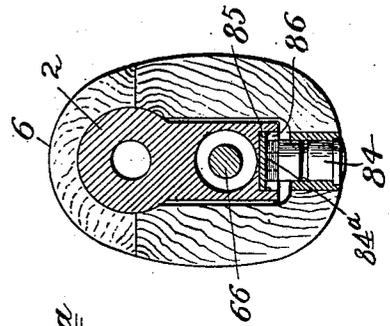
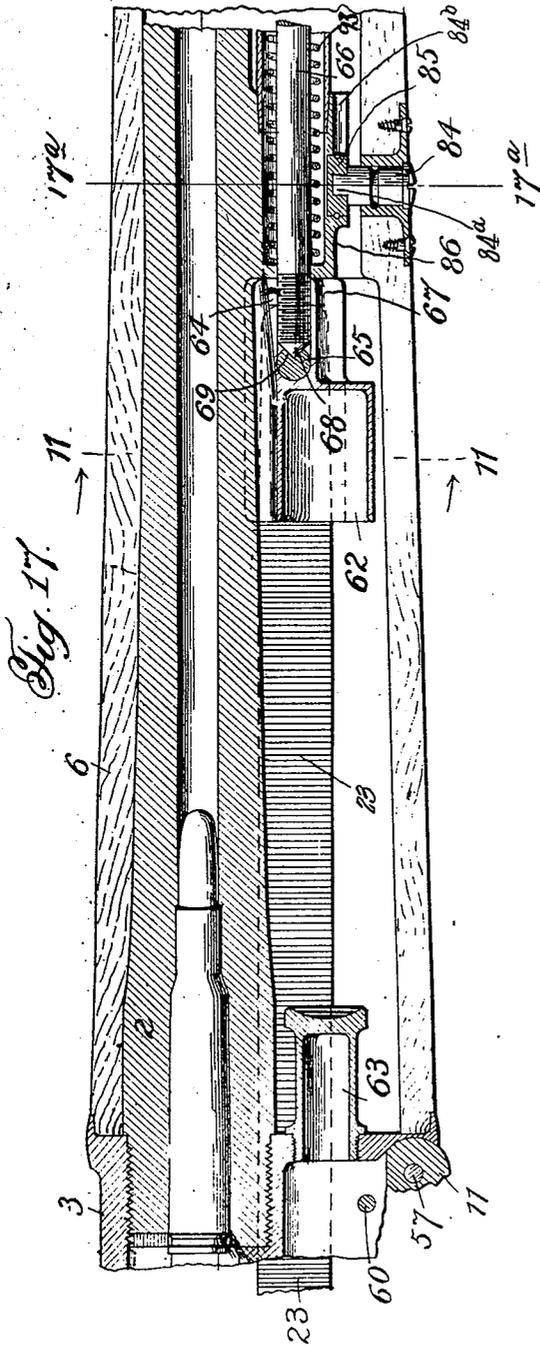
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10 SHEETS—SHEET 8.



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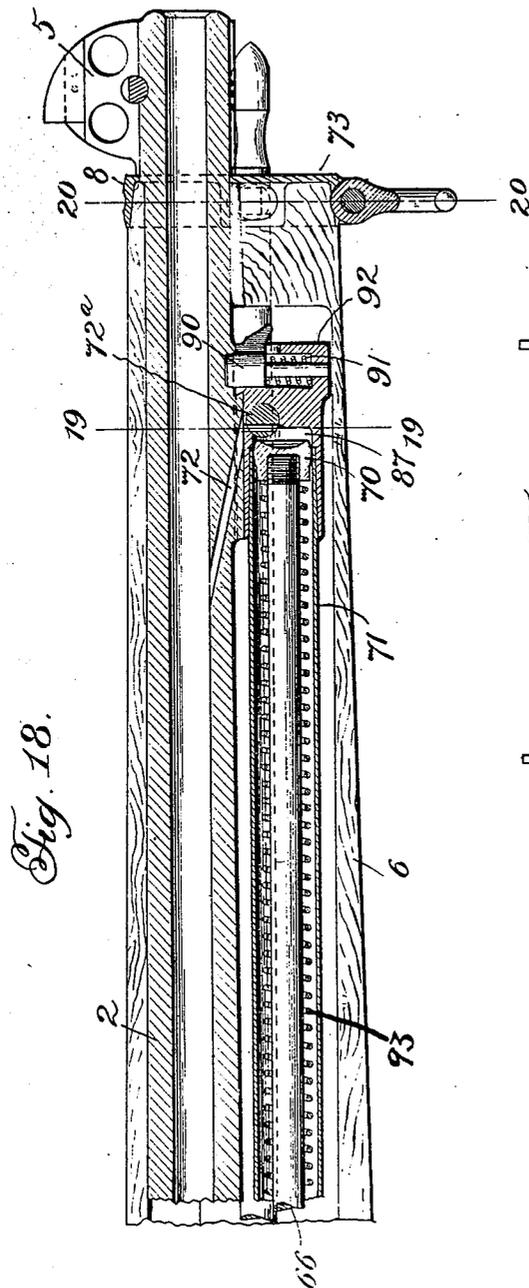


