W. R. CLARK.

GAS OPERATED GUN.

APPLICATION FILED MAY 24, 1917.

1,308,016.

Patented June 24, 1919.

3 SHEETS—SHEET 1.

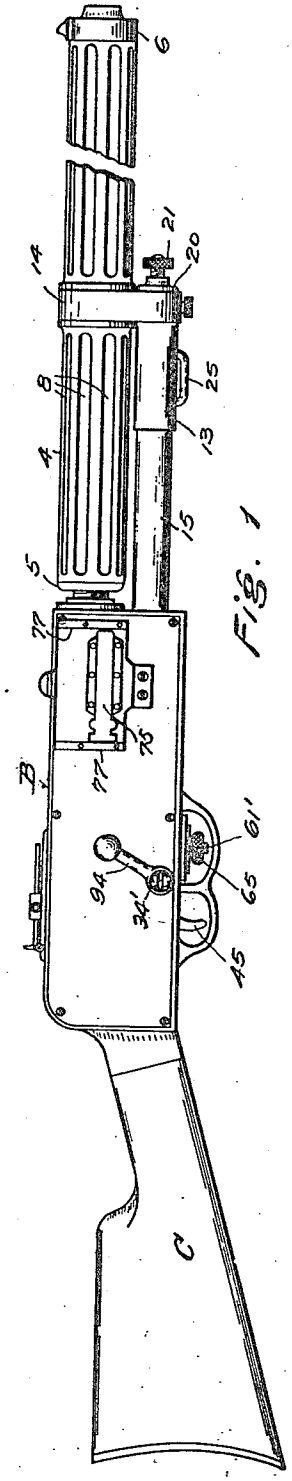


Fig. 1

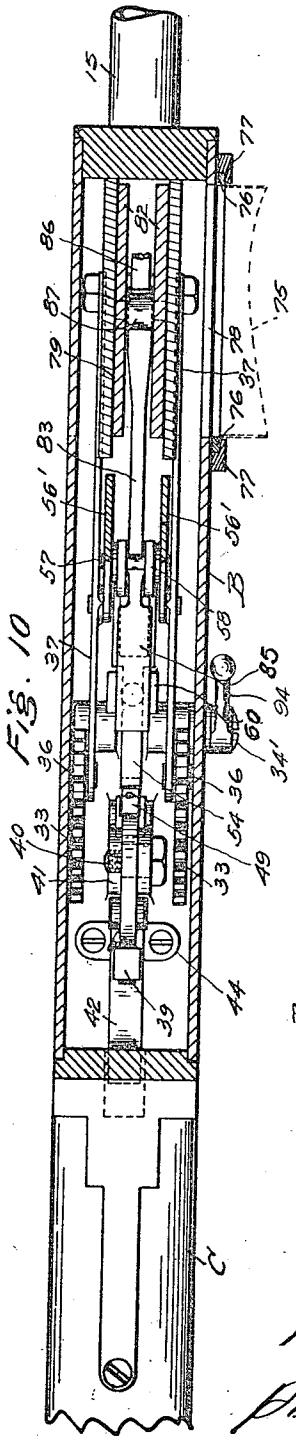


Fig. 10

