A. V. P. M. BERTHIER.

AUTOMATIC FIREARM.

APPLICATION FILED SEPT. 16, 1909.

1,083,872.

Patented Jan. 6, 1914.

3 SHEETS—SHEET 1.

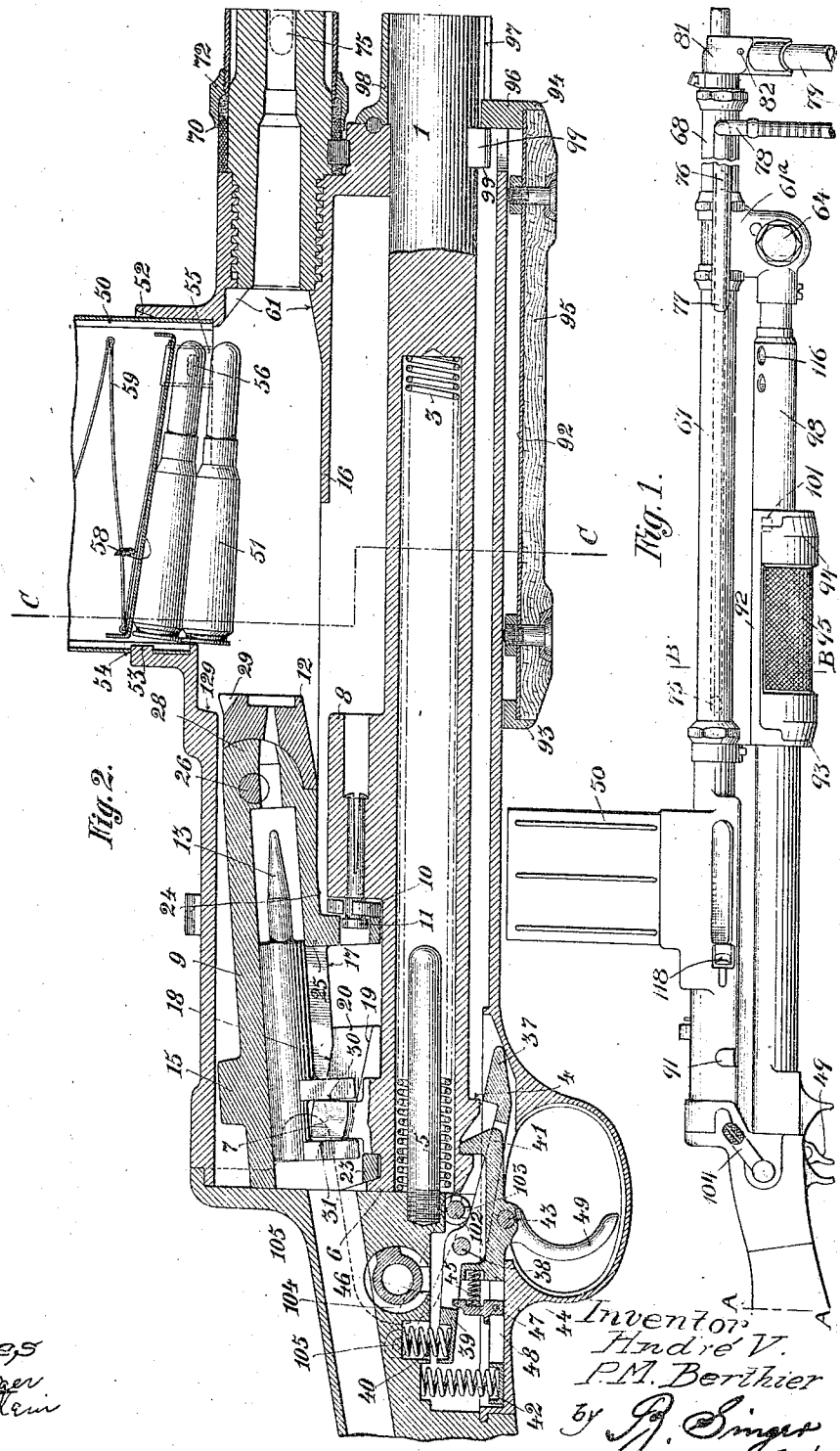


Fig. 2.

Fig. 1.

Witnesses
C. Schallinger
R. Isaak Stein

Inventor
André V.
P. M. Berthier
by J. Singer
Atty

A. V. P. M. BERTHIER.

AUTOMATIC FIREARM.