Fig. 18.

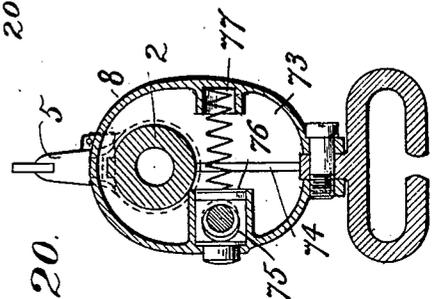


Fig. 20.

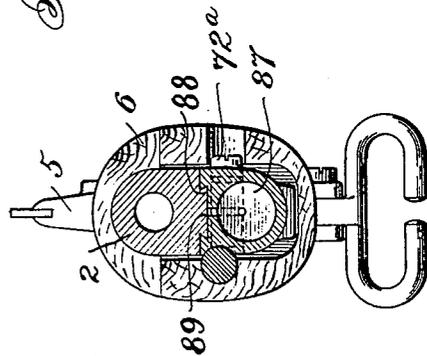


Fig. 19.

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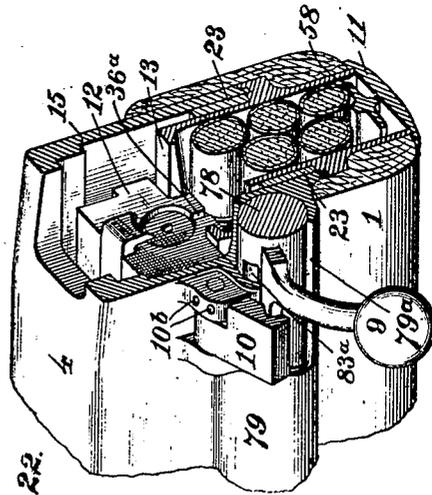
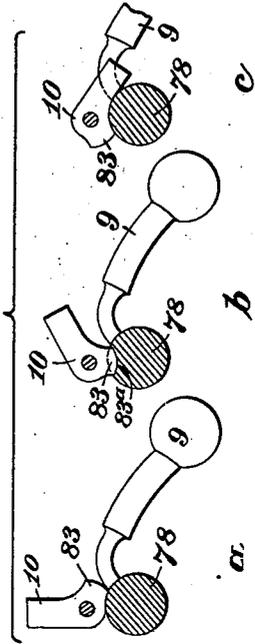
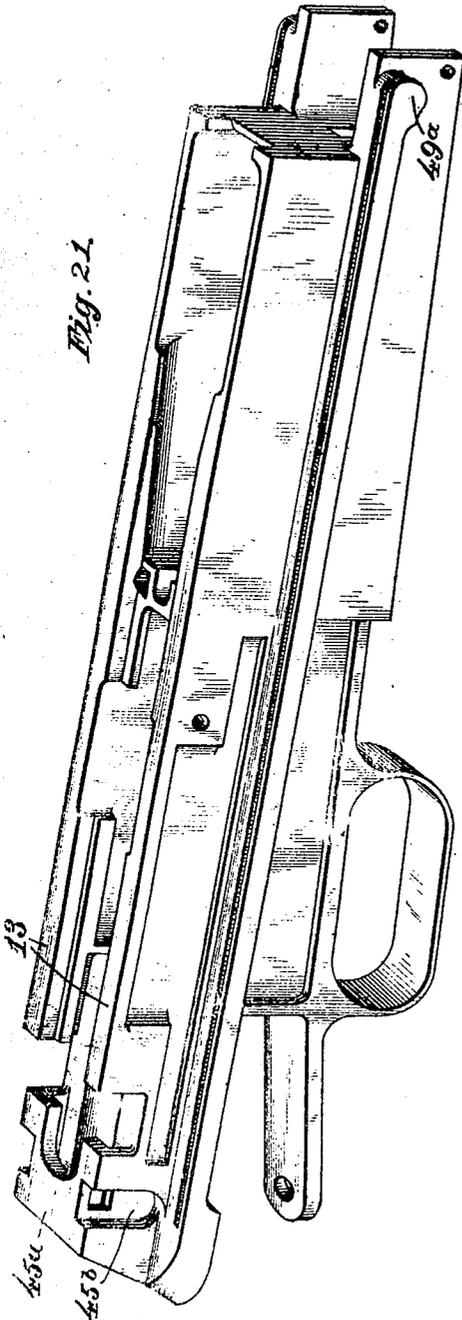
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GAS-OPERATED FIREARM.