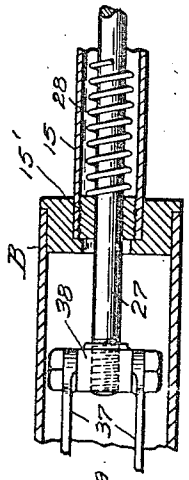


Fig. 12

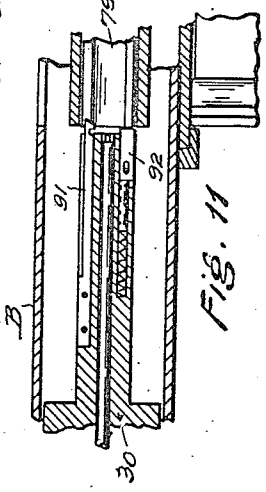


Fig. 11

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14.1

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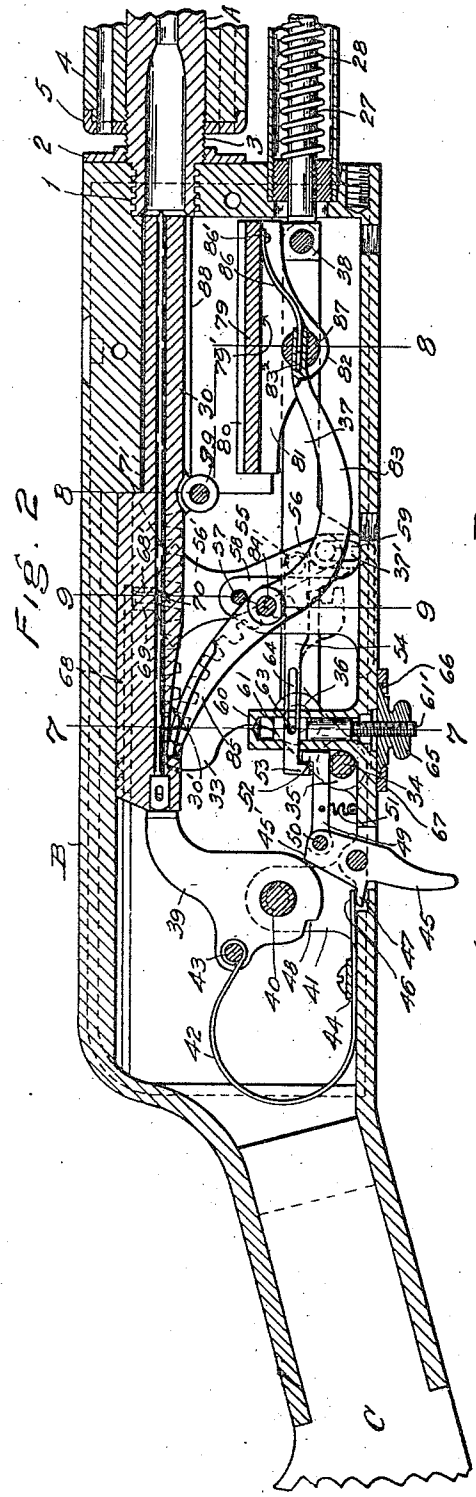


