H. W. GABBETT-FAIRFAX.

AUTOMATIC FIREARM.

APPLICATION FILED APR. 22, 1920.

1,346,012.

Patented July 6, 1920.

2 SHEETS—SHEET 1.

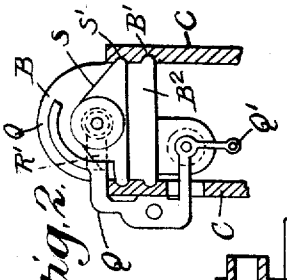


Fig. 2.

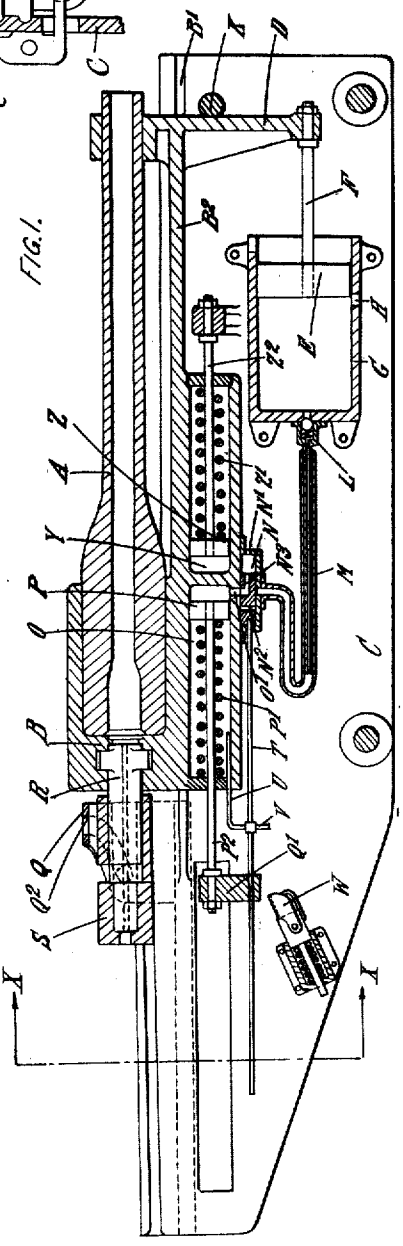


FIG. 1.

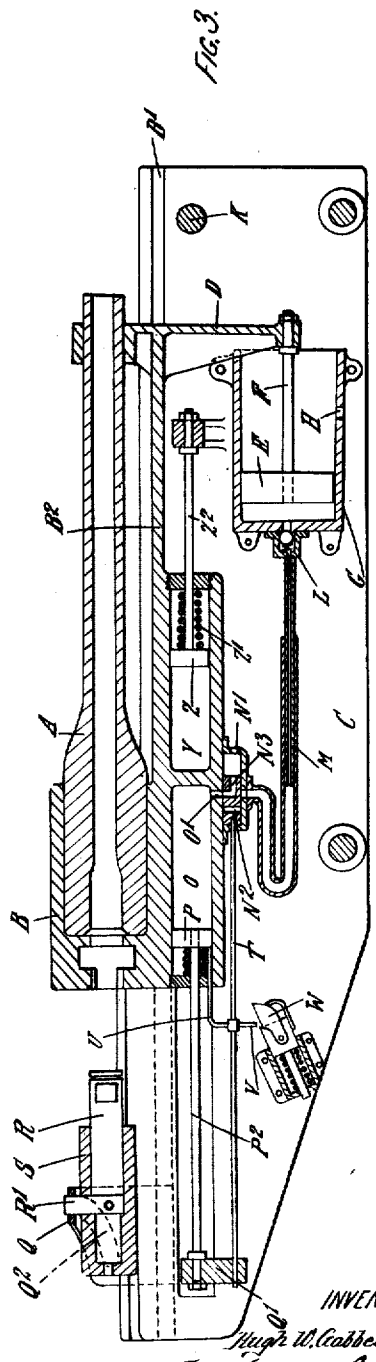


FIG. 3.

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2 SHEETS—SHEET 2.

FIG. 4.