No. 817,198.

Specification of Letters Patent.

Patented April 10, 1906.

Application filed April 27, 1904. Serial No. 205,226.

To all whom it may concern:

Be it known that I, MORRIS FORD SMITH, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Firearms, of which the following is a specification.

This invention has for its object to provide an improved means for mounting the trigger, breaking the connection between the trigger and the sear, mounting the sear, locking the sear against movement, locking and operating the breech-bolt, manually operating the breech-bolt and holding it in an open position, and cushioning the breech-bolt.

Other objects and advantages will appear in the following description and will be particularly pointed out in the appended claims.

While some of the features of my invention are applicable to firearms in general, they are designed more particularly in connection with firearms of the gas-operated type, and my invention will be illustrated and described in connection with a gas-operated shoulder-arm.

My invention consists in certain novel features of construction and combinations of features to be hereinafter fully described, and particularly pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of a military rifle embodying the several features of my present invention. Fig. 2 is an enlarged vertical section in the plane of the axis of the barrel through the receiver portion of the gun, with the firing-pin in cocked position and the safety-catch engaging the sear to prevent the release of the firing-pin, some of the working parts being shown in elevation. Fig. 3 is a view similar to Fig. 2 in which the safety-catch has been withdrawn from beneath the sear and the trigger has been pulled and the firing-pin projected against the primer. Fig. 4 is a view similar to Figs. 2 and 3, in which the parts have been moved by the gas-operated mechanism to the positions which they severally assume when the receiver is open, the spent shell having been thrown out and a new charge having been placed in position to be introduced into the chamber of the gun by the forward movement of the breech-bolt.

Fig. 5 is a horizontal section through the portion of the gun shown in Figs. 2 to 4 with the parts in positions corresponding to Fig. 3. Fig. 6 is a vertical transverse section on the line 6 6, Figs. 3 and 12. Fig. 7 is a vertical transverse section on the line 7 7, Fig. 4. Fig. 8 is a vertical transverse section on the line 8 8, Fig. 3. Fig. 9 is a vertical transverse section on the line 9 9, Fig. 3. Fig. 10 is a vertical transverse section on the line 10 10, Fig. 3. Fig. 11 is a vertical transverse section on the line 11 11, Fig. 17. Fig. 12 is a side elevation of the portion of the gun shown in Figs. 2 to 5. Fig. 13 is a side elevation of the breech-bolt and parts carried thereby, together with the connecting-rod which locks and unlocks the locking-bar and reciprocates the breech-bolt. The connecting-rod is at the rear limit of its movement relative to the breech-bolt and consequently has drawn the locking-bar downward. Fig. 14 is a view similar to Fig. 13, in which the connecting-rod is at the forward limit of its movement relative to the breech-bolt. Fig. 15 is a vertical transverse section on the line 15 15, Fig. 13. Fig. 16 is a vertical transverse section on the line 16 16, Fig. 14. Fig. 17 is a vertical longitudinal section of the forward portions of the gun on the line 17 17, Fig. 6; and Fig. 17^a is a transverse section therethrough on line 17^a 17^a, Fig. 17. Fig. 18 is a vertical longitudinal section of the forward end of the gun. Figs. 19 and 20 are transverse sectional views on the lines 19 19 and 20, Fig. 18, of the front band which connects the frame with the barrel. Fig. 21 is a perspective view of the stock of the gun with all wooden and movable parts removed. Fig. 22 is a sectional perspective showing the magazine locked against feeding. Fig. 23 is a view showing the several positions of the retracting-bolt-limiting stop.