FIG. 2

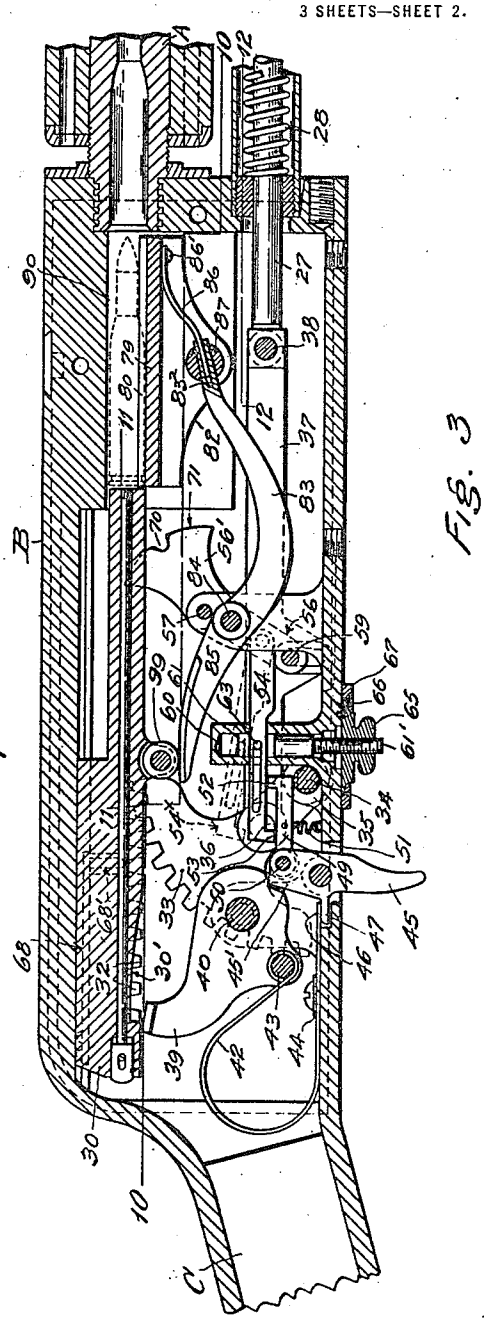


FIG. 3

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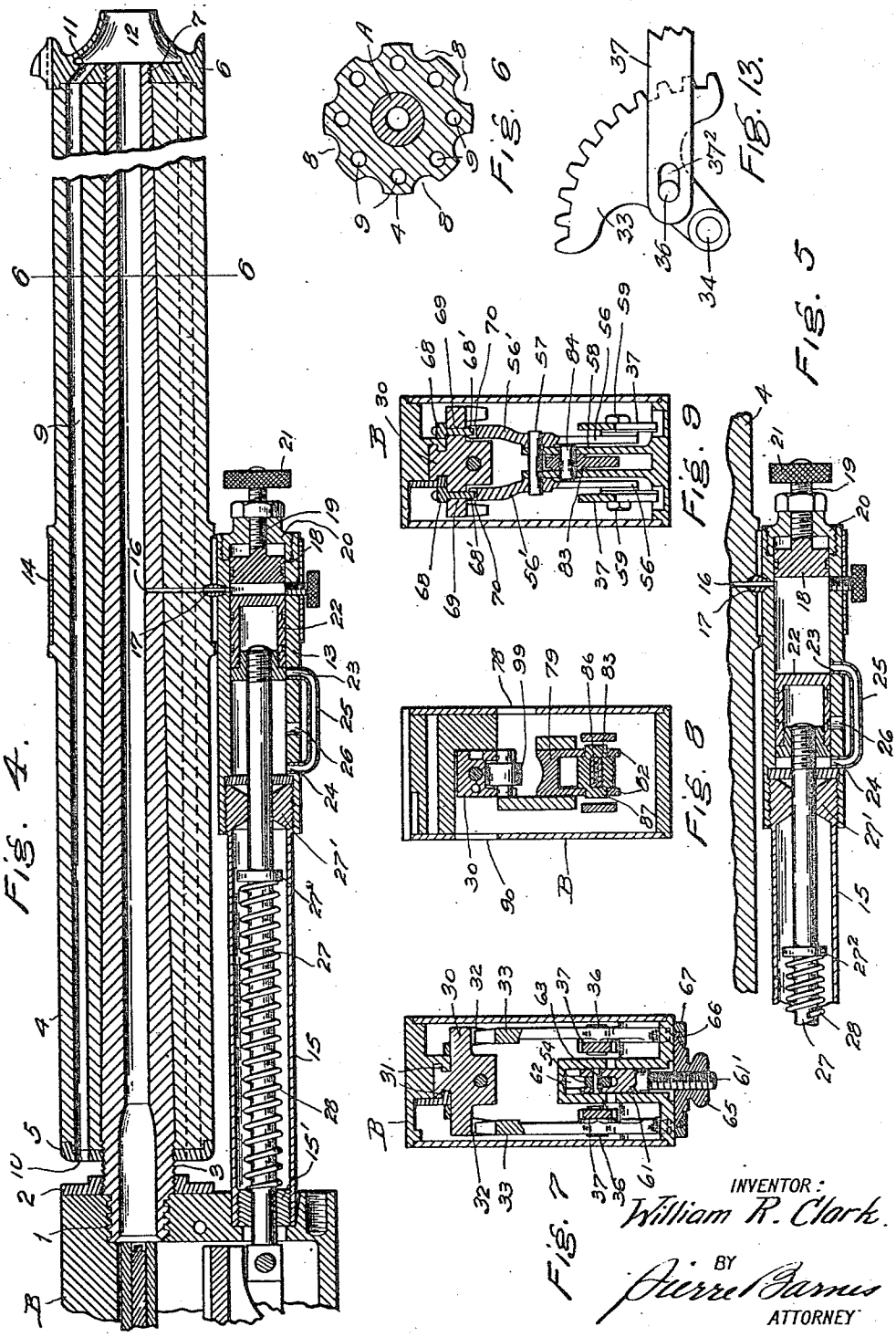
GAS OPERATED GUN.