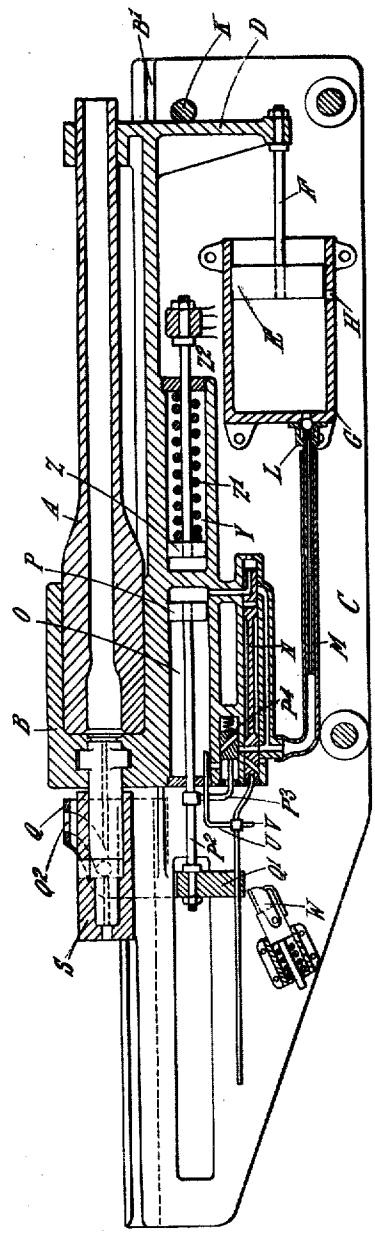


FIG. 7.

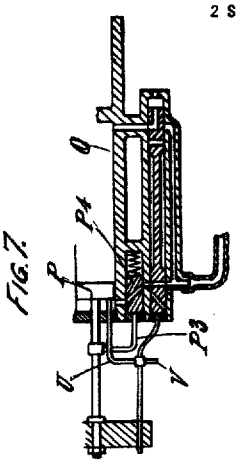


FIG. 6.

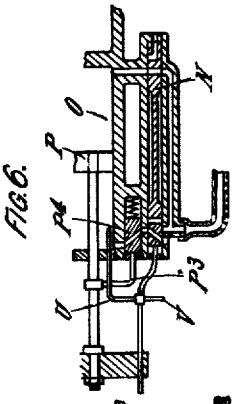
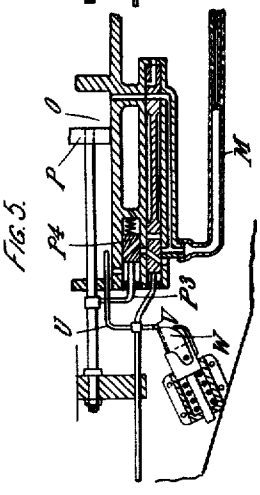


FIG. 5.



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AUTOMATIC FIREARM.

1,346,012. Specification of Letters Patent. Patented July 6, 1920.

Application filed April 22, 1920. Serial No. 375,824.

To all whom it may concern:

Be it known that I, HUGH WILLIAM GABBETT-FAIRFAX, a subject of the King of Great Britain, residing at London, England, have invented new and useful Improvements in Automatic Firearms, of which the following is a specification.

This invention relates to automatic or semi-automatic firearms in general (whether machine guns or small arms) of the kind in which the firearm is operated by the shock of recoil and in which the breech, barrel, and breech-closing mechanism recoil while firmly locked together, and provides means for uncoupling the breech mechanism from the breech at any desired point in the recoil of the latter, after which the breech is opened and the empty cartridge case is ejected in the usual manner and the barrel and breech return to their forward position of rest.

Hitherto the practice in the design of recoil-operated firearms has been that the mechanism for maintaining the cartridge in place in the breech has been liberated by one of two methods; either the mechanism for maintaining the cartridge in place in the breech has been liberated at an early stage in the recoil of the breech, the breech being checked while the bolt or breech-closing mechanism has still sufficient rearward velocity to unlock the breech, withdraw the cartridge case from the chamber and compress a spring for returning the mechanism and closing the breech, and in this case the limited recoil available has led to unlocking of the breech and extraction of the cartridge case while there was still considerable pressure in the chamber with attendant troubles due to torn cartridge cases and faulty extraction; or the breech has been allowed to recoil to its full limit after which the breech closing mechanism has been liberated and held back while allowing the breech to return to its position of rest, the breech-closing mechanism being subsequently carried forward and again connected with the breech. In this case the long travel of the breech causes loss of time between successive shots and considerably decreases the possible rate of fire of the weapon.

