M. G. FARQUHAR & A. H. HILL.

AUTOMATIC FIREARM.

APPLICATION FILED APR. 15, 1911.

1,019,620.

Patented Mar. 5, 1912.

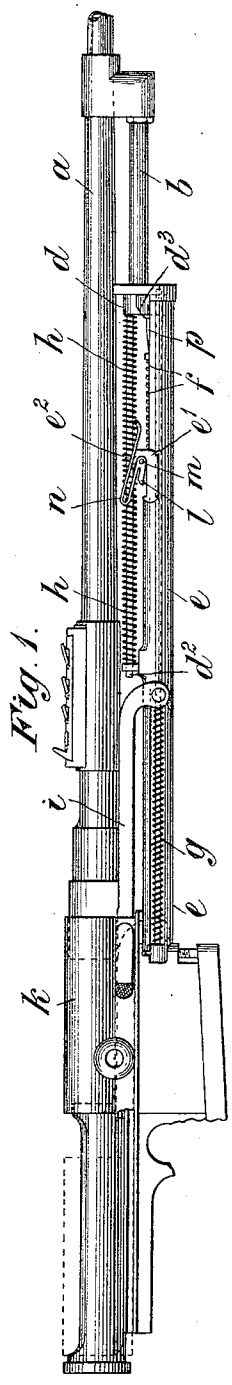

Fig. 1.

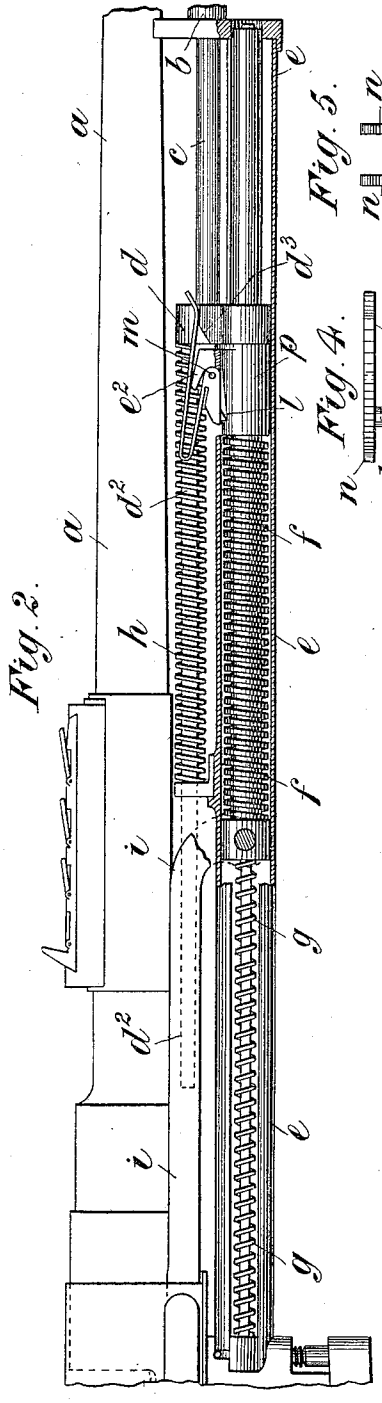

Fig. 2.

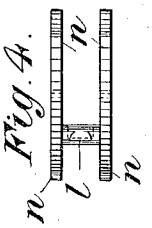

Fig. 4.

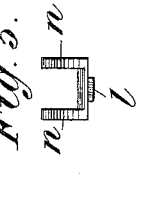

Fig. 5.

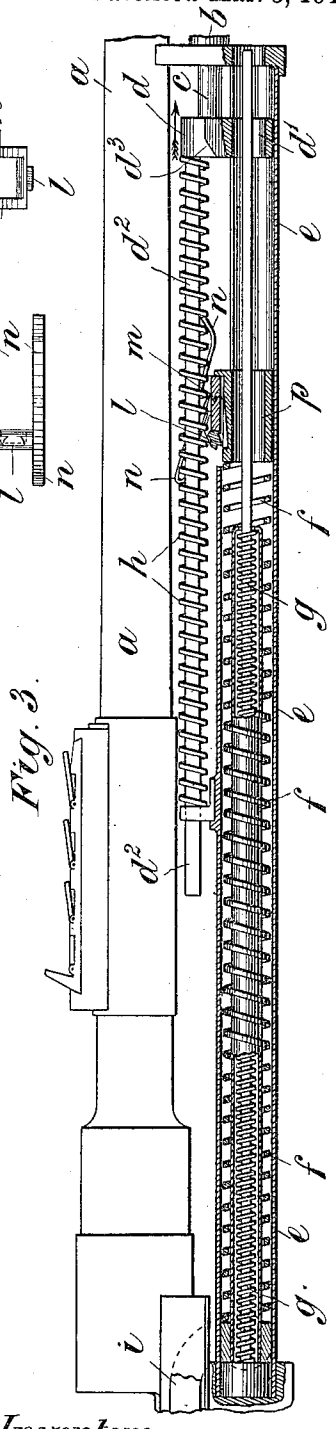

Fig. 3.

