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GAS OPERATED GUN.

APPLICATION FILED FEB. 1, 1910. RENEWED SEPT. 20, 1917.

1,291,690.

Patented Jan. 14, 1919.

3 SHEETS—SHEET 1.

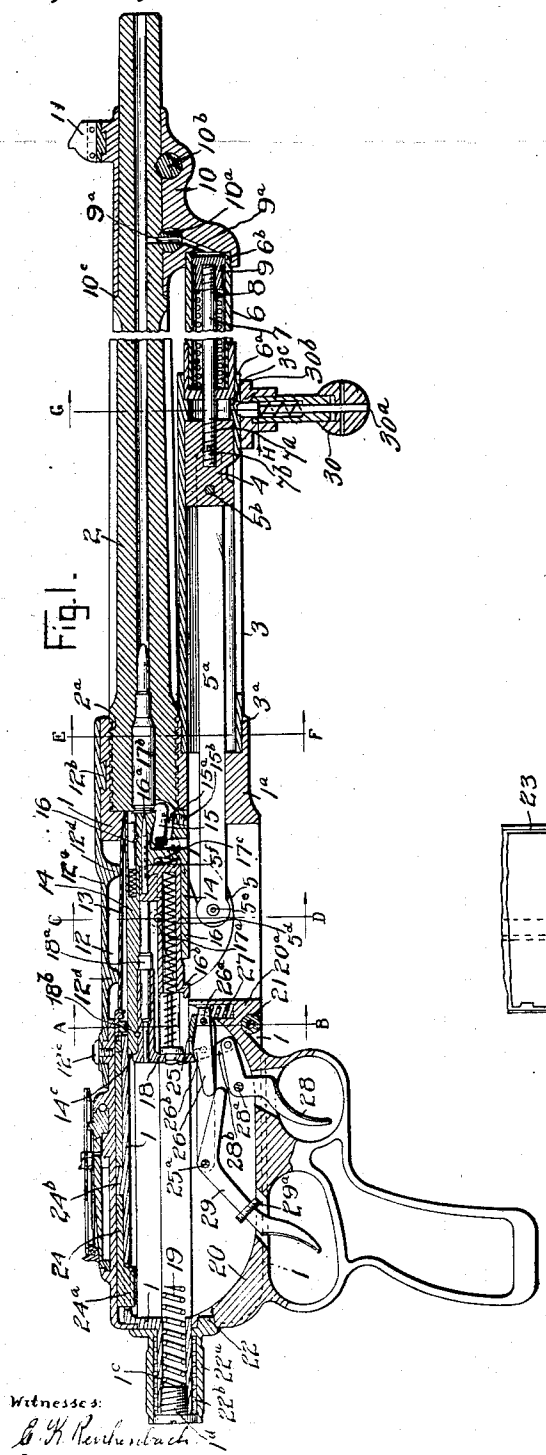


Fig. 1.

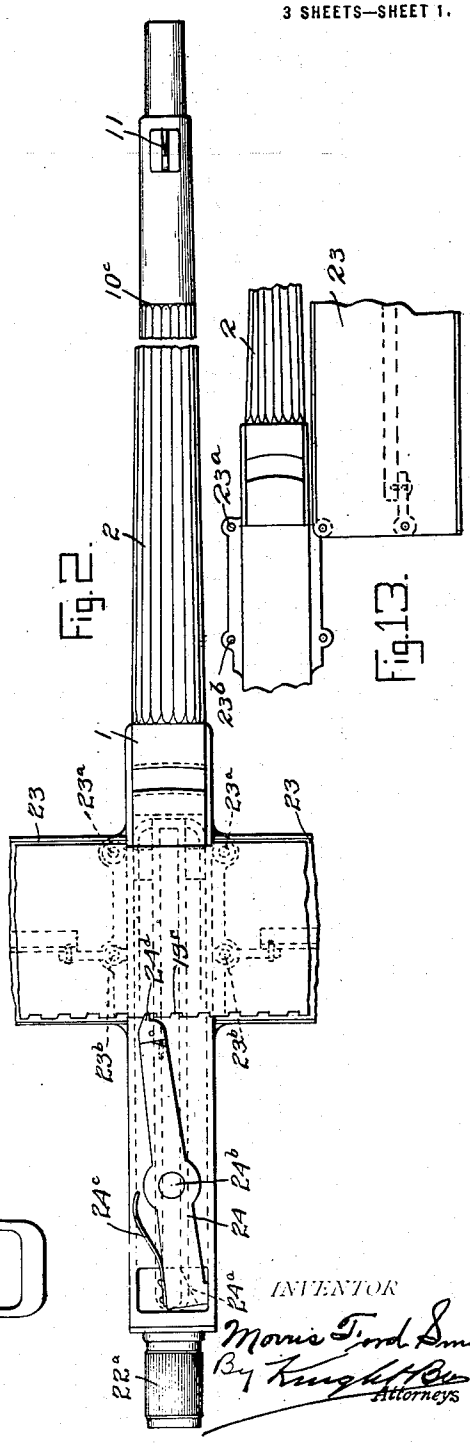


Fig. 2.