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3 SHEETS—SHEET 3.



INVENTOR:
William R. Clark.
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UNITED STATES PATENT OFFICE.

WILLIAM R. CLARK, OF SEATTLE, WASHINGTON, ASSIGNOR OF ONE-HALF TO WILLIAM MARTIN, OF SEATTLE, WASHINGTON.

GAS-OPERATED GUN.

1,308,016. Specification of Letters Patent. Patented June 24, 1919.

Application filed May 24, 1917. Serial No. 170,622.

To all whom it may concern:

Be it known that I, WILLIAM R. CLARK, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Gas-Operated Guns, of which the following is a specification.

My invention relates to gas-operated machine guns. It is the object of this invention to improve the construction of guns of this character to render the same more simple and efficient in operation.

The invention consists in the various operating mechanisms which are selectively actuated either manually or by the energy afforded by the pressure of gases generated in firing the gun.

It further consists in devices for regulating the effective pressure of such gases so as to vary the speed of the gun mechanisms in continuous firing. It further consists in the provision of improved breech-locking and releasing appliances. It further consists in means to prevent the gun barrel from becoming unduly heated from rapid discharges.

The invention further consists in the novel construction, adaptation and combination of parts as will be hereinafter described and claimed.

In the accompanying drawings—

Figure 1 is a view in side elevation of a gun embodying features of my invention. Fig. 2 is a detail view in vertical longitudinal section through the receiver and a portion of the stock and barrel of the gun, the parts of the mechanisms being shown in positions which they occupy when the gun is discharged. Fig. 3 is a similar view showing the parts in the positions which they occupy when the breech-bolt is retracted and a charged shell has been raised into loading position. Fig. 4 is a view in vertical longitudinal section of the forward portions of the gun. Fig. 5 is a fragmentary view similar to Fig. 4 to illustrate the plunger in a different operative position from which it is therein shown. Fig. 6 is a transverse sectional view through 6—6 of Fig. 4. Figs. 7, 8 and 9 are transverse sectional views through 7—7, 8—8 and 9—9 of Fig. 2. Figs. 10, 11 and 12 are sectional views taken substantially through 10—10, 11—11 and 12—12 of Fig. 3. Fig. 13 is a fragmentary side elevational view of one of the operating bars and a sector gear connected therewith.

In said drawings, the reference letter A designates the barrel, B the frame or receiver, and C the stock of a gun. The reduced rear end of the barrel is threaded, as at 1, and engages in a correspondingly threaded opening in the receiver, being further secured by a lock-nut 2 engaging threads 3 of the barrel and screwed firmly against the end of the receiver.

Fitted upon said barrel and in spaced relation to the receiver is a sleeve 4, said sleeve being secured between a disk-shaped nut 5 at the rear engaging the barrel threads 3, and a muzzle cap 6 engaging screw threads 7 provided on the forward end of the barrel. Said sleeve is constructed of a material having a relatively high conductivity for heat, and is desirably provided in its outer periphery with a number of grooves 8 to furnish a large heat-radiating surface.

The sleeve, furthermore, is provided with a plurality of longitudinal air-cooling passages 9 which communicate from the rear with the external atmosphere through holes 10 provided in the nut 5 and at the front through communicating passages 11 and a chamber 12 provided in the cap 6.

The passages 11 are directed toward the axis of the gun barrel at a short distance in advance of the muzzle thereof so that suction will thereby be developed by the passage of a projectile to cause air for cooling purposes to flow in the direction of the latter's travel through the various passages 9.