Referring to Fig. 1, 1 represents the stock, 2 the barrel, 3 the receiver, 4 the rear sight, and 5 the front sight, of the gun. The wooden barrel-covering 6 is held together by bands 7 8, the front band 8 carrying the bayonet-catch. 9 represents a hand-operating lever, and 10 a stop, both of which are of novel construction and are hereinafter fully described. 11 represents the magazine floor-plate.

In any type of gun it is desirable to have

the breech-bolt limited to a single back-and-forth movement and not subject to any transverse movement for locking and unlocking it. For this reason my present invention employs

5 a breech-bolt 12, guided in its longitudinal movements between a track 13, formed by the top of the frame 14, and a track 15, provided by the top of the receiver 3. To lock the breech-bolt in its forward or closed position,

10 the receiver 3 is formed with an upward offset 16, which receives the rear end of a locking dog or bar 17, fulcrumed by its bifurcated forward end 18 on opposite sides of the breech-bolt 12 near the forward end of said bolt. The locking-bar 17 is adapted to

15 move downward into a recess 19, formed in the upper portion of the breech-bolt, and has wings 20, extending downward on opposite sides of the breech-bolt to maintain the alignment of the locking-bar with the breech-bolt and to assist in guiding the latter in the receiver. The wings 20 are provided with cam-

20 grooves 21 in their outer faces, which receive pins 22 on the inner faces of a bifurcated operating or drive rod 23, which extends forward and is connected to the gas-operated mechanism. The shape of the grooves 21 is such that the locking-bar 17 is moved into the offset 16 by the forward movement of the

30 operating-rod 23 and is drawn downwardly out of said offset and into the recess 19 by the rearward movements of said operating-rod, these movements being followed, respectively, by the opening and closing movements of the breech-bolt. The shape of the grooves

35 21 is such that a limited independent movement of the operating-rod 23 relative to the breech-bolt is permitted. This movement occurs at the first part of the rearward movement of the operating-rod and at the last

40 part of its forward movement, and during this relative movement the locking-bar is moved from and returned to its locked position. The forward portions of the grooves

45 21 are of a very low pitch, so as to give the operating-rod greater power over the locking-bar to unlock and lock it, while the rear portions of said grooves are of much greater pitch to accelerate the movement of the locking-

50 bar after it is released from its seat. The rear ends of said grooves are formed with approximately semicircular recesses extending largely in front of the cam-pins when they are in their rearmost position in the cam-

55 grooves, to provide substantial shoulders at such angle as to take nearly all the forward thrust of the operating-rod and avoid transmission of this thrust upwardly to such an extent as would materially increase the friction on the upper track 15.

The firing-pin has a longitudinal bore to receive the projecting spring 25, and this spring abuts at its rear end against a bushing 26, telescoping over the open rear end of the

firing-pin and fitted to slide in the rear end of 65 the breech-bolt and there secured by a pin 27. The pin 27 engages the bushing 26 through a slot 28, which gives the bushing a limited longitudinal movement in the breech-bolt, and thus serves the immediate function of cushioning the rearward stroke of the breech-bolt 70 by the engagement of the bushing with the rear end of the receiver as an abutment and the absorption in the spring 25 of the work transmitted by the rearward momentum of 75 the breech-bolt. The spring 25 being under initial compression by the cocking of the firing-pin 24, it follows that when the bushing 26 strikes the rear end of the receiver the spring 25 must be further compressed by con- 80 tinued rearward movement of the breech-bolt 12, and this will arrest the breech-bolt and tend to start it forward again by the time the operating-rod is reversed in its movement by a return-spring, to be hereinafter de- 85 scribed.