Fig. 13.

Witnesses:

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Fig. 3.

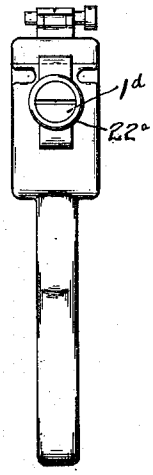


Fig. 8.

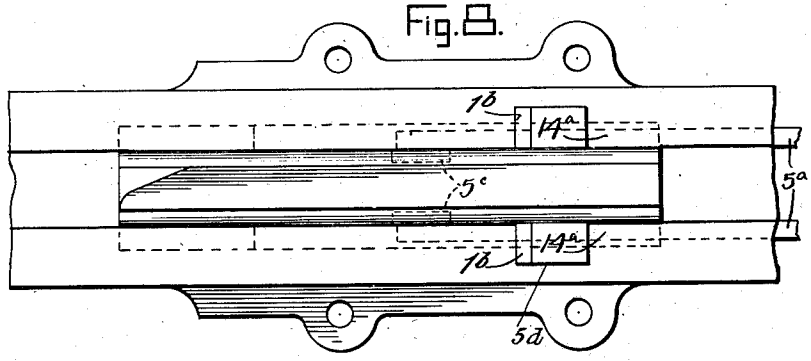


Fig. 9.

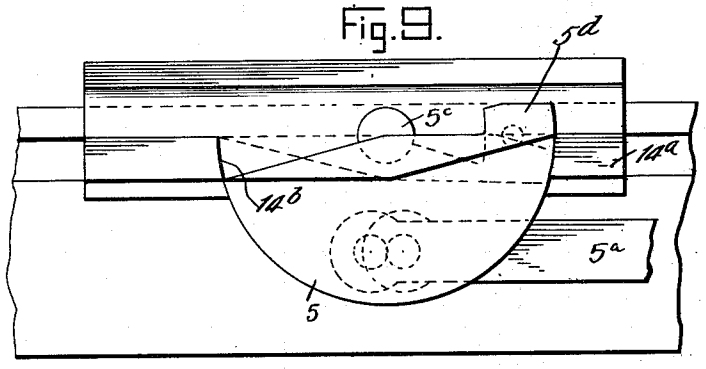


Fig. 10.

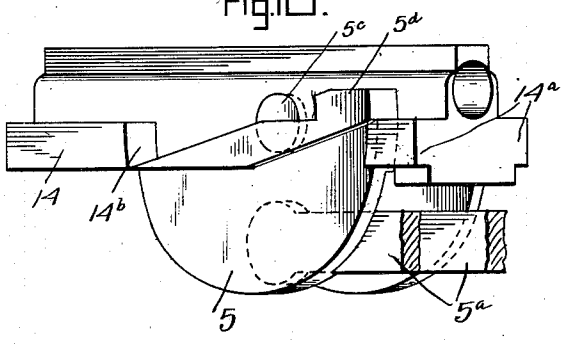
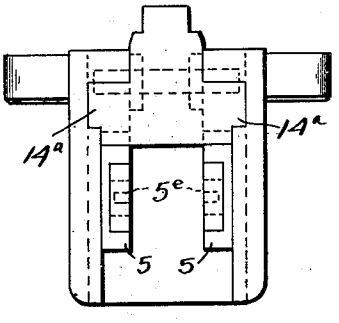


Fig. 11.



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3 SHEETS—SHEET 3.

Fig. 4.