APPLICATION FILED SEPT. 16, 1909.

1,083,872.

Patented Jan. 6, 1914.

3 SHEETS—SHEET 2.

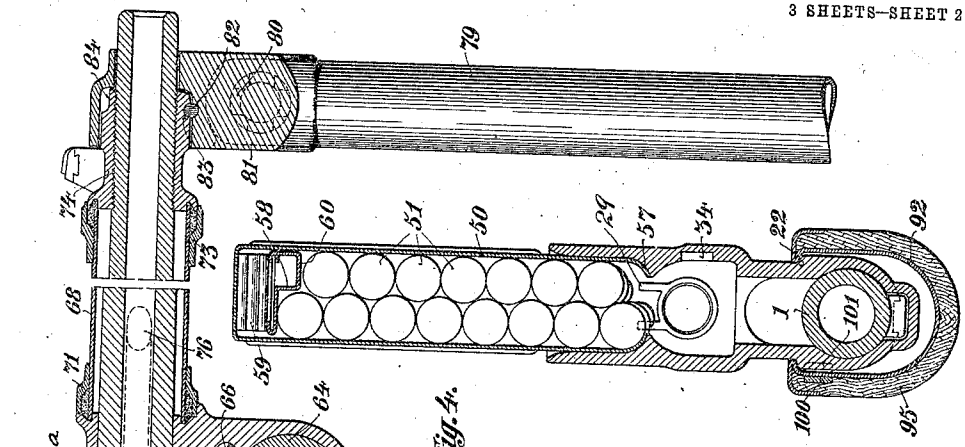


Fig. 4.

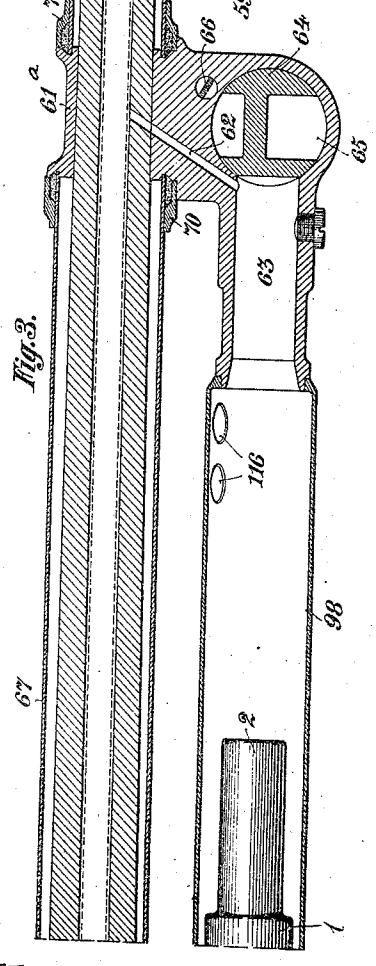


Fig. 3.

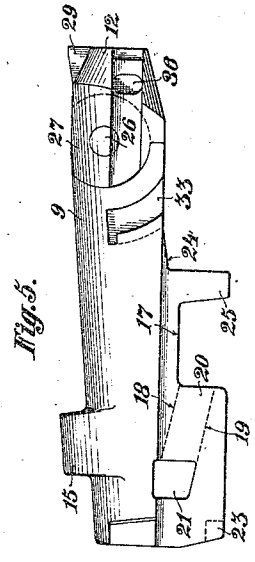


Fig. 5.

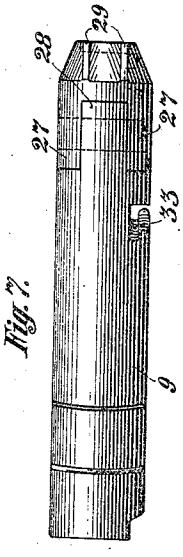


Fig. 7.



Fig. 8.

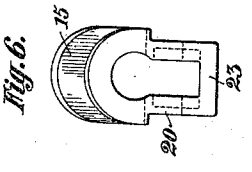


Fig. 6.

Witnesses
C. Schallinger
R. Goldstein

Inventor
André V. P. M. Berthier
by G. Singer
Atty

A. V. P. M. BERTHIER.

AUTOMATIC FIREARM.

APPLICATION FILED SEPT. 16, 1909.