The cocking of the firing-pin is accomplished by means of an additional pair of inwardly-extending integral projections 29 on the operating-rod 23, which work through 90 slots 30 in the sides of the breech-bolt and engage in front of the shoulder 31 of the firing-pin. This is especially advantageous, in that the firing-pin is cocked by the rearward 95 movement of the operating-rod and is prevented from striking the primer until the operating-rod returns to its foremost limit again in the event of the failure of the sear to retain the firing-pin, and this renders premature fire impossible. 100

32 represents the sear which is retained by pins 33^a on opposite sides of the frame and fulcrumed by its bifurcated forward portion 33 in their bearings on opposite sides of the ejector-post 34, which is mounted in a dovetailed 105 seat 35, and projecting upwardly works through a slot 36^a in the breech-bolt and a slot 36, Figs. 15 and 16, in the enlargement 37, formed on the under side of the firing-pin to provide the shoulder for engagement with 110 the sear. (See Fig. 7.) The sear 32 is pressed normally upward by a spring 38.

39 represents the trigger fulcrumed at 40 in a longitudinally-movable fulcrum-block 41, which is pressed normally forward by a 115 spring 42 and having a T-head 43 (shown by dotted lines in Fig. 3 and in plan in Fig. 5) in the path of the operating-rod, so that when the breech-bolt nears its rear limit it imparts rear movement to the fulcrum-block 41 and 120 draws the trigger 39 off the sear 32. This permits the sear to return under the action of its spring 38 to position for engagement with the firing-pin, so that the gun will remain cocked after each shot followed by the auto- 125 matic opening of the breech and introduction of a new charge.

44 represents the trigger-spring.

The stock and the receiver are fitted together by a pivotal connection at the point 49, (see Figs. 12 and 21,) the frame being provided on each side beneath the wooden portion with a rounded portion 49^a and the receiver being formed to turn on these portions. At the rear the parts are secured together by a sliding locking-bolt 45, mounted within a post 45^a and pressed rearwardly by a coil-spring 46. The post 45^a is recessed on each side at 45^b to receive lugs 47 on the inner face of the receiver, the lugs 47 being recessed to permit the ends of the lock to hold the lugs within the recesses 45^b. At the rear the post 45^a is provided with opening 48, so that a device, such as the projectile of a cartridge, may be introduced to engage the lock and move it out of engagement with the lugs 47. 50 represents the safety-catch fulcrumed at 51 and adapted to be swung rearwardly to move its upper end 52 beneath the sear 32. When in this position, the sear cannot be drawn downwardly by the trigger and the gun cannot be fired. The catch 50 works through the forward portion of the trigger-guard in position to be moved into engagement by pressing it in front of the trigger-guard, while it is moved out of engagement by pressing it from the rear of the trigger-guard. It is held in either of its positions by means of a flat spring 53, fixed at its rear end 54 and having a serrated front end 55, which receives a tooth 56 on the side of the safety-catch. (See dotted lines, Figs. 2 and 3 and full lines in Figs. 7 and 9.)

Any suitable form of magazine may be employed. I have shown a magazine located vertically beneath the receiver with a capacity for five charges and having a cover 11, fulcrumed at 57 and carrying a feed-table 58, fulcrumed on a lever 59, which is in turn fulcrumed at 60 on the cover and pressed upward by a spring 61. The operating-rod 23 is, as stated, bifurcated and carries at its cross-head, which is positioned below the barrel, a suitable cushion, preferably comprising a dash-pot 62, working over a fixed plunger 63 on the frame of the gun. The sides of the operating-rod are positioned on the sides of the magazine and are connected to their cross-head by fitting in dovetailed sockets 64, and passing through them and through the cross-head is the taper pin 65.