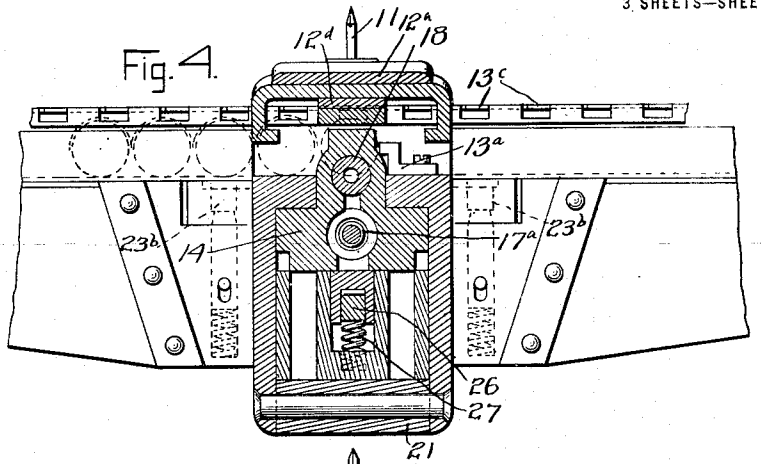


Fig. 5.

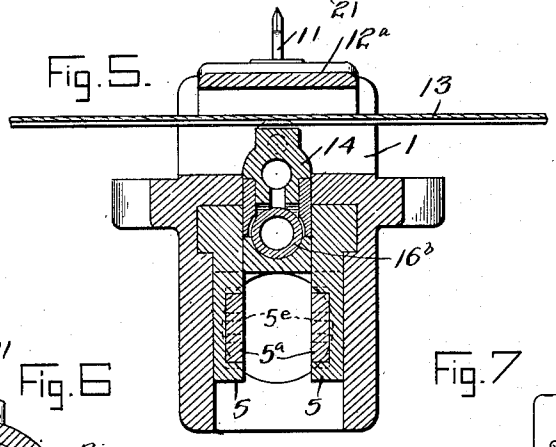


Fig. 6

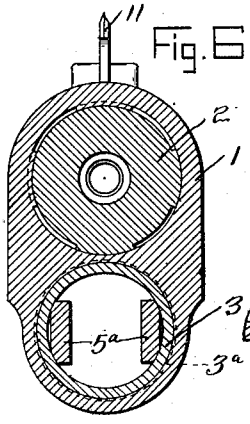
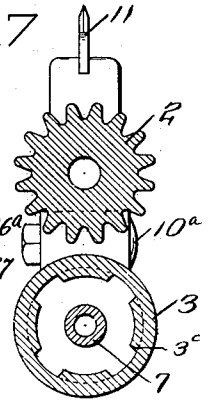


Fig. 7



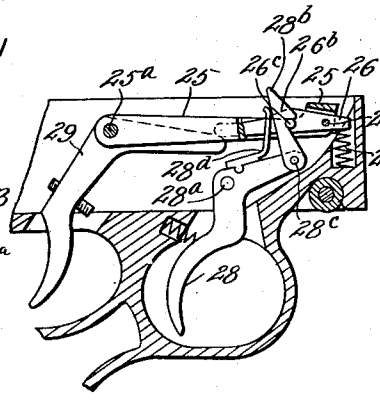


Fig. 12.

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GAS-OPERATED GUN.

1,291,690. Specification of Letters Patent. Patented Jan. 14, 1919.

Application filed February 1, 1910, Serial No. 541,395. Renewed September 20, 1917. Serial No. 192,414.

To all whom it may concern:

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

This gun is believed to approach more closely to the ideal of modern military practice than any rapid fire gun previously devised; being of extremely simple construction both in number and design of its parts, free from small or readily destructible parts, or coöperating mechanism liable to be interfered with by the presence of foreign matters; being readily taken down by simple sequence of shifting or removal of parts, commencing with what might be termed the master key device and without removal of screws or other small securing parts liable to become lost; the readily interchangeable character of all parts that are liable to deterioration with excessive use; absolute security of the assembled gun and high efficiency in use.

The general nature of the invention will be disclosed by the accompanying drawings, containing Figures 1 to 11, wherein:

Fig. 1 is an axial section of the entire gun;

Fig. 2 is a plan view of the gun;

Fig. 3 is a rear end elevation;

Figs. 4, 5, 6 and 7 are sections taken respectively in the planes indicated by the lines A—B, C—D, E—F, and G—H of Fig. 1;

Fig. 8 is a plan view of a portion of the receiver with the cap plate removed;

Fig. 9 is a detail side elevation of the bolt locking means;

Fig. 10 is a perspective view of the bolt with its locking means, and

Fig. 11 is a front elevation of the bolt.

Fig. 12 is an enlarged view of parts of the firing mechanism.

Fig. 13 shows the feeding tray swung alongside the gun.