It is the object of the present invention to provide means for allowing sufficient time to elapse between the firing of the weapon and the unlocking of the breech without using a longer recoil than is actually necessary. For this purpose I attach to the barrel, breech, or sliding carriage connected thereto, a piston so arranged that the effort of recoil will compress a volume of air in a cylinder from which, at any desired point in the recoil, a quantity of compressed air is taken sufficient to uncouple the breech mechanism from the barrel and to force the said mechanism to the desired length of its travel and to return the barrel to its position of rest. The compressed air may also be made to compress springs for returning the barrel and breech mechanism at any desired point. Also, if the energy of recoil be sufficient, the compressed air may be made to return the breech mechanism, and reload, close and lock the breech.

The accompanying drawings show two methods of applying the above principles to a machine gun, and it is evident that a similar method of operation may be applied to any other automatic or semi-automatic firearm operated by means of a recoiling breech.

Figure 1 is a longitudinal section showing one method of applying my invention to a firearm of the kind in which the breech and barrel recoil while firmly locked together as already described. The breech in this arrangement is opened by compressed air and closed by a return spring. It is shown closed in the drawing.

Fig. 2 is a transverse section taken on X—X (Fig. 1) showing one method of arranging the breech-closing mechanism shown in Fig 1.

Fig. 3 is a longitudinal section showing the same firearm as in Fig. 1 but with the breech open.

Fig. 4 illustrates in longitudinal section a modified arrangement in which the breech is both opened and closed by compressed air.

Figs. 5, 6 and 7 show various positions of the valves employed in the arrangement shown in Fig. 4 for a purpose hereinafter described.

Referring to Figs. 1, 2 and 3, the barrel A is carried in, or is integral with a breech B which may be integral with, or attached to a carriage B^2 sliding in guides B′ in the main framing C. The said carriage B^2 carries at its forward end a bracket D which

may be integral with or attached to the carriage. A piston E working in a fixed cylinder G is attached by the rod F to the bracket D and therefore moves with the breech and barrel. The cylinder G is open to the atmosphere by a port H in the side of the cylinder when the barrel is in its forward position (see Fig. 1) but is closed as soon as recoil begins.

The barrel is registered in its forward position by a stop K which may be a fixed stop as shown, or any suitable form of hydraulic, pneumatic or spring buffer.

The air compressed by the piston E passes through a non-return valve L into a tube M which is arranged with a sliding joint. Said tube M communicates through a valve N with a cylinder O which is preferably integral with, or attached to, the carriage B^2 but can be attached to the framework of the gun if suitable modifications are made in the connection M and valve N. The said valve N may be a sliding valve as shown or of any other suitable type which will perform the same functions.

A piston P works in the cylinder O and is normally held in its forward position by a spring P′ and said piston is attached by a rod P^2 to an arm Q′ formed on, or attached to a known form of cam plate Q which serves to unlock the breech bolt.

The bolt R is preferably carried in a sleeve S which slides in guides S′ formed in, or on, the main framing C, and a radial arm R′ rigidly attached to the bolt R works in a slot Q^2 formed in the cam plate Q. The bolt R can rotate in the sleeve S but has no motion of translation relative to it.

When the cam plate Q is drawn back relatively to the sleeve S the bolt R is rotated and the breech is unlocked, and when the cam plate Q is drawn forward relatively to the sleeve S the bolt is rotated, locking said bolt into the breech. The cam plate Q slides in guides formed in or on or attached to the main framing C or the sleeve S.

The valve N is operated by means of a rod T which is attached to said valve, and slides in a bearing formed in the cam plate arm Q′ as shown, or in the main framing. Said rod T has two arms U and V attached to it; the arm U projects into the cylinder O and is pushed backward by the piston P when said piston reaches the end of its backward stroke, and the arm V is arranged to come into contact with a spring stop W for the purpose of actuating the valve N at any desired point in the recoil.

A cylinder Y is formed in the breech carriage B^2 and a piston Z works in it. Said piston Z is connected by a rod Z^2 to the framework of the gun and has a return spring Z′ introduced between it and the forward end of the cylinder.

If preferred, the piston may be attached to the breech carriage and may work in a fixed cylinder attached to the framework of the gun. The functioning is as follows:—

When a shot is fired, the barrel A and breech B with the bolt R securely locked into it, recoil, and the piston E is driven back compressing the air in the cylinder G and forcing the compressed air through the non-return valve L into the tube M. The recoil also compresses the spring Z′ and this spring serves to return the barrel to its forward position.