1,083,872.

Patented Jan. 6, 1914.

3 SHEETS—SHEET 3

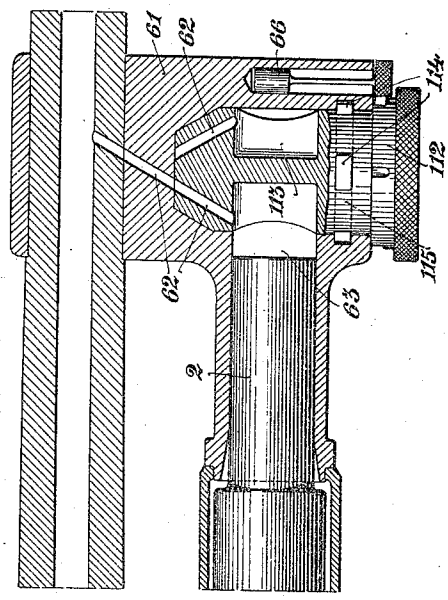


Fig. 13.

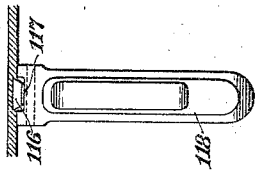


Fig. 10.

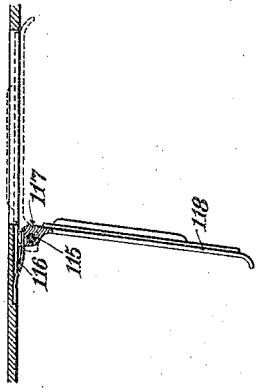


Fig. 9.

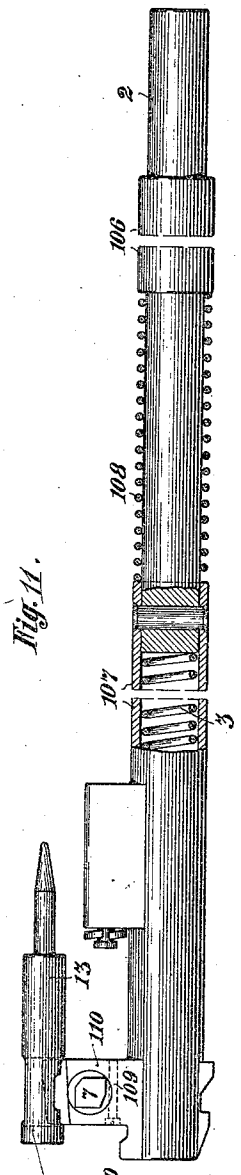


Fig. 11.

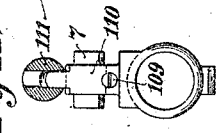


Fig. 12.

Witnesses
E. Schallinger
R. Goodstein

Inventor
André V. P. M. Berthier
by B. Singer
Atty

UNITED STATES PATENT OFFICE.

ANDRÉ VIRGILE PAUL MARIE BERTHIER, OF PARIS, FRANCE.

AUTOMATIC FIREARM.

1,083,872. Specification of Letters Patent. Patented Jan. 6, 1914.

Application filed September 18, 1909. Serial No. 518,013.

To all whom it may concern:

Be it known that I, ANDRÉ VIRGILE PAUL MARIE BERTHIER, a citizen of the Republic of France, residing at No. 90 Rue de Grenelle, Paris, France, have invented new and useful Improvements in Automatic Firearms, of which the following is a specification.

This invention relates to an automatic fire arm for purposes of war and the like. It may also be used as a single loader, wherein the power required for operating the mechanism is derived from the gases, which are set free when the shot is fired.

Referring to the accompanying drawings, Figure 1 is a side elevation of a fire arm constructed according to this invention; Fig. 2 is a longitudinal section through the part of the fire arm between the lines A A and B B (Fig. 1) and shows the whole breech mechanism and also the repeating and trigger mechanism with withdrawn cocking handle; Fig. 3 is a longitudinal section through that part between B B (Fig. 1) and the barrel end of the fire arm; Fig. 4 is a cross-section according to line C C of Fig. 2; Fig. 5, is a side elevation of the breech block. Fig. 6 is a rear-end elevation thereof. Fig. 7 is a plan view thereof. Fig. 8 is a plan view of the cartridge extractor. Fig. 9 is a sectional view of the cartridge deflector, with parts in elevation. Fig. 10 is a transverse sectional view with the deflector in elevation. Fig. 11 is a side elevation of a modified form of the piston and firing pin, with parts thereof in section. Fig. 12 is an end elevation thereof. Fig. 13 is a sectional view of a modified form of arrangement regulating the gas supply.

