O. B. GRAHAM.

BREECH CLOSURE.

APPLICATION FILED NOV. 26, 1917.

1,340,891.

Patented May 25, 1920.

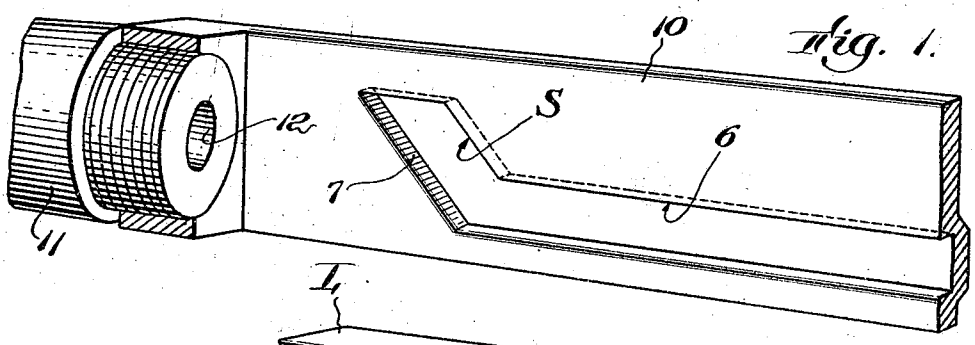



Fig. 1.

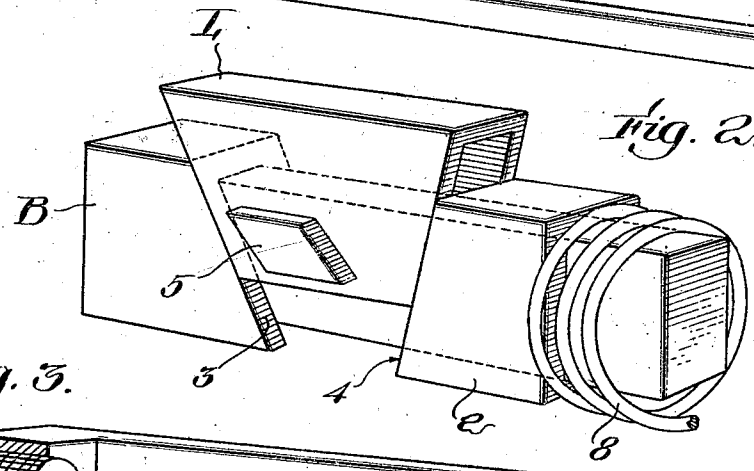



Fig. 2.

Fig. 3.

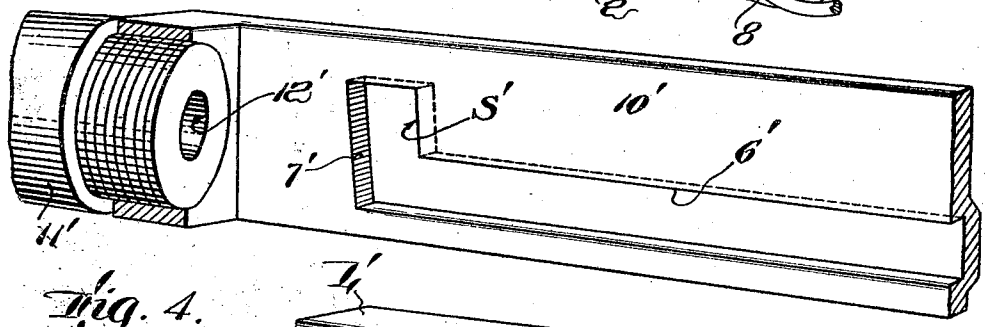
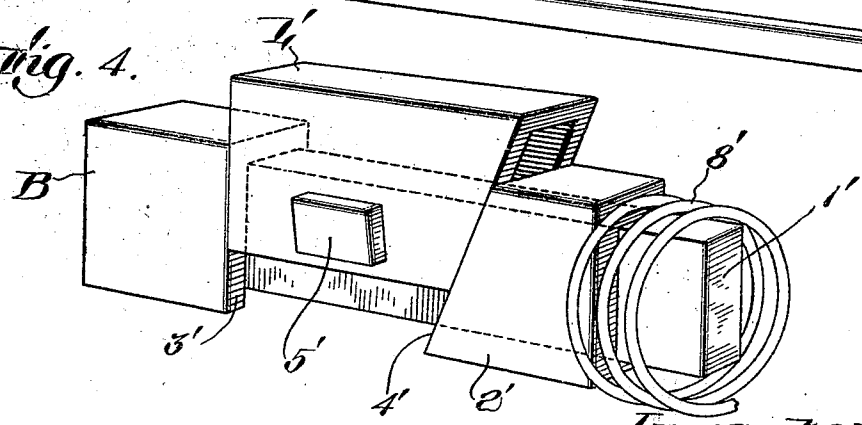



Fig. 4.




