L. T. HILLMAN.

FIREARM.

APPLICATION FILED SEPT. 21, 1916.

1,293,776.

Patented Feb. 11, 1919.

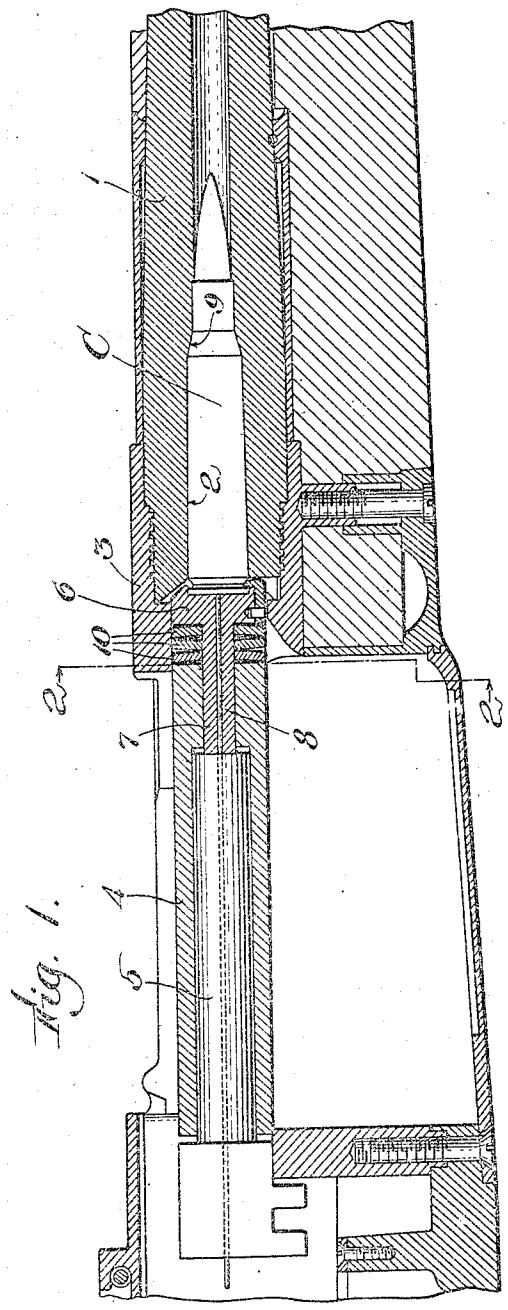


Fig. 1.

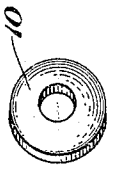


Fig. 3.

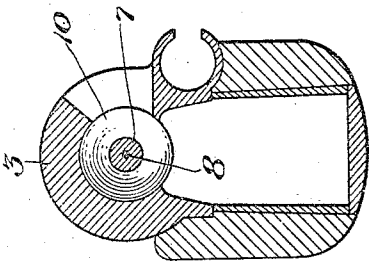


Fig. 2.

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UNITED STATES PATENT OFFICE.

LEROY T. HILLMAN, OF WATERTOWN, MASSACHUSETTS.

FIREARM.

1,293,776. Specification of Letters Patent. Patented Feb. 11, 1919.

Application filed September 21, 1916. Serial No. 121,509.

To all whom it may concern:

Be it known that I, LEROY T. HILLMAN, a citizen of the United States, and resident of Watertown, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Firearms, of which the following is a specification.

This invention relates to so-called automatic firearms of the type in which the rearward movement or elongation of the cartridge case resulting from the explosion of the charge, automatically operates a self-loading breech mechanism.