With regard to the general arrangement of the new fire arm, it comprises essentially the automatic operating mechanism, the breech mechanism, the trigger mechanism, the magazine, the barrel and breech casing, the cooling means, the shooting stay or support, the cocking handle and the cartridge case deflector.

The automatic mechanism includes a piston 1 (Figs. 2 and 3) made out of one piece, whose front end 2 extends into the gas chamber 63 and whose other end is provided on the lower side with the two sear notches 4 and 5 and on the upper side with a projection 6, a nipple 7 and a reinforcement or shoulder 8. The latter is adapted to receive the recoil with its forward end and to move the breech block backward with its rear end when the shot is fired. An elastic ring 10 held by a pin 11 and inserted between the reinforcement 8 and the abutment 25 of the breech block is provided for the purpose of lessening the shock between these two parts. The parts 6 and 7 serve for carrying, closing and opening the breech mechanism and also for operating the firing pin, as will be described later on. The driving spring 3 is provided within the piston 1.

The breech mechanism comprises the following parts: the breech block 9, the bolt head 12, the connecting pin 26, the striking pin 13, the cartridge extractor 14, the projection 6 and the nipple 7. The two last-named parts effect the closing movement of the breech bolt. The breech block 9 is provided on its upper rear part with the nipple 15. Guide plane surfaces 17 (Figs. 2–5) are provided on the lower part of the breech block and symmetrically to its axis. These guide surfaces begin at the forward part and extend only for a certain distance parallel to the axis of the breech bolt, then they undergo at 18—18 an inclination, which corresponds to a certain elevation of the breech bolt. These inclined guide surfaces 18—18 are so connected to two other guide surfaces 19—19 by means of side pieces 20—20 that they are held in position and are integral with the breech bolt. At the end of these guide surfaces is a transverse slot 21, whose length and height is somewhat larger than the distance between said surfaces, said slot being adapted to receive the T shaped head of the nipple 7. At the rear lower part, a stud 23 unites both lower inclined surfaces 19—19, said stud also serving as an abutment for the projection 6 of the piston. A small inclined guide plane 24 on the front lower part in front of the nipple 25 releases, at a predetermined time, the T of the nipple from its seat.

The bolt head 12 (Figs. 2 and 5) is connected to the breech block by the pin 26 (Fig. 2) and is guided laterally through the two cheeks 27—27, which embrace the front abutment 28 of the breech bolt. The bolt head moves in a corresponding guide on the casing and does not take part in the ascending movement of the breech block.

The front face of the bolt head remains always parallel to the rear end of the barrel, which is necessary for insuring engagement and extraction of the cartridge. The front part of the bolt head is conical and has two projections 29—29 adapted to advance the cartridges. The firing pin 13 is moved forward by the nipple 7 by means of its forward face 30, for the firing, and rearwardly by means of the rear face 31.

The cartridge extractor 14 is mounted on the breech block by means of a pin 32 which engages in a curved recess 33 in such a manner that the breech block can ascend and descend independently of the cartridge extractor, which is guided during its entire course in a longitudinal groove 34 of the breech casing (Fig. 4). The extractor 14 cannot move in a vertical direction. There is provided under the tail of the cartridge extractor 14 a shoulder terminating in a feather edge and which, when the parts are assembled, bears against a similar edge on the breech block. In the event of a cartridge case resisting the extraction, the breech block moves alone to such an extent rearwardly as the play allows which the cartridge extractor has for passing over the cartridge edge when the breech block is being closed. At this moment, the shoulder rises to the edge, whereby the tension of the cartridge extractor is increased and also its power. It must be stated that the cartridge extractor yields at its rear end for enabling it to pass over the edge of the cartridge and that when withdrawing the cartridge case, a reinforcement 35 close to the projection of the cartridge extractor takes up the pull, while in former cartridge extractors, the same part which provided for the pull also served as spring. The reinforcement 35 is supported in a recess 36 (Fig. 5) in the right side of the breech block.