Inventor:
Oliver B. Graham,
by Robb Robb & Cushman
His Attorneys.

# UNITED STATES PATENT OFFICE.

OLIVER B. GRAHAM, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AUTO-ORDNANCE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## BREECH-CLOSURE.

1,340,891. Specification of Letters Patent. Patented May 25, 1920.

Application filed November 26, 1917. Serial No. 203,873.

*To all whom it may concern:*

Be it known that I, OLIVER B. GRAHAM, a citizen of the United States of America, and resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Breech-Closures, of which the following is a specification.

This invention relates to breech closure mechanism for firearms and more particularly to breech closures of the type disclosed in the application of Eickhoff and Payne, Sr. No. 203,887, filed November 26, 1917.

Breech closures of the type referred to comprise three essential elements, namely, a breech-block, a stop or abutment, and a lock arranged to be interposed between the breech-block and stop to lock the block against breech pressures of relatively large magnitude and to be moved from between the breech-block and stop automatically by diminished breech pressure of such magnitude as safely to retract the breech-block. Breech closures of this type operate according to the principle set forth in the patent to Blish, 1,131,319, granted March 9, 1915, and I hereby make reference to this patent for a more detailed disclosure of the principle underlying the mode of operation of breech closures of the type to which my invention is particularly applicable. It is not to be understood in this connection, however, that my improvements are limited in application to mechanisms embodying this principle.

According to the aforesaid application the said three essential elements comprise a reciprocatory bolt, a guideway having a transverse surface forming a stop, and a lock movable both longitudinally with the bolt and laterally with respect to the bolt, the lateral movement carrying the lock to and from locking position between the bolt and the stop; and my improvements are particularly though not exclusively applicable to this combination of elements.

The principal objects of the invention are to move the locking member of the breech closure mechanism into locking position quickly, smoothly and positively, to move the locking member both to and from the firing chamber with the breech-block and also angularly or transversely or otherwise laterally with respect to the breech-block in a simple and efficient manner, to actuate the breech-block and locking member by common means adapted to move the breech-block relatively to the firing chamber and also forcibly to move the locking member relatively to the breech-block, to effect the transverse movement of the locking member during the longitudinal movement of the breech-block, and more particularly to attain these results in breech mechanism of the aforesaid type.

Other objects of the invention will be apparent from the following description and the accompanying drawings, in which,

Figure 1 is a sectional perspective view of a portion of a firearm adapted to use my improved breech closure;

Fig. 2 is a perspective view of an embodiment of my improved breech closure adapted to the firearm of Fig. 1;

Fig. 3 is a view similar to Fig. 1 of a modified construction; and

Fig. 4 is a view similar to Fig. 2 showing a modification of my improved closure adapted to the firearm of Fig. 3.

The embodiment of my improved breech closure mechanism illustrated in Fig. 2 comprises a bolt B adapted to reciprocate longitudinally of the receiving chamber of a firearm, such as illustrated for example in Fig. 1, wherein the receiving chamber is indicated at 10 in the rear of the barrel 11 containing the firing chamber 12. The bolt B is provided with a stem 1 of reduced cross-sectional area extending rearwardly therefrom, and surrounding this stem is a follower in the form of a sleeve 2 adapted to slide longitudinally of the stem 1. Between the forward end of the bolt and the sleeve 2 is disposed a locking member L, the locking member having a U-shaped cross-sectional shape and extending over the stem of the bolt so as to engage the rear faces 3 of the bolt B at its forward end and to engage the forward faces 4 of the sleeve 2 at its rearward end. Lugs 5 project laterally from the opposite sides of the locking member L and the receiver 10 is provided with a slot 6 to receive the lugs 5 and guide the movement of the locking member. The

slot 6 is provided with a lateral portion 7 extending obliquely from the forward end of the longitudinal portion and the obliquity of the forward portion 7 is made to correspond with the inclination of the forward and rearward surfaces of the lugs 5. The abutting surfaces of the breech-block B and locking member L may be inclined relatively to the path of movement of the bolt any desired degree, but the inclination of these surfaces must bear a certain relationship to the slope of the forward and rearward faces of the lugs 5 and the forward portion 7 of the slot 6, the difference in inclination between these surfaces being approximately 5° for the standard U. S. service rifle, all as more fully explained in the aforesaid application. In the rear of the sleeve 2 is provided a compression spring 8, this spring abutting against a suitable stop at its rearward end and pressing forwardly against the rear end of the sleeve 2.