General arrangement.

The gun comprises three main parts, to wit: the receiver 1, which constitutes the main sustaining structure of the gun, the barrel 2, and a grip frame 20, which, instead of affording the support for the receiver as is usual, is subsidiary to the receiver, in that it is mounted in the open underside of the latter.

The cartridges are fed by the use of a known type of clip, which passes laterally into the receiver beneath the cap plate in advance of the open position of the breech block, suitable lateral supports (collapsible for easy transport) being employed for sustaining the clip on one or both sides.

The barrel.

The barrel 2 is fluted or longitudinally corrugated for the purpose of enlarging its radiating surface and rendering it longitudinally rigid against drooping under excessive temperatures. It connects with the receiver by a mutilated thread 2^a. This construction of barrel permits it to be readily detached and replaced by another barrel upon removal of the front sight band to be hereinafter referred to, which has readily releasable means engaging the barrel and holding it against rotation.

Gas motive power.

The receiver has a lower socket 1^a in which is threaded at 3^a, the guideway 3 of a reciprocating cross head 4, which transmits locking and unlocking movements to the locking segments 5 and opening and closing movements to the breech bolt through the medium of the drive rods 5^a, which have countersunk and dowel connection with the cross head at 5^b. To cock the gun for the first round, a handle 30 having a spring operated plunger 30^a and being carried by a slide 30^b is utilized. It is normally locked to the guideway 3 by the plunger 30^a engaging a recess in said guideway. When in use, the handle is partly drawn out and with the slide riding on the guideway drawn to the rear until the plunger engages a recess in the crosshead 4. The guideway having a slot in its bottom will then permit the sliding back of the crosshead and cocking the gun actuated by the handle, when drawn rearward. Fitted in the forward end of the guideway 3 is the seat 6^a of the cylinder 6 which contains the piston rod 7 connected

by threads 7^a and through pin 7^b with the cross head 4, the return spring 8 and the piston 9; the spring being confined between piston 9 and the seat 6^a of the cylinder. The forward end 6^b of the cylinder 6 is threaded to and closed by the downwardly extending or offset part of the front sight band 10, but the rear end of said cylinder has only sliding connection with its seat 6^a so that any longitudinal expansion in the barrel, owing to heat, may be compensated for in the driving connections, and there will be no tendency to distort the barrel by tension on its underside exerted through the leverage of the offset. Gas pressure reaches the piston 9 through the port 9^a passing partly through the combined dowel and valve 10^a, so that the gas pressure may be regulated by the rotation of said valve. 10^b is a dowel, which together with the dowel 10^a fixes the front sight band against longitudinal displacement on the barrel under internal gas-pressure between it and the piston, and at the same time secures the barrel against rotation on its axis. The sight band seats against a shoulder of the barrel at 10^c. The sight 11 is merely suggestive and may be replaced by any preferred form of front sight. By rotating the dowels 10^a and 10^b until their flat faces are tangent to the periphery of the barrel, the band 10 may be removed longitudinally forward. It will take with it the cylinder 6, which will draw out of its seat 6^a and leave the piston 9 with its rod and surrounding spring exposed. The seat 6^a, between which and the piston 9, the spring 8 is confined with some tension, is constructed as indicated in Fig. 7, so that by bayonet joint motion, it may be rotated to a position which will permit it to pass rearward through the reduced neck 3^c of the guideway 3. This done, cross head 4, drive rods 5^a, piston rod 7, cylinder seat 6^a, spring 8 and piston 9, may all pass rearward through the guide 3, the rods 5^a being previously disconnected from the segments 5 in the manner hereinafter referred to.

Loading and firing mechanism.

The receiver has a top opening 12 adapted to be closed by a cap plate 12^a, except at the sides where it receives the loading clip 13; said cap plate being slid laterally into engagement with the receiver by the dove-tail 12^b and secured against displacement by the pin 12^c, while on its under face it has guide lugs 12^d for the clip 13.

The breech block is represented at 14. Its general section, except at its forward end, is that of a cross, whereby it is provided with top, bottom and lateral guides. It enlarges, however, at its forward end to provide abutment shoulders 14^a, by which it stands in constant abutment with the locking segments 5 which are trunnioned to the breech block at 5^e and provided with lugs 5^d adapted to move, by the swinging of the segments 5, to and from their seats behind the fixed locking shoulders 1^b on the receiver (see Fig. 8). The segments are also made to abut the shoulders 14^b of the breech block 14, when the segments are rocked to unlocked position in order to secure an effective drive of the breech bolt in the rearward direction.