The trigger mechanism consists of a recessed sear 37, which oscillates on the pin 38 and whose rear arm is provided with a plate 39, in which is mounted one end of a spiral spring 40. This sear engages in the sear notch 4 of the piston 1 in the case of individual firing. The second sear 41 carries on its rear arm a spiral spring 42 and has a reinforcement 44 between this spring and the axis 43 of the sear 41. There engages in the said reinforcement a small spring 45, the hook 46 oscillating on the axis 47. The shoulder 48 of this hook limits its position with respect to the sear 41. This second sear serves for automatic firing, the hook 46 and its spring acting on the first sear 37 in the case of individual firing. A trigger (fingerpiece) 49, which is integral with the sear 41, operates the trigger mechanism in the hereinafter described manner.

The magazine 50 (Figs. 2 and 4) contains a number of cartridges 51 which are arranged in a zigzag position. The magazine is inserted from above into its bearing sleeve 52 in the gun and locked by a projection 53 engaging in the slot 54 of the magazine. In order to secure the magazine, there are provided besides the slot 54 two tongues 55 in the side faces. Each tongue has a boss, which bears in a corresponding recess 56 of the sleeve 52. Only one of such tongues may be employed at the front. Two lateral lips 57 (Fig. 4) between which the projections 29 of the bolt head extend insert the cartridge into the chamber. An angularly bent metal plate 58, as shown in Fig. 4, is adapted to press downward the cartridges under the action of a fanshaped bent flat spring 59. The plate 58 is so bent that a projection 60 is formed, whereby the cartridges receive their zigzag arrangement.

With regard to the barrel and breech casing, there is provided between the bearing sleeve 52 of the magazine and the rear end of the barrel, the guiding cone 61, which forms an integral part of the breech casing. This cone has for its object to guide the projectile when it enters the barrel chamber. At the rear end of this cone and in the lower part of the breech cylinder bearing, there is a guide piece 16, which also forms an integral part of the breech casing and causes the breech block 9 to rise when during its forward movement, it moves with the inclined plane 24 on to the breech casing, as hereinafter explained.

The breech casing is of such a shape (Fig. 4) that it permits the sliding of the cocking handle on the guides 22. The barrel carries on a suitable part a block 61^a; this block, which may be secured to the barrel, or be integral therewith, has a passage 62 which extending through the barrel wall establishes the communication of the interior chamber of the barrel with the gas chamber 63 in which the end 2 (Fig. 13) of the piston 1 engages. The quantity of gas in the chamber 63 may be regulated by a cylinder 64 rotating horizontally in the piece 61^a. On the periphery of the cylinder 64, there are recesses (chambers) 65 of different sizes, which are adapted to regulate the quantity of gas in the chamber 63. A bolt with elastic arm 66 having a projection entering a correspondingly shaped recess in the periphery of the cylinder 64 permits the latter to be locked in position.

The arrangement of the cooling means is based on the combination of a thin tube surrounding the barrel and a water receptacle, which may eventually form an integral part of the fire arm and if required, supply the tube with cooling water. This method has the advantage that the cooler need only be of small proportions and that the barrel may at any time be cooled down to a temperature suitable for shooting pur-

poses. As the evaporation of the water is complete after each injection, the fire arm is always free from water, whereby the handling of the fire arm is not inconvenienced.

The cooler is formed of one or two steel tubes 67—68 (Figs. 2 and 3) according as the piece 61ª is in the middle or at the end of the barrel. The steel tubes are either smooth or provided with transverse flutings in order to permit the linear expansion due to heating. The tubes are secured by means of rings or with stuffing box joints and screws between conical recesses in the breech casing. The piece 61ª and the sight-ring 74 also form a part of the cooling means. The cooling tubes are held by nuts 72—73, which secure an asbestos or other packing. The sight-ring 74 is screwed on to the barrel. This mode of connection permits the cooling means to be taken to pieces for the purpose of examining or replacing parts thereof. On the left side of the cooling means, there are two tubes 75—76 (Figs. 1, 2, 3) which are united at one point accessible to the hand of the rifleman or the second operator, who has to connect the stationary or portable water receptacle with the cooling means. On the right side of the cooler, there are two other tubes 77—78 (Fig. 1) which are likewise connected with a flexible tube leading to the ground and through which the steam escapes that is produced for cooling the barrel. If only one cooler is employed, there need only be one supply tube and one discharging tube. The discharging tube may also be connected with one of the legs of the hereinafter described shooting stay.