Subjacent to the sleeve 4 is a pressure cylinder 13 which is secured thereto as by a clamping strap 14 and is connected to the receiver C by means of a tube 15 which is threaded at one end into the cylinder, said tube having screwed into its other end an apertured plug 15^1 and fits into a socket provided in the receiver. This cylinder is communicatively connected with the gun bore by a duct 16 extending through a nipple 17. Fitted into the cylinder bore is a piston 18 having a screw-threaded stem 19 which extends through a threaded aperture in a closure 20 detachably connected to the forward end of the cylinder.

Rigidly secured to said piston stem is a

knurled head 21 which is utilized to rotate the stem to adjustably move the piston toward or from the gas duct 16 for the purpose of increasing or diminishing the effective capacity of the cylinder bore.

22 represents a plunger operable within the gas cylinder and is of a length approximately equal to the distance between the outlet and inlet openings 23 and 24 of a by-pass connection 25 which is utilized to transfer pressure gas from in front to the rear of the plunger to cushion the plunger during the latter part of its rearward travel and thereupon serves to neutralize the effective power of the gas pressure until the plunger has been moved forward to uncover an exhaust port 26.

Extending from said plunger through a packing box 27^1 of the cylinder, the tube 15 and the plug 15^1 into the chamber of the receiver B, is a rod 27 which is surrounded by a helical spring 28 interposed between the plug 15^1 and a collar 27^2 provided on the rod. This spring is operated through the energy derived from the gas pressure and serves with the latter to actuate the hereinafter described gun mechanisms.

30 represents the breech-bolt having laterally arranged flanges extending into guideways 31 (Fig. 7) provided in the frame or receiver B and is provided adjacent to its sides with depending rack teeth 32 which are engaged by the teeth of sector gears 33, said gears being pivotally connected by a bolt 34 to supporting posts 35 of the receiver. These sector gears are connected from studs 36 thereon by means of operating bars 37, one on each side, with a cross-head 38 secured to the rod 27 so that when the latter is urged rearwardly or forwardly, the sector gears are influenced to retract or advance the breech-bolt 30. The connections between the sector gears and said operating bars are, however, arranged to afford relative lost motion which is obtained by the provision of an elongated slot, such as 37^2, Fig. 13, into which extends the respective stud 36.

The hammer 39 is pivotally connected by a pin 40 to post 41 and is moved into cocked position by the breech bolt in opposition to the main spring 42 engaging by its bifurcated end the horns 43 provided on the hammer, as shown. Said spring is substantially of the form of a letter **C**, being secured to the receiver by means of an attachment 44.

This spring is also arranged to be used to regulate the trigger 45 by having its end 46 bear downwardly upon a tongue 47 of the trigger whereby the arm 45^1 of the latter is yieldingly held in the hammer notch 48.

To fire the gun singly, the trigger is used as in ordinary firearms to release the hammer and enable the main spring to assert its power to project the firing pin provided in the breech-bolt.

To discharge the gun automatically for continuous firing, I employ a finger 49 pivotally connected at its rear end to the trigger-arm 45^1 at 50 and retained in a longitudinal position with respect to the gun by means of a spring 51 acting to cause the forward part of the finger to bear upon the aforesaid bolt 34. At its forward end, said finger is provided with an upturned lug 52 which, upon occasion, is encountered by a bill 53 formed at the rear end of a pulling finger 54 whose forward end is connected by a pin 55 to a pair of arms 56 of levers $56—56^1$ which are pivotally connected by a pin 57 to the elements of a slotted post 58.

Said lever arms are connected at their lower ends by pivotal studs 59 extending into slots, such as 37^1, provided in the respective operating bars 37 so that when the latter are pulled forwardly, the lever arms 56 act through the medium of the fingers 54 and 49, to cause the trigger to release the hammer through the agency of the bill 53 of one finger engaging the lug 52 of the other one during the last portion of the forward movements of the operating bars and the breech-bolt.