66 represents the gas-operated piston-rod, which screws into the cross-head at 67 and has a pointed end 68, which enters a seat 69 in the taper pin 65 and prevents displacement of the latter.

70 represents the piston on the forward end of the piston-rod, which works in cylinder 71 and receives gas-pressure from the gun-barrel through a port 72. Owing to the material reduction in the length of the barrel 2, now preferred to service-guns, and the ne-

cessity, on the one hand, of having the gas taken from the barrel at a sufficient distance back from the muzzle and, on the other hand, of accommodating a sufficiently long spring on the barrel, this port 72 is formed at a suitable angle in the gun-barrel, so that it leaves the bore at a point considerably in rear of where it enters the cylinder-head 87. Again, this port is of uniform diameter from the bore through the cylinder-head until it reaches the small space in front of the piston.

72^a represents a rotary valve for cutting off gas from the bore when the gun is to be manually operated. This feature is very important to the successful operation of a gas-operated gun, as it is essential that the gas be conducted at the pressure which it has in the bore to the piston without material expansion.

The end band 8, which secures the barrel to the stock, is provided with a front plate 73, bifurcated, as shown at 74, to permit the band to clamp around the stock and having formed integral therewith a bayonet or rod socket 75, with a spring-pressed retaining-clamp 76, whose spring extends across the band and seats at 77 on the opposite side thereof.

The hand-operated lever 9 and limiting-stop 10 will be best understood upon reference to Figs. 7, 8, 9, 22, and 23, from which it will be seen that the lever 9 projects laterally from a longitudinally-sliding hand-retracting bar or bolt 78, guided in a socket 79 on the side of the receiver, the socket being provided with an extension 79^a, providing a shoulder 79^b at its forward end, in front of which the lever 9 rests when the gun is in condition for operation by the gases.

When it is desired to open the breech by hand, the lever 9 is elevated, thereby moving it from in front of the shoulder 79^b, oscillating the retracting-bar and causing an eccentrically-pivoted pin 80 to enter a recess 81 in one of the side members of the operating-rod 23, thus establishing a controlling connection with the breech-bolt. The pin 80 is pivoted in the retracting-bolt by means of a small forwardly-extending trunnion 80^a and a large rearwardly-extending trunnion 80^b, the periphery of the latter intersecting the periphery of the retracting-bolt, as shown in Fig. 9. The lever 9 is moved rearwardly after the pin 80 has entered recess 81, the pin 80 during this movement traveling in a slot 81^a in the receiver. (See Fig. 5.)

The stop 10 in the position shown in Figs. 1, 9, 12, and 23^a, permits the free movement of the retracting-bolt to the extreme rear, thereby ejecting the shell from the barrel and feeding a new cartridge into the barrel on its forward movement. When the retracting-bolt and the breech-bolt are in their extreme rearward positions and it is desired to hold

the breech-bolt open to clean the gun or for other purposes, the stop 10 is moved to its second or intermediate position, as shown in Fig. 23^b. In this position a lip 83 enters into a notch 83^a in the retracting-bolt and prevents the breech-bolt moving forward under the action of the return-spring. If, however, it is desired to extract the shell and feed by hand instead of from the magazine when the magazine is not empty, it is necessary to prevent the breech-bolt moving to the extreme rear. This is done by moving the stop 10 to the third and last position, as shown in Figs. 8, 22, and 23^c. In this position the retracting-bolt is free to move rearwardly until the lever 9 engages the stop, at which time the breech-bolt will be disposed above the rear end of the cartridge, preventing the uppermost cartridge getting in front of the breech-bolt and being fed forward when the breech-bolt moves forward.

The stop 10 is held in various positions by a spring-pressed pin 10^a, which rides into and out of recesses 10^b on one of the lugs in which the stop is pivoted.