According to the present invention the abutting surfaces between the locking member L and the follower 2 are inclined relatively to the path of movement of the bolt B, the inclination relatively to a vertical transverse plane being opposite to that of the abutting surfaces between the locking member and the breech-block, the object of inclining the abutting surfaces of the locking member and follower being apparent from the following description of the operation of the mechanism.

When the bolt B is in forward position closing the firing chamber 12, the locking member L is disposed in uppermost position as illustrated in Fig. 2, the lugs 5 being disposed in the oblique forward portion 7 of the slot 6 with the rear faces of the lugs 5 abutting against the rear faces S of the oblique portions of the slots, which constitute stops adapted to hold the bolt B against rearward movement when the firearm is discharged, the breech pressure being transmitted to the stops S through the forward end of the bolt and the locking member L. The rearward thrust on the bolt B produced by a discharge in the firing chamber F tends to force the locking member L upwardly by virtue of the inclination of the abutting faces of the two members, and it tends to force the locking member downwardly by virtue of the inclination of the abutting surfaces of the lugs 5 and stops S. Owing to the fact that the inclination of the lock-stop surfaces is greater than the inclination of the lock-block surfaces there is a resultant force acting downwardly on the lock tending to force it downwardly along the oblique portion of the slot. However, the difference of inclination between the two sets of surfaces is such that high breech pressures lock the parts together so that the locking member cannot slide along the slot 7, whereas breech pressures of diminished magnitude are effective to force the locking member along the slot 7 according to the principle disclosed in the aforesaid patent, as is more fully described in the aforesaid application. When the lugs 5 come into alinement with the longitudinal portion of the slot the bolt lock and sleeve move rearwardly together against the action of the spring 8.

The above operation is substantially the same as disclosed in the aforesaid application, but during the forward movement of the parts the operation is different. After the parts have been fully retracted as above described, the spring 8 becomes effective to advance the parts into locking position. So long as the lugs 5 remain in the longitudinal portions of the slots 6, the parts move forward as a unit with no relative movement therebetween. However, when the lugs 5 reach the oblique portions of the slot, the locking member moves obliquely with relation to the path of movement of the bolt during the completion of the forward movement of the bolt. By virtue of the fact that the abutting surfaces of the locking member and follower are inclined upwardly and rearwardly, the forward pressure on the follower 2 tends to force the locking member upwardly so that when the lugs 5 reach the lateral portions of the slots 7 this upward pressure becomes effective quickly and positively to move the locking member transversely with respect to the bolt. In this way the locking member is given an upward tendency as soon as released from the horizontal portion of the slot and an instant before the forward faces of the lugs engage the forward sides of the slot 7, so that there is substantially no shock of impact caused by the lugs 5 engaging the forward faces of the slots 7. Indeed, if the inclination between the sleeve and locking member be made sufficiently great the lugs 5 may never engage the forward faces of the slots 7, in which event the forward faces of the slots 7 serve no purpose in the normal operation of the mechanism.

It will be observed that during the forward movement of the parts the locking member begins to move transversely of the bolt into locking position before the bolt reaches advanced position, thus if a premature discharge is produced by the advancement of the bolt, the locking member will have reached its locking position before the premature discharge takes place and will therefore lock the parts in position until the pressure drops to the predetermined value, thereby preventing the parts being shot rearwardly with excessive force.