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UNITED STATES PATENT OFFICE

MOUBRAY GORE FARQUHAR AND ARTHUR HENRY HILL, OF BIRMINGHAM, ENGLAND.

AUTOMATIC FIREARM.

1,019,620. Specification of Letters Patent. **Patented Mar. 5, 1912.**

Application filed April 15, 1911. Serial No. 621,338.

To all whom it may concern:

Be it known that we, MOUBRAY GORE FARQUHAR and ARTHUR HENRY HILL, subjects of the King of Great Britain, and respectively residing at No. 255 Monument road, Edgbaston, Birmingham, and No. 16 Loveday street, Birmingham, Warwickshire, England, have invented certain new and useful Improvements in Automatic Firearms, of which the following is a specification.

Our invention relates to automatic fire arms of the kind described, represented and claimed in the specification of Letters Patent No. 920301 dated May 4th 1909 granted to us and consists of the improvements hereinafter described in the said automatic fire arms whereby the mechanism of the same is simplified.

In order that the present invention may be the better understood we remark that the essential feature of the mechanism of the patented fire arm hereinbefore referred to is the employment of three springs which are successively put into a state of compression on the firing of the gun, one of the said springs returning the recoil moved barrel into its normal or firing position, or in the case of a fire arm with a fixed or stationary barrel returning a piston into its normal position in a cylinder adjacent to the barrel, another and preferably much stronger spring effecting at the required time the opening of the breech chamber of the fire arm and ejecting the spent cartridge case, and the third spring effecting the return of the sliding bolt into its breech closing position and the reloading of the barrel with a cartridge taken from the magazine. The strong spring for opening the breech is retained in a state of compression by a pair of catches, pawls or dogs, one being situated to the rear of the other, the rearward catch, pawl or dog retaining a sleeve or collar forming the abutment for the rear end of the said breech opening spring until the recoil operated barrel, or piston, has returned under the action of its spring to its normal position when the rearward catch, pawl or dog is disengaged from the sleeve or collar and the breech opening spring expanding rearwardly effects the unfastening of the breech bolt and the opening of the breech chamber.

By the present invention we dispense with the rearward catch, pawl or dog referred to and avail ourselves of the gas pressure within the barrel on the firing of the gun to retain the lugs of the sliding bolt securely locked in the grooves or ways in the breech end of the shoe or barrel until the forces tending to resist the extraction of the spent cartridge from the breech chamber fall below that of the compressed breech opening spring when the unfastening of the bolt and opening of the breech automatically take place under the action of the expanding breech opening spring which has an abutment at the front end against the catch, pawl or dog engaged therewith. We may also dispense with the two small coiled springs used in connection with the forward catch, pawl or dog of the previously patented fire arm hereinbefore referred to, and which constitutes the single catch, pawl or dog of the improved fire arm hereinbefore described and substitute therefor a plate spring or pair of plate springs.

Figure 1 of the accompanying drawing represents in side elevation so much of the patented automatic fire arm (with fixed or stationary barrel) hereinbefore referred to, as is necessary for the illustration of our present invention which is applied to the said patented fire arm. Figs. 2 and 3 represent partly in side elevation and partly in longitudinal section a portion of the automatic fire arm drawn to a larger scale than Fig. 1, Fig. 2 illustrating the breech opening spring in compression and Fig. 3 illustrating the same after the opening of the breech by the expansion of the said breech opening spring. Figs. 4 and 5 illustrate in plan and end elevation respectively the single catch, pawl or dog and pair of plate springs formed integral therewith which we prefer to employ for temporarily holding the forward end of the breech opening spring after compression.

The same letters of reference indicate the same parts in the several figures of the drawing.

a is the fixed or stationary barrel of the fire arm having thereunder the cylinder *b* in which is arranged a piston, the rod *c* of which (see Figs. 2 and 3) is connected at its rear end to the crosshead *d* the lower part of which has in it an eye d^1 and works in the forward slotted part of the tubular casing *e* in which the breech opening spring *f* and breech closing spring *g* are arranged and work. The breech opening spring *f*

employed under the present improvements is of such a strength that at the time of full compression its force is not equal to that of the gaseous pressure which is holding the case of the spent cartridge within the breech chamber, hence the action of the compressed breech opening spring f is delayed. The upper part of the crosshead d is connected to the rod d^2 on which the spring h for returning the crosshead d and piston c to their normal position is arranged.

The breech opening spring f and breech closing spring g and rod or arm i connecting the breech opening spring f with the sliding breech bolt k differ in no essential respect from the corresponding parts in the previously patented fire arm hereinbefore referred to except that the spring catch for the rear end of the breech opening spring is dispensed with.

The single catch l employed which is jointed to a pin m passing through a hole in a projection e^1 on the casing e has preferably formed integral therewith a pair of plate springs n, n which normally bear on the downwardly inclined edges of side cheeks e^2, e^2 on the projection e^1 and thereby preserve the catch in its normal or raised position seen in Figs. 1 and 3.