The drive rods 5^a are connected to the segments 5 by means of the integral bearing pins 5^e, around which the ends of the drive rods are counter-sunk into the face of the segments 5. This permits easy disconnection of the rods 5^a from the segments 5 by pressing together the rear ends of the rods, when it is desired to take down the gun.

Spent shell.

The extractor is represented at 15, being pivoted on the breech bolt and pressed upwardly into engaging position by a spring 15^a introduced from beneath and held in position by screw 15^b. The coöperating ejector is likewise mounted on the breech bolt instead of on a fixed part and is in the form of a spring pressed plunger 16, which constantly seeks to tip the shell, but is only effective when the shell has so far gone out of the gun as to permit its forward end to be flipped downward through the open underside of the receiver. 17 represents the striker propelled by spring 17^a. It is mounted in the lower portion of the breech bolt and has an upwardly extending head, which carries the rigidly inserted firing pin 17^b. This firing pin can be removed and replaced without difficulty. The forward end of the striker is beveled as shown at 17^c and the segments 5 carry a pin 5^f which, in the unlocking movement, impinges the face 17^c sufficiently to prevent the firing pin reaching the cartridge, but in the locked position of the segments, allows the striker to move forward a sufficient distance to detonate the cartridge. This serves two important purposes; first, it prevents firing the gun until the breech block is absolutely locked, and secondly, it prevents the firing pin reaching the primer in the event that the breech should be closed without cocking the gun. These considerations are the more important in view of the hereinafter described timing of the release of the sear in automatic firing, which release is effected by the closing movement of the breech and, therefore, slightly previous to the locking movement, whereby a greater rapidity of firing is secured.

18 represents the abutment for the spring 17^a. It also provides an abutment 18^a for the head of the striker, which abutment is

removable and readily replaceable. The combined spring and striker abutment is removably held in place by a through pin 18^b.

The receiver is further provided with a buffer spring 19 mounted in a rear horn 1^c, said spring being seated against a removable screw 1^d.

Grip frame.

The grip frame represented at 20, is provided at its front end with a semi-cylindrical bearing 20^a by which it is supported, pivotally upon the pin 21 between the side walls of the receiver and fits in the open bottom of the latter. Its engagement with the pin 21 is such that when the frame is swung downward and forward to its extreme position, it may be released from the pin in order to expose the parts within the receiver as well as those carried by the frame and facilitate removal of the cross head 4 and connected parts, as hereinbefore described. When engaged with the pin 21 and swung rearwardly and upwardly in addition to being firmly guided laterally between the side walls of the receiver, said frame receives the locking stud 22 on a sleeve 22^a, which surrounds the horn 1^c and is constantly pressed inward by a spring 22^b, which finds its abutment against the head of the screw 1^d already described.

Cartridge feed.

As will be seen from the section A—B, shown in Fig. 4, the plane of the cartridge clip is slightly above the axis of the bore of the gun, so that the clip can retain control of the cartridge until it reaches the position at which control is assumed by the closing breech block. The upper reduced portion of the breech block may work between the spring jaws, which hold the cartridges on the clip and the provision of the lateral bearings of the breech block well below this upward extension, provides the space for the admission of the clip with its contained cartridges. The clip is sustained while entering the gun and leaving it, by the lateral brackets 23, hinged at 23^a, so as to adapt them to fold alongside the gun when not in use, but having spring pressed locking bolts 23^b, Figs. 2 and 4, which oppose their swinging movements and assist in supporting them vertically when in use. It is optional whether the bracket 23 be used on the discharge side of the gun.

The clips are laid on the feeding tray 23 and pressed into the gun until the end cartridge impinges the breech bolt after which the cross head 4 will be drawn rearward by the usual grip lever such for instance as shown at 30. In withdrawing the breech bolt, its rear upper face 14^c (Figs. 1 and 2) will impinge the inclined face 24^a on a feed lever 24 which is fulcrumed at 24^b and normally pressed to the right by a spring 24^c, thereby causing the forward end 24^d of said lever, which takes into the recesses 13^b of the clip, to move the clip into the gun a distance of one cartridge. This brings the cartridge immediately in front of the upper portion of the breech bolt 14, which may now be released or permitted to close under the action of the return spring 8 which will introduce the cartridge into the chamber of the gun and cock the gun ready for firing. On the forward movement of the breech bolt, the lever 24 is returned to normal position by its spring 24^c, its engaging end 24^d being in the form of a spring pressed pawl, which permits it to drag rearwardly over the clip. On firing the gun, the movement of opening the breech with all the attendant functioning of other parts takes place automatically, so that repeated firing may continue as long as cartridges are supplied. A stop 13^a is preferably provided, as shown in Fig. 4, to limit the movement of the clip, by engaging each cartridge as it arrives in the vertical plane of the bore of the gun.