Referring to Fig. 1, the gun, as before stated, is arranged as a take-down by having the barrel and receiver separable from that portion of the frame that carries the stock. To gain access to the gas-operated parts, it is not necessary to remove the bands 7 and 8, but simply to remove the front sight 5, to loosen end band 8, and to turn the catch 84, carried by the barrel-frame and projecting into a rotatable and grooved keeper 85 in the lower side of the guide 86. (See Figs. 17 and 17^a.) When the catch 84 is rotated to bring the rib 84^a on its upper end longitudinal with the bore of the gun and in alinement with guide-groove 84^b, carried by the barrel, the barrel-frame may be lifted slightly at its forward end from behind the shoulder on the barrel, the opening in the barrel-frame being enlarged to permit this movement. The frame may then be slid endwise over the barrel and withdrawn, which will expose the gas tube or cylinder and its securing-head 87. The securing-head (see Fig. 18) is fitted by a dovetailed groove 88 to an undercut tongue 89 on the under side of the gun-barrel and may be withdrawn longitudinally after depressing its detent 90, pressed vertically by a spring 91 into a socket 92 on the under side of the barrel, taking the cylinder with it and leaving the piston with its rod connected with the parts which it operates, as already described. The spring 93 for returning the piston forward seats at its forward end against the piston and at its rear end against the rear end of the guide 86, already referred to, the piston-rod working through the rear wall of this guide, as clearly shown in Fig. 17.

Having thus described my invention, what I claim is—

1. In a gas-operated firearm, the combination with the magazine, a breech-bolt movable toward and from the breech across the magazine, and a gas-operated drive-rod, of hand-operated means normally out of engagement with the breech-bolt and adapted to be thrown into connection with the breech-bolt to move it, and means for limiting the rearward movement of the breech-bolt to prevent a feed from the magazine but to permit a hand-feed into the breech.

2. In a magazine-firearm, the combination with the magazine, the breech-bolt, and means for moving the bolt, of a stop movable to one position to prevent a feed from the magazine and to another position to hold the breech open.

3. In a gun, the combination with the breech-bolt, of an oscillatory and sliding retracting-bar, and a pin through which the breech-bolt is moved by the bar, eccentrically pivoted on said retracting-bar and movable into and out of controlling relation with said bolt on the oscillation of the retracting-bar.

4. In a gun, the combination with the breech-bolt, and the magazine, of an oscillatory and sliding retracting-bar, a stop and a pin through which the breech-bolt is moved by the bar, eccentrically mounted on said retracting-bar and movable into and out of controlling relation with said bolt on the oscillation of the retracting-bar, said stop movable to a position to permit a feed from the magazine and to a position to limit the rearward movement of the breech-bolt to prevent a feed from the magazine.

5. In a gun, the combination with the breech-bolt, of an oscillatory and sliding retracting-bar, and a pin through which the breech-bolt is moved by the bar, eccentrically mounted on said retracting-bar and movable into and out of controlling relation with said bolt on the oscillation of the retracting-bar, and means engaging the retracting-bar to hold the breech open.

6. In a gun, the combination with the breech-bolt, of an oscillatory and sliding retracting-bar, a pin through which the breech-bolt is moved by the bar, eccentrically mounted on said retracting-bar and movable into and out of controlling relation with said bolt on the oscillation of the retracting-bar, and a stop movable to a position to limit the sliding movement of the retracting-bar and to another position to engage the bar to hold the breech open.

7. In a gun, the combination with the magazine, and the breech-bolt, of hand-operated means normally out of connection with the breech-bolt but adapted for connection with the same, and means movable to one position to engage the hand-operated means and limit its rearward movement to prevent a feed

from the magazine and to another position to permit the feed.

8. In a gun, the combination with the magazine and the breech-bolt, of hand-operated means normally out of connection with the breech-bolt but adapted for connection with the same, and means movable to and from a position to limit the rearward movement of the hand-operated means, said means being movable to another position to engage the hand-operated means and hold the breech open.

9. The combination of the breech-bolt provided with slots on opposite sides, a firing-pin, a locking-bar fulcrumed on the forward portion of said bolt and its rear end forming the locking-abutment, wings extending downwardly on opposite sides of the breech-bolt, provided with cam-slots, and a bifurcated connecting-rod, each member of which carries a stud which engages in one of the cam-slots to control the locking-bar, and a stud which enters one of the slots on the side of the bolt and engages the firing-pin.