During the first part of the recoil, the valve N is set so that the cylinder O is open to the atmosphere through ports O′ and N^3 and opening N′, as shown in Fig. 1, and is not in communication with the tube M. The breech therefore remains locked.

When the arm V engages with a stop W the valve N is momentarily checked, while the cylinder O continues to recoil, thus closing the cylinder to atmosphere and connecting it with the tube M through a port N^2. Further recoil of the cylinder O causes the arm V to push the stop W backward and downward against the action of its spring, and after a short backward movement the arm V becomes disengaged from the stop W and rides over it.

The compressed air in front of the piston P drives the piston back relatively to the breech-compressing spring P′ and also drives back the cam plate Q which first rotates and unlocks the bolt R and then retracts it, thus opening the breech.

The breech can be allowed a further short recoil after the breech is opened, or it may be checked at once, either by a fixed stop or by so proportioning the spring Z′ that the energy of recoil is expended just after the breech is opened. In either case the spring Z′ expands and returns the breech to its forward position against the stop K. The piston P is driven back by the compressed air till it reaches the end of its travel and then pushes back the arm U which shifts the valve N and thus closes the communication between the cylinder O and the tube M and opens said cylinder to the atmosphere. The spring P′ now expands thus closing the breech and locking the bolt.

During the forward motion, the arm V treads down the spring toe of the stop W and runs over it. The stop W may have any suitable form but must be capable of tripping the valve N at any desired point in the recoil without interfering with the subsequent motion.

Loading may be performed by any suitable mechanism actuated by the sleeve S in its forward movement, and the cycle of operations is then repeated. Suitable spring stops or detents may be introduced to retain the valve in position between one movement and the next.

Referring to Figs. 4, 5, 6 and 7:—The construction here shown differs from that in Fig. 1 in the arrangement of the cylinder O and of the inlet and exhaust valves controlling the breech mechanism.

The return spring P′ (Fig. 1) is dispensed with and compressed air is admitted to either end of the cylinder as required.

P^3 is an arm carried on the piston P^2 and presses against a spring plunger P^4 when the breech is closed. This, as will be readily seen from the drawings, has the effect of opening the rearward end of the cylinder O to atmosphere through the space around the arm P^3, and cutting off the air supply from this end of the cylinder till such time as it is required. The valve N is arranged to control both ends of the cylinder and functions as already described.

When recoil begins, the valve N is in its rearward position as shown in Fig. 4, and the forward end of the cylinder is therefore open to the atmosphere through the passage shown. The rearward end of the cylinder would be in communication with the tube M if the plunger P^4 were not interposed, but this plunger is in its forward position closing the rearward branch of connection tube M and preventing the setting up of back-pressure and consequent waste of compressed air during the first stage of recoil. When the arm V engages with the spring stop W the valve is held back momentarily, and admits air to the forward end of cylinder O while closing that branch of tube M which communicates with the rearward end of said cylinder, as shown in Fig. 5. Subsequently the arm V runs over the stop W as already described with reference to Fig. 1.

The compressed air now drives the piston P to the rear, thus opening the breech and causing the arm P^3 to become disengaged from the plunger P^4, whereupon said plunger is forced rearwardly by its control spring. The rear end of the cylinder O is immediately placed under the control of the valve N as shown in Fig. 6.

At the end of its rearward travel, the piston P pushes the arm V to the rear, thus opening the forward end of the cylinder O to the atmosphere, and admitting compressed air to the rearward end of the cylinder as shown in Fig. 7.

The piston P is now driven forward and the breech is closed and locked, the plunger P^4 being returned to its forward position by the pressure of the arm P^3.

In other respects the arrangement shown in Figs. 4 to 8 is similar to that shown in Figs. 1 to 4.

If the locking and unlocking of the breech be completed before the barrel has gone far on its forward journey, the non-return valve L may be dispensed with, otherwise it is essential, as without it the pressure due to the compression of the air might be lost before the operation of the breech mechanism was complete. The connection tube M may be made of sufficient size to store the necessary quantity of compressed air at the desired pressure, or a container or receiver may be introduced into the tube M at any suitable point, the tube and container together having the necessary storage volume.

It is evident that the modification shown in Fig. 4 may be further extended, and that compressed air may be used to return the barrel as well as the bolt and sleeve, thus dispensing with return spring Z′. Or, if the cylinder O be made of sufficient size, the pressure of the air in its forward end may be sufficient to drive the recoiling parts forward at the same time as it drives the bolt back. In that case, a stop or buffer similar to K would be fixed at the rear end of the gun to hold up the sleeve or cam plate at the end of its travel and the air would remain in the forward end of the cylinder O till the barrel had gone home. The parts Y, Z, Z′, Z^2 would thus be dispensed with.