When the piston c is forced rearwardly by the passage of gas from the barrel a into the cylinder b when the bullet or projectile has passed the communicating hole between the barrel and cylinder side inclines or shoulders d^3 on the crosshead d pass under the upwardly curved ends of the plate springs n, n and thereby effect the tilting of the catch l into the position for engaging with the tubular sleeve or bush p constituting the abutment for the front end of the compressed breech opening spring f as is seen in Fig. 2. The expansion in a backward direction of the spring f which effects the backward sliding motion of the breech bolt k and the putting into a state of compression of the spring g will not take place until the gaseous pressure within the breech chamber which is holding the case of the spent cartridge firmly therein falls below that of the spring f acting through the arm or rod i on the sliding breech bolt k. As soon as the gaseous pressure within the barrel a and cylinder falls below that of the spring h the crosshead d and piston c commence their forward or return motion indicated by the arrow in Fig. 3 and when the breech opening spring f is fully extended and the shoulders d^3 have passed by the forward motion of the crosshead from under the plate springs n, n the catch is lifted and the breech opening spring commences its return or forward sliding motion under the pressure of the compressed breech closing spring g.

It will be understood that on the discharge of the fire arm the compression in succession of the three springs h, f, g and their expansion in succession follow so rapidly one on the other that the positions of the parts with respect to each other represented in Fig. 3 are assumed and may not be strictly accurate.

Although we have only represented our present improvements in combination with an automatic fire arm having a fixed or stationary barrel we wish it to be understood that our improvements are equally applicable to a fire arm having a sliding barrel. We further wish it to be understood that in the case of fire arms having fixed or stationary barrels we may dispense with the spring which returns the piston of the cylinder adjacent to the barrel to its normal position and the rod occupying the axis of the said spring, which rod operating the catch, pawl or dog, is rendered unnecessary by the first described improvement of the present invention.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In an automatic fire arm, the combination, with a barrel, and a breech block cooperative therewith; of a breech-opening spring having means for compressing it preparatory to the opening of the breech block, said spring having a strength less than the force initially acting to resist opening of the breech block, whereby a delayed opening of said breech block is insured; a second spring adapted to be compressed by said compressing means; holding means adapted to engage one end of the breech-opening spring when compressed; means for disengaging said holding means; and a spring compressed by the expansion of said breech-opening spring for returning that spring to normal position and for closing the breech block.

2. In an automatic fire arm, the combination, with a barrel, and a breech block cooperative therewith; of a breech-opening spring; a gas-operated plunger for compressing the spring preparatory to the opening of the breech block, said spring when under compression having a strength less than the force initially acting to resist opening of the breech block, whereby a delayed opening of said breech block is insured; a second spring adapted to be compressed by said plunger for returning the latter to its normal position; a catch associated with one end of the breech-opening spring when compressed; means for disengaging said catch during the return movement of the plunger; and a spring compressed by the expansion of said breech-opening spring for returning that spring to normal position and for closing the breech block.

3. In an automatic fire arm, the combination, with a barrel, and a breech block cooperative therewith; of a breech-opening spring provided at its forward end with an abutment; a gas-operated plunger for compressing the spring preparatory to the opening of the breech block, said spring when under compression having a strength less than the force initially acting to resist opening of the breech block, whereby a delayed opening of said breech block is insured; a second spring adapted to be compressed by said plunger for returning the latter to normal position; a pivoted catch for engaging said abutment when the breech-opening spring is compressed, said catch being formed with a pair of controlling plate springs; means adapted for coaction with said plate springs, to disengage said catch during the return movement of the plunger; and a spring compressed by the expansion of said breech-opening spring for returning that spring to normal position and for closing the breech block.

4. In an automatic fire arm, the combination of a barrel, a breech block coöperative therewith, a breech-opening spring provided at its forward end with an abutment, means associated with said spring for compressing the same preparatory to the opening of the breech block, and a pivoted catch for engaging said abutment, said catch having resilient controlling means formed integral therewith.

5. In an automatic fire arm, the combination of a barrel, a breech block coöperative therewith, a breech-opening spring provided at its forward end with an abutment, means associated with said spring for compressing the same preparatory to the opening of the breech block, and a pivoted catch for engaging said abutment, said catch having a pair of controlling plate springs formed integral therewith.

6. In an automatic fire arm, the combination of a barrel, a breech block coöperative therewith, a breech-opening spring provided at its forward end with an abutment, means associated with said spring for compressing the same preparatory to the opening of the breech block, and a pivoted catch for engaging said abutment, said spring when under compression having a strength less than the force initially acting to resist the opening of the breech block, whereby a delayed opening of the breech is insured.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

MOUBRAY GORE FARQUHAR.
ARTHUR HENRY HILL.

Witnesses:
ARTHUR J. POWELL,
WILLIAM J. BOWKER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."