To render the above-described automatic mechanism inoperable when it is desired to use the gun for single firing, the finger 54 is tilted upwardly into approximately the position whereat it is indicated by broken lines 54^x in Fig. 3. This finger is thereby prevented from engaging the other finger 49; for which purpose I provide within a hollow post 60 a vertically movable bar 61 having a slot 62 (Fig. 7) through which extends the finger 54 and, as shown, is connected to the bar for vertical movements by means of a pin 63 extending through a slot 64 of the finger.

The bar 61 is provided with a screw-threaded stem 61^1 engaging in a nut 65 having a peripheral flange 66 disposed between the underside of the receiver and a recessed plate 67 secured to the latter.

For locking the breech-bolt, I provide upon the latter spring latches 68 each having a tooth element 68^1 extending downwardly through an aperture 69 provided in the breech bolt to engage in a notch 70 provided in the arcuate extremity of the respective lever arm 56^1 when the breech-bolt arrives in the position (Fig. 2) which it occupies when the gun is in firing condition.

The action of the locking mechanism may be explained as follows—Assuming the various parts to be in the positions in which they are illustrated in Fig. 2, when the operating bars 37 are driven rearwardly by the power of the powder gas, the levers $56—56^1$ are thereby first actuated toward the teeth 68^1 of latch 68 upwardly, where-

upon the breech-bolt is released, the continued movement of the operating bars, the studs 36 are engaged thereby resulting in the sector gears 33 being influenced to effect the retraction of the breech-bolt.

During the return, or forward, movement of the breech-bolt, the referred-to latch teeth 68^1 encounter the curved extremities 71 of the levers to thereby be influenced to elevate the locking tooth until the notches 70 are presented at or about the time the breech-bolt is at the end of its travel when the resiliency of the latches will effect their engagement in the lever notches to accordingly lock the breech-bolt.

75 represents a suitable magazine detachably secured, as by interfitting devices 76, 77, to the side of the receiver B and is provided with means, not shown, to supply fixed charges of ammunition through a feed opening 78 into the receiver and upon a lifter 79 whereby the charges are successively elevated into the path of the breech-bolt to be driven forwardly thereby into the gun barrel.

The lifter 79 is in the nature of a block having a groove 80 in its upper surface in which a charge is seated and is provided in its underside with a longitudinal recess 81 between spaced wing elements 82 to receive the forward arm 83 of a lever which is fulcrumed by a pin 84 to the post 58, and having its other arm 85 directed rearwardly and disposed so that it will be held by the weight of the lifter 79 in contact with an inclined bearing surface 30^1 in the underside of the breech-bolt 30 when the latter is in its forward position, as shown in Fig. 2.

When the breech-bolt retracts, the lever arm 83 continues to contact with, while being slightly depressed by, the block surface 30^1 until a roller 99 carried by the breech-bolt engages such arm to further depress the same, resulting in the raising of the lifter into position (Fig. 3), whereat the elevated charge may be introduced into the barrel by the breech-bolt in its succeeding forward stroke.

The lever-arm 83 is advantageously connected with said lifter by the provision of a coupling member 87 having a slot to receive such lever-arm and being journaled for oscillatory movements in the block wing elements 82.

To obviate any tilting of the lifter when at the top and bottom of its travel, I provide a spring 86 fixed at one end by means of a screw 86^1 to the underside 79^1 of the lifter and having its other end extend into a slot 83^2 provided in the lever arm, said spring being adapted to retain the lifter horizontally with respect to the gun when at its lowest or charge-receiving position, and yielding to allow the lifter to assume a similar position when encountering ledge stops such as 88, which limit the upward travel of the lifter.

The charges are introduced into the barrel-bore by the breech-bolt in its forward movements. The shells are ejected from the gun through an opening 90 in the side of the receiver opposite the aforesaid feed-opening by means of devices indicated by 91 and 92 attached to opposite sides of the breech-bolt and which may be of any ordinary or suitable type.

The gun is initially rendered operative by means of a crank 94 secured to a squared end of the bolt 34 as by means of a screw 34^1.

The construction and operation of the various mechanisms employed in my gun will, it is thought, be understood from the foregoing description.