What I claim is:—

1. In a firearm, a recoiling breech and barrel, an air-cylinder, a piston movable in said cylinder, gearing connecting said piston to said breech and barrel, means for taking compressed air from said cylinder at any desired point in the recoil, breech mechanism, means actuated by such compressed air for operating the breech mechanism and opening the breech, and means for closing the breech and returning the recoiling parts of the firearm to their forward position.

2. In a firearm, a recoiling breech and barrel, an air-cylinder, a piston movable in said cylinder, gearing connecting said piston to said breech and barrel, means for taking compressed air from said cylinder at any desired point in the recoil, breech mechanism, means actuated by such compressed air for operating the breech mechanism and opening the breech, and means actuated by compressed air from said cylinder for closing and locking the breech.

3. In a firearm, a recoiling breech and barrel, an air-cylinder, a piston movable in said cylinder, gearing connecting said piston to said breech and barrel, means for taking compressed air from said cylinder at any desired point in the recoil, breech mechanism, means actuated by such compressed air for operating the breech mechanism and opening the breech and also for returning the whole of the recoiling parts of the firearm to their forward position, and simultaneously closing and locking the breech.

4. In a firearm, a recoiling breech and barrel, a carriage combined with said breech and barrel, a frame having guides in which said carriage is slidable, an air-cylinder fixed

to said frame, a piston movable in said cylinder and connected to said carriage, said piston being adapted to open a port in said cylinder when the barrel is in its forward position and to close such port as soon as the recoil begins, an air-cylinder movable with the carriage, a conduit connecting said fixed and movable air cylinders, a non-return valve in said conduit controlling the outlet of said fixed air cylinder, a piston in the movable air cylinder, means connected to the piston in said movable air cylinder for unlocking and locking the breech bolt, a valve controlling the conduit between the fixed and movable air cylinders, a rod connected to said valve, an arm on said rod adapted to be engaged by the piston in the movable air cylinder and an arm on said rod adapted to be engaged by a stationary stop, and means for returning the carriage and attached parts to their forward position.

5. In a firearm, a recoiling breech and barrel, a carriage combined with said breech and barrel, a frame having guides in which the carriage is slidable, an air-cylinder fixed to said frame, a piston movable in said cylinder and connected to said carriage, said piston being adapted to open a port in said cylinder when the barrel is in its forward position and to close such port as soon as the recoil begins, an air cylinder movable with said carriage, a conduit connecting the outlet of said fixed air cylinder and the ends of the movable air cylinder, a non-return valve in said conduit controlling the outlet of the fixed air cylinder, a piston in the movable air cylinder, means connected to the piston in the movable air cylinder for unlocking and locking the breech bolt, a valve controlling the conduit between the fixed and movable air cylinders, means operated by a fixed stop and by the piston of the movable air cylinder for actuating said valve, a supplementary plunger-valve controlling the communication between the conduit and one end of said cylinder, said plunger-valve being actuated by the piston of the movable air cylinder, substantially as and for the purposes specified.

6. In a firearm, a recoiling breech and barrel, a carriage combined with said breech and barrel, a frame having guides in which the carriage is slidable, an air cylinder fixed to said frame, a piston movable in said cylinder and connected to said carriage, said piston being adapted to open a port in said cylinder when the barrel is in its forward position and to close such port as soon as the recoil begins, an air cylinder movable with the carriage, a conduit connecting said fixed and movable cylinders, a non-return valve in said conduit controlling the outlet of said fixed air cylinder, a piston in the movable air cylinder, a sleeve slidable in guides on the frame, a breech-bolt rotatable in said sleeve, a radial arm on said bolt, a cam plate slidably mounted on said frame and having its cam surfaces in engagement with said radial arm, a connection between said cam plate and the piston of said movable air cylinder, a valve controlling the conduit between the fixed and movable air cylinders, means for operating said valve actuated by the piston in the movable air cylinder and by an elastic stop, and means for returning the carriage and attached parts to their forward position.

26th March, 1920.

HUGH WILLIAM GABBETT-FAIRFAX.

Witnesses:

EDWARD SIDNEY ROYSTON ADAMS,
GEORGE HUBBARD GELTON SHEPHERD.