Means for controlling the firing mechanism see Figs. 1 and 12 comprises sear 25, fulcrumed at 25^a carrying the releasing lever 26 fulcrumed on the sear at 26^a and under control of spring 27, the trigger 28 fulcrumed at 28^a and having the connecting finger 28^b fulcrumed at 28^c and held in upright position by a spring 28^d, and normally engaging a pin 26^c on the releasing lever whereby it is adapted to pull off the sear. The end of said finger 28^b projects into the path of the breech block so that the trigger connection is broken after each shot to permit the sear to automatically enter into engagement with the striker. There is provided a rapid fire lever or automatic trigger 29 fulcrumed on the sear fulcrum 25^a and having an end which engages the sear lever 26 so as to force a beveled face 26^b up into the path of the abutment 18 and cause the sear to be automatically thrown off each time the breech block closes, when it is desired to have full automatic firing. The bevel of the face 26^b is such that the exact instant at which the sear will be thrown off may be determined by the elevation of the lever 26. One feature of the present invention consists in releasing the sear at a moment of time relative to the closing movement of the breech bolt that will cause firing to take place at the smallest possible fraction of time after the breech block is actually locked, thereby increasing the rapidity of firing. This is entirely feasible, since both the closing movement of the breech and the detonating movement of the striker are induced by springs, of which that effecting the former movement must be brought into play and get the parts of its control well under way before the spring

effecting the latter movement can begin to act. In order to determine with great accuracy the throw of the sear lever 26, by the automatic trigger 29, the latter carries a stop screw 29^a that may be adjusted to arrest the downward and forward movement of said trigger with nicety. Notwithstanding the minute fractional time involved in the sequence of movements of the breech bolt and the striker, this arrangement is without danger of ill consequences of mistake in adjustment, for it is obvious that if the sear release is advanced too much, it merely has the effect of causing the striker to impinge the safety stop 5′ on the segments 5; as a matter of fact, an easy way to effect the adjustment would be to withdraw the screw 29^a until firing is interfered with, and then advance it gradually only so far as will render firing certain.

Taking down the gun.

To take down the gun, the securing device 22^a is drawn rearward to release the grip frame 20, which is then swung downward and forward until its forward hook 20^a is released from the pin 21. The dowels 9^a 9^b are then rotated to bring their flat faces tangent to the barrel and the front sight band is slipped off forward, taking with it the cylinder 6. Cylinder seat 6^a is then rotated until it will pass through the reduced neck 3^c and the piston rod with connected parts, including the cross head 4 and drive rods 5^a, can move rearward without compressing the return spring. This is accompanied by the unlocking and opening movement of the breech block and all the parts borne thereby. Inasmuch as the breech block is supported in its rearward position by the grip frame 20, as shown in Fig. 4, the absence of the grip frame allows the breech bolt to fall down out of the gun as soon as the drive rods 5^a are disconnected from the segments 5 by pressing the rear ends of the drive rods together. After removal of the breech block, the driving connections may continue their rearward movement until they are out of the gun as soon as the screw 1^d and locking stud 22 have been removed.

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

1. In a fire arm, a receiver, a breech block reciprocating in the receiver locking segments pivoted upon the breech block, said breech block and receiver having shoulders between which the locking segments are adapted to move and transmit the reaction of firing from the breech block through the segments to the shoulders on the receiver, and a driving connection adapted to oscillate the locking segments and impart reciprocating movements to the breech block.

2. In a fire arm, a receiver, a breech block adapted to reciprocate longitudinally in said receiver, segmental locking wings pivoted upon the sides of the breech block, shoulders formed respectively upon the receiver and the breech block, and lugs on the locking wings, moving into and out of position between the shoulders by the oscillation of the wings and adapted to lock the breech block by the shearing resistance of the lugs.

3. In a fire arm, a receiver, a breech block adapted to reciprocate longitudinally in said receiver, segmental locking wings upon the sides of the breech block, shoulders formed respectively upon the receiver and the breech block, and lugs on the locking wings moving into and out of position between the shoulders by the oscillation of the wings and adapted to lock the breech block by the shearing resistance of the lugs, said lugs being on one side of the axis of oscillation of the wings, and a driving connection for the wings and breech block being provided and attached to the wings on the opposite side of the axis of oscillation from said lugs.