The handle adapted to cock and carry the fire arm in the hand consists of a cap 92 of steel plate (Fig. 2), which is provided at both ends with projections 93—94, between which the wooden handle 95 (Figs. 2–4) is secured. The latter extends laterally up into the bends of the cap 92. The projection 93 bears against the breech casing. The projection 94 has a nose 96 which slides in a slot 97 of the guide tube 98. The nose 96 acts on the nose 99 of the piston.

In the position of rest, the cocking handle is secured by a spring 100 inserted between the cap 92 (Fig. 4) and the wooden handle, the hook of such spring engaging in a recess 101 in the guide tube of the piston. It can be removed out of this position merely by a pull of the handle.

The deflector 118 has for its object to direct downwardly the ejected cartridge cases in front of the rifleman at an angle of 45°. The deflector oscillates on an axis 115 (Figs. 11 and 12) and is held in the open and closed position by a spring 116 which is secured to the breech casing. This spring may act on planes 117 or in recesses contained in the rounded edge of the deflector. In the position of rest, the deflector closes the ejector opening and protects the mechanism against the penetration of dust.

The operation of the fire arm is as follows: If, for example, the fire arm is adjusted for individual firing, a pressure of the finger on the trigger 49 causes the latter to turn on the axis 43. The hook 46 lifts the plate 39 to such an extent that the sear 37 is lowered below the sear notch 4 of the piston which is released from sear 37. The piston 1 moves forward under the action of its spring 3 until the sear notch 5 enters into engagement with the sear 41 which is not yet released from the piston 1. On continuing the pressure of the finger on the finger-piece, the hook 46 is released from the plate 39 of the sear 37; the sear 37 tends under the action of its spring 40 to return to its original position and is therefore prepared to drop into the sear notch 4 of the piston when it returns to its initial position. On the sear 41 continuing its movement, it is finally released from the notch 5 of the piston, which is now driven forward by its spring 3. By means of the projection 6 and the nipple 7, the piston carries the breech block in a rectilinear movement until the inclined plane 24 reaches the stationary part 16 and lifts the rear part of the breech block which oscillates on the pin 26. The rear part of the breech block will then be released from the projection 6 and the nipple 7 passes out of the notch 21. During the rectilinear movement of the breech block, the bolt head passes on to the bottom cartridge in the magazine and pushes it forward, whereupon the projectile enters the cone and then the cartridge chamber. The cartridge extractor 14 engages over the edge of the cartridge. The breech block is now closed behind the cartridge. At this moment, the nipple 7, which continues the rectilinear movement and carries the striking pin, passes on to the inclined planes 18 of the breech block, compels the latter to rise and its nipple 15 enters the groove 129. On the piston continuing its forward movement under the breech bolt, it carries the firing pin and finally effects the firing of the shot. A part of the explosive gases pass through the passage 62 into the gas chamber 63 and acts on the end 2 of the piston, which is thus driven rearward and performs the above-described movements in reverse order of succession. The cartridge extractor pulls back the case until the same comes in contact with the ejector, which ejects it. The next cartridge now passes out of the magazine downwardly and comes in front of the bolt head. At this moment, the return movement of the piston terminates, the gases escape through the openings 116 in the guide tube of the piston and the notch 4 again enters into engagement with the sear 37. The

action of the finger on the trigger is completed and the sear 41 returns to its position under the action of the spring 42. On the plate 39 coming in contact with the hook 46, the latter deviates while compressing its spring 45 and reassuming its position of engagement under the plate 39 when the sear 41 has returned to its original position. A second pressure on the trigger causes a second shot etc. The repeating key 102 mounted on the gun and having two abutments 103 may be operated outwardly from the left by an arm 104 which has a boss for engaging in the recesses 105 in order to secure the key in position.

For the purpose of automatic shooting, the key 102 is placed in the position as indicated in Fig. 2, in which position one of the shoulders 103 acts on the sear 37, depressing the same and releasing it from the notch 4 of the piston, which however is secured by the notch 5. On exerting a constant pressure on the trigger 49, the above-described movements of the mechanism will be repeated as often as cartridges are contained in the magazine. When the last cartridge case is ejected, the mechanism closes again, the pressure of the finger on the trigger ceases and the mechanism is cocked again by the cocking handle. The possibility is obvious from the described arrangement of the trigger mechanism to cock the breech mechanism no matter whether the repeating key is adjusted for individual or automatic firing.