In Figs. 3 and 4 I have shown a modification of my improved mechanism for the

purpose of illustrating the fact that the inclination of the various sets of abutting surfaces may be widely varied within the scope of the present invention. The parts in Figs. 3 and 4 are designated correspondingly to the parts of Figs. 1 and 2, and the parts are constructed and arranged the same except that the bolt-lock surfaces are vertical, the lock-stop surfaces are nearly vertical, and the lock-sleeve surfaces are inclined a greater amount than in Fig. 2. While the bolt-lock surfaces and lock-stop surfaces are both sloped a lesser amount, the difference between the inclinations of these two sets of surfaces is substantially the same as in Fig. 2, namely about 5° for the U. S. service rifle having a breech pressure of approximately 52,000 pounds per square inch. Owing to the fact that the forward portion of the slot is more nearly perpendicular to the longitudinal portion of the slot than in Fig. 2, the lock-sleeve surfaces are preferably inclined a greater amount so that when the lugs 5′ reach the forward end of the longitudinal portions of the slots during the forward movement of the parts, the upward tendency on the lock produced by the sloping lock-follower surfaces will be greater, thereby producing a more rapid upward movement of the lock relatively to the bolt. This is desirable to prevent an impact between the lugs 5′ and the forward faces of the slots 7′ inasmuch as the lock must complete its lateral movement while the bolt is moving a shorter distance than when the slots 7 have a greater slope as in Fig. 1.

While no firing pin has been illustrated in the drawings inasmuch as it forms no part of the present invention it is to be understood that a firing pin could be employed in the manner illustrated in the aforesaid application of Eickhoff and Payne, or in the application of Eickhoff, Sr. No. 223,657, filed March 20, 1918, or in other suitable manner.

I claim:

1. Breech closure mechanism for firearms comprising a bolt, a lock, a follower, and a recoil spring, the lock being movable laterally of the bolt into locked position in front of locking abutments on the receiver and being movable longitudinally with the bolt when out of locked position, the lock having bearing surfaces engaging the bolt, receiver and follower respectively, certain of said engaging surfaces including the lock-follower surfaces being inclined to the line of breech pressure at such angles that the movement of the lock into and out of locked position is controlled by the breech and recoil pressures acting upon the lock respectively through the bolt and follower.

2. Breech closure mechanism for firearms comprising a bolt, a lock, a follower, and a recoil spring, the lock being movable laterally of the bolt into locked position in front of locking abutments on the receiver and being movable longitudinally with the bolt when out of locked position, the lock engaging the bolt, receiver and follower respectively through lock-bolt, lock-receiver and lock-follower bearing surfaces, said lock-bolt surfaces being inclined in one direction relatively to said lock-receiver surfaces at such angles that the lock is automatically unlocked in response to the breech pressure transmitted through the bolt to the lock and thence to the receiver, and said lock-follower surfaces being inclined in the opposite direction relatively to said lock-receiver surfaces at such angles that the lock is automatically locked in response to the recoil spring acting on the follower.

3. Breech closure mechanism for firearms comprising a bolt, a lock, a follower and a recoil spring, the lock having oblique surfaces adapted to bear against oblique abutments on the receiver to lock the bolt closed, said surfaces being inclined relatively to the line of breech pressure at such angles that the bolt is maintained closed during high breech pressure but is automatically opened directly in response to the breech pressure acted thereon when the pressure has decreased to a relatively low value, and said lock and follower having oblique engaging surfaces inclined in the opposite direction relatively to the line of breech pressure to move the lock into locked position in response to the recoil spring, whereby the unlocking and locking movements of the lock are controlled by said oblique surfaces in response to the breech and recoil pressures.

4. Breech closure for firearms, comprising a breech-block, a lock and a stop, the lock being movable laterally of the breech-block, the surfaces of lock-block contact and lock-stop contact being disposed at an angle with each other such as to lock the breech block during high breech pressures and to release it for movement in response to low breech pressures, a follower in sliding engagement with the lock, yielding means operative on the follower to urge the lock and block to breech-closure position, the lock-follower surfaces being inclined with relation to the lock-stop surfaces, to urge the lock into the stop.

5. Breech closure for firearms, comprising a breech-block, a lock, and a stop, the lock being movable on the stop laterally of the block, the surfaces of lock-block contact and lock-stop contact being inclined to the line of breech pressure and at an angle with each other such as to lock the block during high breech pressures and to release it for movement under low breech pressures, a guide substantially parallel with the line

of breech pressure from which the stop is developed to its angle with the said line, a follower in sliding engagement with the lock and carried by the block, yielding means operative on the follower to urge the lock along the way and into the stop and thereby move the block to breech closing position, the lock-follower surfaces being inclined with relation to the stop-surface to urge the lock from the way into the stop.

Signed by me at Cleveland, Ohio, this 14th day of November, 1917.

OLIVER B. GRAHAM.