4. In a fire arm, a receiver, a breech block adapted to reciprocate longitudinally in said receiver, segmental locking wings upon the sides of the breech block, shoulders formed respectively upon the receiver and the breech block, and lugs on the locking wings moving into and out of position between the shoulders by the oscillation of the wings and adapted to lock the breech block by the shearing resistance of the lugs, said lugs being on one side of the axis of oscillation of the wings, and a driving connection for the wings and breech block being provided and attached to the wings on the opposite side of the axis of oscillation from said lugs, and said locking wings having arcuate bearings upon the breech block independent of their pivots, said arcuate bearings receiving the thrust of the driving connection.

5. In a fire arm the combination with a frame having a socket, of a breech block, locking segments of semicircular shape and journaled at their center for said breech block adapted to oscillate parallel to the gun axis, said locking segments being provided with lugs at their forward end, and said frame being provided with recesses for interlocking with said lugs, a gas driven rod and means connecting said rod with said segments for oscillating said segments and reciprocating the breech block.

6. In a fire arm, the combination with a frame, of a breech block, oscillating segments of semicircular shape and journaled at their center for locking said breech block, said segments being provided with lugs at their forward end, and said frame being provided with recesses for interlocking with said lugs, a gas driven rod, a cross head connected to said rod, and means connecting the cross head with the segments for oscil-

lating said segments and reciprocating the breech block.

7. In a fire arm, the combination with a frame, having a socket and a guide way in said socket, a cross head mounted in said guide way, a breech block, oscillating segments of semicircular shape and journaled at their center for locking said breech block, said segments being provided with lugs at their forward end, and said frame being provided with recesses for interlocking with said lugs, means connecting said segments with said cross head for oscillating said segments and reciprocating said breech block, and a gas driven rod connected to said cross head.

8. In a fire arm, a breech block, a guide way having a seat in its forward end, a cylinder mounted at one end in said seat, segments for locking said breech block, a gas driven rod in said cylinder actuating said segments, a band having a seat in which the other end of the cylinder is mounted, a dowel fixing the band to said barrel, a gas port in said barrel, dowel and band, communicating with said cylinder.

9. In a gas operated fire arm, a barrel, a gas cylinder, a front band mounted on said barrel and having a seat for said cylinder, and a revolubly mounted securing dowel constructed with a port, through which gas is transmitted from the barrel to the cylinder.

10. In a fire arm, the combination with the receiver having a top opening, and side openings said side openings adapted to receive a cartridge clip, a cap plate constructed to close the top opening of the receiver and lugs depending from said plate to guide the said clip.

11. A fire arm having a breech block substantially cross shaped in transverse section, whereby it is provided with top, bottom and lateral guides, a frame with guide ways for said block and common means for locking and reciprocating said breech block, said locking means comprising recesses in the frame and oscillating semicircular segments on the breech block, said segments having lugs situated forward of their axis of oscillation adapted to engage with said recesses, and said segments being journaled at their center.

12. A fire arm having a breech block provided with a top, bottom and lateral guides, a frame with guide ways for said breech block and means for locking and reciprocating said breech block, said locking means comprising recesses in the frame and oscillating semicircular segments on the breech block, said segments having lugs situated forward of their axis of oscillation adapted to engage with said recesses and said segments being journaled at their center.

13. In a fire arm, a breech block of substantially cross shaped transverse section having abutment shoulders near the front and rear ends of said block, a receiver having fixed locking shoulders, segments journaled transversely on said block, projections on the front end of said segments for interlocking with said receiver shoulders, said segments being in constant abutment with the shoulders near the front end of the block and in abutment with the shoulders near the rear end of the block when unlocked from said receiver, and drive rods the ends of which are sunk into the face of said segments, said rods constructed to actuate said breech block through said segments.

14. In a fire arm, a frame, a breech block, sliding in said frame actuated by gas pressure, a striker mounted in said breech block and comprising a hollow guiding and propelling portion, a beveled portion at its forward end and an upwardly extending head carrying a firing pin, an action spring in said hollow portion abutting with one end against said breech block and with the other end against the hollow portion of the striker, a contact member connected with said breech block adapted to engage said beveled portion during the unlocking operation for slightly retracting the striker.