What I claim is—

1. In a gas-operated gun, a pressure cylinder communicatively connected with the gun barrel bore, a plunger operable within said cylinder, a by-pass having openings into the cylinder, said openings being spaced to accommodate the plunger therebetween, and an exhaust port provided in the cylinder intermediate said by-pass openings.

2. In a gas-operated gun, a pressure cylinder communicatively connected with the gun barrel bore, a plunger operable within said cylinder, a by-pass having openings into the cylinder, said openings being spaced to accommodate the plunger therebetween, an exhaust port provided in the cylinder intermediate said by-pass openings, a piston within the cylinder, and means connected with said piston for adjustably moving the same with respect to the adjacent of said by-pass openings.

3. In a gas-operated gun, a breech-bolt provided with rack teeth, a sector gear engaging therewith, locking devices for releasably securing the breech-bolt in its forward position, and a reciprocating operating bar for disengaging said locking devices from the breech-bolt and subsequently influencing said sector gear to retract the breech-bolt.

4. In a gas-operated gun, a breech-bolt provided with rack teeth, a sector-gear engaging therewith, locking devices for releasably securing the breech-bolt in its forward position, and a reciprocating operating bar connected to said devices and to said sector gear to primarily render said locking devices inoperative and subsequently afford motion to said sector gear to retract the breech-bolt.

5. In a gun, the combination of a reciprocating breech-bolt, a hammer, a main spring therefor, a spring-regulated trigger engageable with said hammer to releasably retain the latter in cocked relation, an operating bar operatively connected with said breech-bolt, means to reciprocate said bar to cock the

hammer through the instrumentality of the breech-bolt during the rearward movement of the bar and enable the trigger to engage the hammer, releasable means for coupling the trigger with said bar whereby the trigger is disengaged from the hammer by the forward movement of the bar, and means whereby said releasable means are rendered inoperable to release the trigger with respect to the hammer.

6. In a gas-operated gun, a breech-bolt having a resilient latch depending therefrom, an operating bar, operative connections between the bar and the breech-bolt, said bar being reciprocated through the power derived from the pressure of powder gas, locking devices for engaging the latch of said breech-bolt, said locking devices consisting of a lever provided with an arm having a curved extremity and a latch-receiving notch extending therein, operative connections between said lever and said operating bar whereby the lever is affected to present the notch thereof in position to receive said latch after the breech-bolt has reached the end of its forward stroke.

7. In a machine gun, the combination with the breech-bolt, a reciprocating operating bar for actuating said breech-bolt, a hammer adapted to be cocked by the breech-bolt in its rearward travel, a trigger engageable with the hammer, a hooked finger connected to said trigger, a hooked finger connected for reciprocatory travel with said operating bar whereby the first named finger is engaged and influenced to disengage the trigger from the hammer for automatic firing.

8. In a machine gun, the combination with the breech-bolt, a reciprocating operating bar for actuating said breech-bolt, a hammer adapted to be cocked by the breech-bolt in its rearward travel, a trigger engageable with the hammer, a hooked finger connected to said trigger, a hooked finger connected for reciprocatory travel with said operating bar, and means for controlling the last-named finger to render it operable or inoperable with respect to the first-named finger whereby the trigger may be selectively actuated either automatically or manually to release the hammer.

9. In a machine gun, the combination with the breech-bolt, a reciprocating operating bar for actuating said breech-bolt, a hammer adapted to be cocked by the breech-bolt in its rearward travel, a trigger engageable with the hammer, means operatively connecting said operating bar with the trigger for disengaging the trigger from the hammer during the forward movements of the operating bar, and means regulated from outside of the gun receiver whereby said means are rendered temporarily inoperable.

10. In a gun, a breech-bolt provided with rack-teeth, sector gears engaging therewith, breech-bolt locking devices including vibratory levers, reciprocating bars connecting the levers of said locking devices with the sector gears, and powder-gas operated means and manually operable means adapted to be used selectively for operating the breech-bolt and the locking devices.

Signed at Seattle, Washington, this 14th day of May, 1917.

WILLIAM R. CLARK.