In firearms of this character a longitudinally movable bolt head made with a stem is held against the end of the cartridge at the time of firing, and a longitudinally movable breech bolt is held against the bolt head stem. A locking sleeve surrounds the breech bolt and the stem of the bolt head. The locking sleeve is mounted in the receiver behind the cartridge chamber in such manner as both to rotate and to slide lengthwise and the breech bolt is mounted to slide lengthwise but not to rotate. The locking sleeve has a lug coöperating with a shoulder on the receiver of the firearm to lock the sleeve against longitudinal movement when the breech is closed and the parts are in position ready for firing, but when the locking sleeve is given a partial rotation, the lug is disengaged from the shoulder and the sleeve is free to move rearwardly. There is a pin and cam-groove connection between the breech bolt and the locking sleeve adapted to permit the breech bolt to move rearwardly without affecting the locking sleeve during the first part of its stroke. The continued rearward movement of the breech bolt acts through the pin and cam-groove connection to rotate the locking sleeve sufficiently to disengage the locking sleeve lug from the shoulder and the remainder of the movement of the breech bolt carries the locking sleeve and the bolt head rearwardly with it, thus opening the breech. The rearward movement of the breech bolt sets in motion a train of mechanism which automatically ejects the spent cartridge case when the breech is open, inserts a new cartridge from a suitable magazine and restores all parts to position ready for firing. The mechanisms for ejecting the case of the spent cartridge, for automatically reloading, for cocking and firing, and sundry other associated mechanisms form no part of the present invention and need not be further described nor shown in the drawings. This invention has to do with the bolt head, locking sleeve and breech bolt and only such parts of a firearm will be shown and described as are necessary to make clear the construction and principle of operation of the invention.

In the accompanying drawings illustrating one embodiment of the invention,—

Figure 1 is a longitudinal section showing parts of the breech mechanism of a rifle containing the invention;

Fig. 2 is a cross section on line 2—2 of Fig. 1;

Fig. 3 is a perspective view of one of the springs hereinafter described.

Referring to the drawings, 1 represents the barrel of a rifle having a cartridge chamber 2, and 3 represents the receiver in which the end of the barrel is secured. In the receiver at the rear of the cartridge chamber, is mounted the locking sleeve 4 which has a locking lug (not shown) of usual construction in breech mechanism of this character engaging a shoulder on the receiver to lock the sleeve in the position shown with the parts ready for firing. The locking sleeve is rotatable to disengage the locking lug from the shoulder and when so unlocked is movable rearwardly to open the breech. The breech bolt 5 is mounted to slide within the locking sleeve but not to rotate. There is the usual pin and cam-groove connection (not shown) between the breech bolt 5 and the locking sleeve 4 by which the bolt 5 is permitted to make the first part of its rearward movement without rotating the locking sleeve 4, and whereby the continued rearward movement of the bolt 5 will impart to the locking sleeve a partial rotation thereby unlocking the sleeve after which the bolt carries the sleeve rearwardly to open the breech.

The bolt head 6 is made with a stem or neck 7 which extends into the locking sleeve 4 and into contact with the end of the breech bolt when the parts are in position ready for firing. The face of the bolt head is formed to engage and grip the end of a cartridge C within the cartridge chamber, and a firing pin 8 extends through the breech bolt and bolt head into contact with the end of the cartridge to fire the latter when driven forward by the hammer or equivalent mechanism.

The parts thus far described may be sub-

stantially of the construction usual in firearms of this character.

In operation, the explosion of the cartridge causes the cartridge case to tend to move bodily rearwardly and also tends to cause the cartridge case to elongate, and as the forward end of the cartridge case abuts against the shoulder 9 of the cartridge chamber, such elongation takes place rearwardly. The rearward motion of the end of the cartridge case forces the bolt head 6 rearwardly, sufficient space being provided therefor between the bolt head 6 and the end of the locking sleeve 4, whereupon the breech bolt 5 is driven rearwardly by the neck 7 of the bolt head. The breech bolt 5 during this rearward movement partially rotates and unlocks the locking sleeve 4 as already described, carries the locking sleeve 4 and bolt head rearwardly to open the breech, and operates the mechanism for ejecting the case of the spent cartridge and for reloading the firearm.

Upon the explosion of the charge in the cartridge, and while the gas pressure resulting from the explosion is at or near the maximum, the cartridge case expands momentarily thereby binding the case within the walls of the cartridge chamber at the instant of high pressure. The rearward impulse given the cartridge case at the instant of firing, resisted by this binding of the case in the cartridge chamber causes the cartridge case to elongate, and it has been found in practice, particularly with service ammunition or other ammunition developing high pressure, that without some support or counter resistance for the end of the cartridge until the pressure of the gases of combustion is so far reduced as to relieve the binding of the case within the cartridge chamber, the cartridge case will frequently rupture, leaving the forward end of the case in the chamber.