10. The combination with the receiver and the breech-bolt having guide-faces guided between upper and lower tracks in the receiver; of a locking-bar fulcrumed on the forward portion of the breech-bolt, fitted in a recess in said breech-bolt and having its rear end movable upward out of said recess and into engagement with an offset in the receiver when the breech-bolt is in its closed position; and wings on the locking-bar extending downward on opposite sides of the breech-bolt and forming guide-faces which aline with the guide-faces of the breech-bolt to maintain the alinement of the locking-bar with the breech-bolt.

11. In combination with the breech-bolt, the firing-pin mounted therein and the projecting-spring for the firing-pin; of a bushing secured on the breech-bolt forming the rear abutment for the spring, and having a limited movement in the breech-bolt and an abutment on the frame with which the bushing contacts near the end of the movement of the breech-bolt to cushion the latter at its rearward limit.

12. In combination with the breech-bolt, the firing-pin mounted therein and the projecting-spring for the firing-pin; of a bushing secured on the breech-bolt by a slot-and-pin connection forming the rear abutment for the spring, and having a limited movement in the breech-bolt, and an abutment on the gun with which the bushing contacts near the end of the movement of the breech-bolt, to cushion said bolt.

13. In combination with the firing-pin, and means for cocking the same; a sear having a bifurcated forward end introduced longitudinally into suitable bearings and a pin

engaging in rear of the sear holding it in its bearings.

14. The combination of the breech-bolt having a firing-pin and an extractor, an ejector-post, and a sear formed with a bifurcated forward end seated in bearings on opposite sides of the ejector-post.

15. In an automatic gun actuated by firing, the combination with the breech-bolt having a firing-pin, the sear, the trigger, and a sliding block in which the trigger is mounted, projecting into the path of a part moved by the firing of the gun.

16. In an automatic gun actuated by firing, the combination of the breech-bolt, the operating-rod for reciprocating the breech-bolt, the sear, the trigger, and a movable block in which the trigger is mounted, having lateral projections in the path of the operating-rod.

17. In combination with the breech-bolt, a bifurcated operating-rod for reciprocating it, consisting of the cross-head, the side members fitted by dovetailed sockets to the cross-head, and the taper pin passing through the side members and the cross-head.

18. In combination with the breech-bolt, a bifurcated operating-rod for reciprocating it, consisting of the cross-head, the side members fitted by dovetailed sockets to the cross-head, and the taper pin passing through the side members and the cross-head and the piston-rod screwed into the cross-head and having a taper end seated in the taper pin.

19. The combination of a breech-bolt provided with locking means movable to and from the breech and having cam-slots disposed on opposite sides thereof, and a bifurcated connecting-rod each member of which is located on one side of the breech-bolt and carries an inwardly-extending stud engaging in one of the cam-slots to cause the locking and unlocking of the breech-bolt when the rod is moved.

20. The combination with the breech-bolt, of a locking-dog carried thereby and provided with cam-slots on opposite sides thereof, and a bifurcated connecting-rod each member being located on one side of the breech-bolt and having an inwardly-extending stud engaging in one of the cam-slots to cause the locking and unlocking of the breech-bolt.

21. The combination of the breech-bolt movable to and from the breech to close it and having cam-slots disposed on opposite sides thereof, the forward portions of the slots being of low pitch, and the end portions being recessed to provide a shoulder, and a bifurcated connecting-rod having each member located on one side of the breech-bolt and engaging in the forward portion of the slot to lock and unlock the bolt, and in the recess

behind the shoulder to move the bolt longitudinally.

22. In combination with the gun-barrel and the gas-chamber longitudinally slidable therefrom, the spring-pressed catch carried by the front end of said gas-chamber and movable transversely of the barrel into and out of a seat on the barrel.

The foregoing specification signed this 31st day of March, 1904.

MORRIS FORD SMITH.

In presence of—

FRANCIS C. ADLER,
BESSIE D. RHODES.