15. A gas operated fire arm, having a breech block, the combination with a sear of means timing the release of the sear in automatic firing, by the closing movement of the mechanism slightly previous to the locking movement, whereby greater rapidity of firing is attained, said means comprising an automatic trigger having a set screw for adjusting its throw, a releasing lever in engagement with said trigger and fulcrumed on said sear and an abutment for contacting with said breech block.

16. In a fire arm, the combination with the breech block, of an abutment member, a striker having an upwardly extending head, a spring for said striker one end of which is seated against said abutment member, an abutment on said member for the rear side of the head of the striker, and a pin holding the said member in place.

17. In a fire arm, the combination with a sear fulcrumed at one end, a releasing lever fulcrumed on the sear at the other end thereof, a support for the rear end of the lever and a projection on said lever, a trigger, a spring actuated finger on said trigger normally engaging said projection, and a spring acting on the forward end of said lever to raise it whereby the sear will be brought into cocking position.

18. In a fire arm, the combination with a breech block, a trigger, a sear, a releasing lever having a projection and being connected to the sear, a finger on said trigger en-

gaging said projection and extending from said trigger into the path of said block and constructed to be engaged thereby so that the trigger connection with said projection is broken after each shot.

19. In a fire arm the combination with a breech block and a striker of a trigger, a releasing lever having a projection, a sear connected to said lever, a spring operated finger on the trigger extending into the path of said block and adapted to be engaged by the block, so that the trigger connection with said projection is broken off after each shot to permit the sear to enter into engagement with the striker.

20. In a rapid fire gun, the combination with a sear fulcrumed at one end, of a releasing lever fulcrumed on said sear at the other end thereof, a support for the rear end of the lever, and a projection on said lever, a spring acting on the forward end of said lever, a trigger, a spring actuated finger extending from said trigger and normally connecting with said projection, whereby said trigger, finger, projection and lever coöperate in pulling off the sear.

21. In a rapid fire gun, the combination with a sear, a breech block, of a releasing lever fulcrumed on said sear, a rapid fire lever fulcrumed on the sear fulcrum, and constructed when manipulated to engage the releasing lever to throw it into the path of the breech block each time the breech block closes, whereby said breech block will cause the depressing of said releasing lever and said sear and the gun will be fired.

22. In a rapid fire gun, the combination with a breech block having an abutment, of a sear, a releasing lever fulcrumed on said sear, a rapid fire lever fulcrumed on the sear fulcrum and having an end which engages the releasing lever so as to place it into the path of said abutment and cause said sear to be automatically thrown off each time the breech block closes.

23. In a rapid fire gun, the combination with a sear, an automatic trigger and a sear lever, said trigger and lever coöperating in governing the position of the sear, of means to determine the throw of said trigger, comprising a set screw on said trigger and a shoulder on the gun for said screw.

24. In a rapid fire gun having a breech block and a sear fulcrumed at one end, means coöperating with said breech block, said means comprising a releasing lever fulcrumed on the free end of the sear and a rapid fire trigger continuously engaging the free end of said releasing lever.

25. In a rapid fire gun, the combination with a sear, a releasing lever on the sear, of a rapid fire trigger adapted when manipulated to engage said releasing lever, said lever and trigger coöperating in governing the position of the sear, and means controlling the extent of movement of said trigger to determine the throw of the lever and the sear, said means comprising a set screw on said rapid fire trigger and a shoulder on the gun adapted to abut with said screw.

26. In a firearm, the combination of a receiver having breech mechanism, and a longitudinally reciprocated drive rod for said breech mechanism; a housing for the drive rod secured to and projecting forwardly from the receiver and constructed with an abutment providing a forward limit stop for the drive rod, an automatically returning gas-driven piston rod working through said abutment, and having a connection with the drive rod, through which the drive rod, when arrested by the abutment, also arrests the forward movement of the piston rod, and a tubular housing for the piston rod sustained against rearward movement by said abutment; said piston rod housing having an annular header fitted to its rear end, through which it rests against said abutment.

27. In a firearm, the combination of a breech block, a striker mounted in said breech block, a locking member having a movement on said breech block independent of the closing movement thereof, and a barrier carried by the locking member intersecting the path of the striker until the breech is completely locked; said locking member comprising a pair of wings on opposite sides of the breech block, and said barrier comprising a through pin carried by said wings.

The foregoing specification signed at Washington, D. C., this 8 day of December, 1909.

MORRIS FORD SMITH.

In presence of—
HERVEY S. KNIGHT,
EDWIN S. CLARKSON.