The principal object of the present invention is to provide means for so constraining or retarding the rearward movement of the bolt head 6 at or about the time of maximum pressure, that the bolt head will offer sufficient resistance to the resulting sudden rearward movement of the end of the cartridge case to prevent the latter from rupturing.

To this end I provide a spring, which may be of any suitable form, between the bolt head 6 and the end of the locking sleeve 4, which will offer sufficient resistance to the sudden rearward movement of the bolt head 6 at or about the time of maximum pressure to allow the elongation and rearward thrust of the cartridge case to take place gradually without rupturing the case. In the preferred form, such spring consists of a series of stiff spring disks 10 slightly concavo-convex as shown and arranged with their peripheries or their crowns in contact or alternately or successively with their peripheries and crowns in contact, as shown in Fig. 1. Three such disks are shown in the drawings; but the number of disks and the extent of their possible deflection may be varied according to the extent of movement of the bolt head 6 which is desired in the particular firearm in question. Similarly, the rapidity of such movement may be regulated by varying the stiffness or strength of the springs. When the explosion of the charge occurs and the end of the case moves rearwardly as above explained, the movable head 6 is forced rearwardly against the compression of the springs 10 whereby the first shock of such rearward movement of the end of the cartridge case is so far relieved as to prevent the rupture of the case. The rearward movement of the head 6, however, drives the breech bolt 5 rearwardly as usual, unlocking the locking sleeve and actuating the ejecting and reloading mechanisms.

I claim:

1. A firearm comprising, in combination, a cartridge chamber, a locking sleeve movable longitudinally toward and away from the cartridge chamber, a breech bolt mounted to slide longitudinally of the locking sleeve, a bolt head, the forward end of which is adapted to engage the end of a cartridge, and the rear end of which actuates the breech bolt, said bolt head being mounted to move longitudinally of the locking sleeve at the forward end thereof, and a stiff recoil spring interposed between the bolt head and the locking sleeve adapted yieldingly to resist the initial rearward movement of the bolt head under the influence of the explosion of the cartridge, whereby the said rearward movement of the bolt head is restrained and gradually reduced in velocity.

2. A firearm comprising, in combination, a cartridge chamber, a locking sleeve movable longitudinally toward and away from the cartridge chamber, a breech bolt mounted to slide longitudinally of the locking sleeve, a bolt head, the forward end of which is adapted to engage the end of a cartridge, and the rear end of which actuates the breech bolt, said bolt head being mounted to move longitudinally of the locking sleeve at the forward end thereof, and a concavo-convex spring disk interposed between the bolt head and the locking sleeve adapted yieldingly to resist the initial rearward movement of the bolt head under the influence of the explosion of the cartridge.

3. A firearm comprising, in combination, a cartridge chamber, a locking sleeve movable longitudinally toward and away from the cartridge chamber, a breech bolt mounted to slide longitudinally of the locking sleeve, a bolt head, the forward end of which is adapted to engage the end of a cartridge, and the rear end of which actuates the

reech bolt, said bolt head being mounted
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t the forward end thereof, and a plurality
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etween the bolt head and the locking sleeve
dapted yieldingly to resist the initial rear-
ard movement of the bolt head under the
nfluence of the explosion of the cartridge.

4. A firearm comprising, in combination,
cartridge chamber, a locking sleeve mov-
ble longitudinally toward and away from
ne cartridge chamber, a breech bolt mount-
d to slide longitudinally of the locking
leeve, a bolt head, the forward end of
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cartridge, and the rear end of which actu-
ates the breech bolt, said bolt head being
mounted to move longitudinally of the lock-
ing sleeve at the forward end thereof, and
three or more concavo-convex spring disks
arranged successively periphery to periph-
ery and crown to crown, interposed between
the bolt head and the locking sleeve adapted
yieldingly to resist the initial rearward
movement of the bolt head under the influ-
ence of the explosion of the cartridge.

Signed by me at New York, N. Y., this
15th day of September, 1916.

LEROY T. HILLMAN.