Fig. 11 and the following figures are diagrammatic views of modifications.

Fig. 11 shows a modification of the already described piston. It has for its object to lessen the shock on the nipple 25 and to effect slow firing in that a larger interval is provided for between the shot and the commencement of the opening of the breech bolt; the piston consists of two parts 106—107, which slide one within the other and between which a spring 108 is interposed. This spring takes up the energy of the gas imparted to the head 2 of the piston and delivers it to the part 107 when the gas pressure on the breech bolt has ceased. The intermediate spring may also be dispensed with and the retardation be taken from the front part of the piston by pressure on the driving spring 3, said piston sliding in the rear part. The nipple 7 may be quite independent of the piston. In this case, the nipple is fixed or wedged by a screw or a pin 109 in an abutment 110. which is tapered above in order to engage in a corresponding recess 111 of the firing pin 13. This abutment 110 forms an integral part of the piston and is sufficiently high to bring the shock of the percussion close to the axis of the firing pin. In the latter is the recess 111 in which the abutment 110 engages. The two cheeks are thus superfluous.

Fig. 13 represents a device for varying the capacity of the gas chamber. It consists of a vertical rotatable drum 112 containing recesses 113 of various sizes, so that by suitably adjusting the drum the capacity of the gas chamber 63 can be increased or decreased and the action of the gas on the recoil piston adapted to the charge of the cartridges in use for the time being. The drum 112 is secured in the block 61 by lugs 114 of a varying size but of equal thickness, which are adapted to rotate in a circular recess 115. The drum will thus be held in position until it assumes its accurate leading in position. The drum is held in its adopted operative position by a pin similar to that described. The gas is admitted to the chamber through the passages 62.

I claim:—

1. An automatic fire-arm comprising a barrel, a receiver, a breech block slidably mounted in said receiver and provided with a transverse slot and inclined surfaces forming a notch, a recoil piston having a nipple engaging said slot, an inclined guide surface on the lower end of the breech block, and means coöperating with said guide surface for releasing the nipple from the slot, substantially as set forth.

2. An automatic fire-arm, comprising a barrel, a receiver, a breech block slidably mounted in the receiver and provided with a transverse slot and inclined surfaces on the lower end of the breech block forming a notch, an inclined guide surface on the lower end of the breech block, and a guide piece extending rearwardly from the forward end of the receiver and adapted to engage said guide surface and cause the breech block to swing vertically upward, substantially as set forth.

3. An automatic fire-arm, comprising a barrel, a receiver, a breech block slidably mounted in said receiver, a gas tube mounted beneath said barrel and adapted to receive gas therefrom, a piston reciprocably mounted in said gas tube and provided with trigger rests, connections between said piston and said breech block, an operating sear adapted to engage one of said trigger rests, an actuated sear actuated by said operating sear and adapted to engage a second trigger rest, means carried by the operating sear and adapted to engage and actuate the actuated sear, and means for operating said operating sear, substantially as set forth.

4. An automatic fire-arm, comprising a barrel, a receiver, a breech block slidably mounted in the receiver, a gas tube mounted beneath said barrel and adapted to receive gas therefrom, a piston reciprocably mounted in said gas tube and provided with trigger rests, connections between said piston

and said breech block, an operating sear adapted to engage one of said trigger rests, an actuated sear actuated by said operating sear and adapted to engage a second trigger rest, means carried by said operating sear and adapted to engage and actuate said actuated sear, means for operating said operating sear, and means for holding the actuated sear in inoperative position, substantially as set forth.

5. An automatic fire-arm, comprising a barrel, a receiver, a breech block, slidably mounted in said receiver, a gas tube mounted beneath said barrel and adapted to receive gas therefrom, a piston reciprocably mounted in said gas tube and provided with trigger rests, connections between said piston and said breech block, an operating sear adapted to engage one of said trigger rests, an actuated sear actuated by the operating sear and adapted to engage a second trigger rest, means carried by said operating sear and adapted to engage and actuate the actuated sear, means for holding the actuated sear in inoperative position, and means for securing said holding means in operative position, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDRÉ VIRGILE PAUL MARIE BERTHIER.

Witnesses:

H. C. Coxe,

Jack H. Baker