T. H. EICKHOFF AND O. V. PAYNE.

BREECH CLOSURE.

APPLICATION FILED NOV. 26, 1917.

1,340,943.

Patented May 25, 1920.

2 SHEETS—SHEET 1.

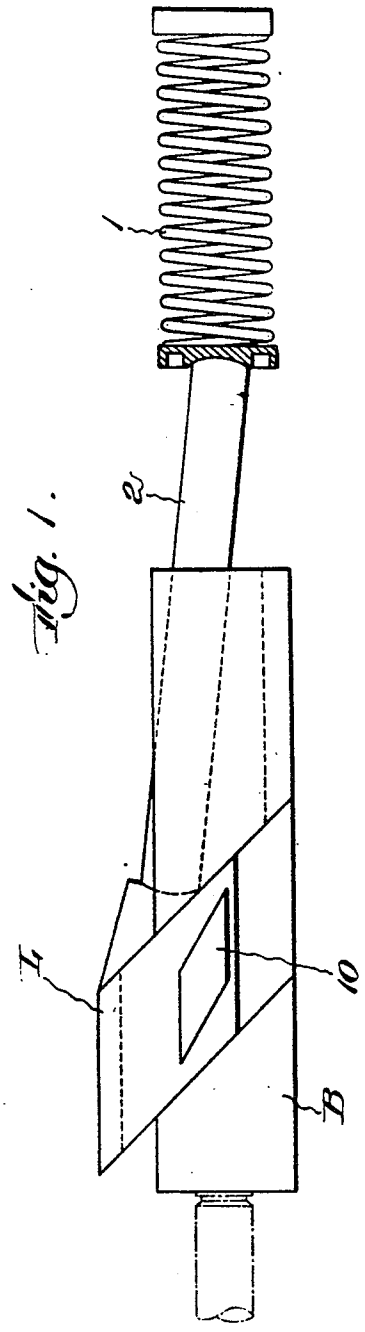

Fig. 1.

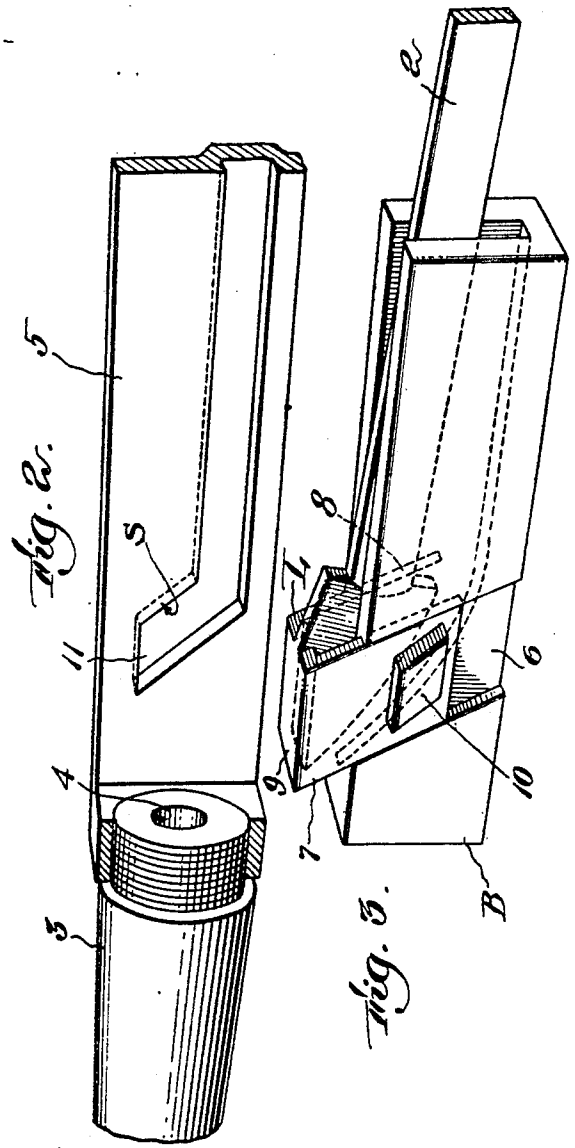

Fig. 2.

Fig. 3.

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2 SHEETS—SHEET 2.

Fig. 4.

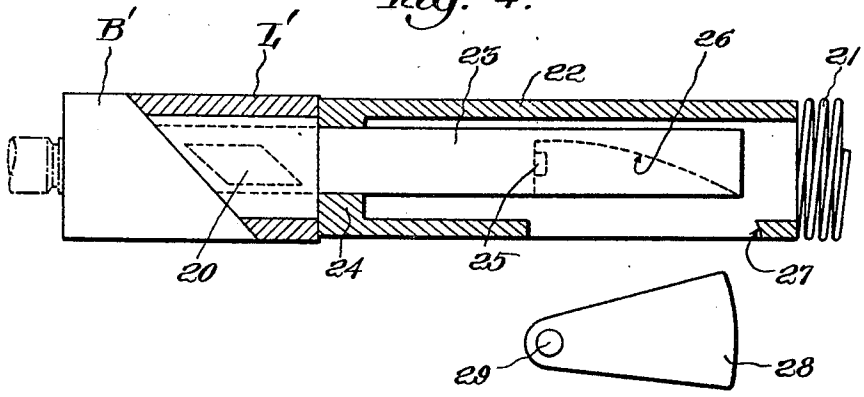


Fig. 5.

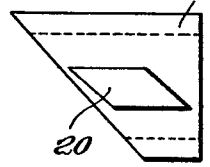


Fig. 6.

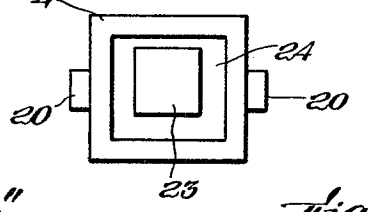


Fig. 7.

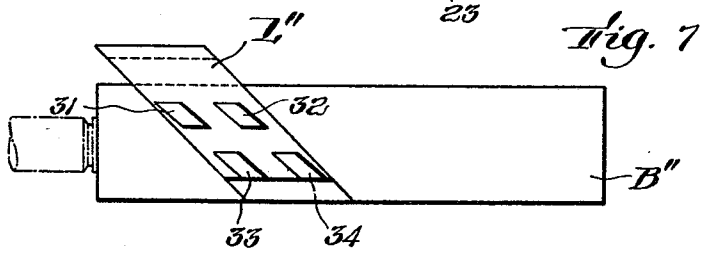
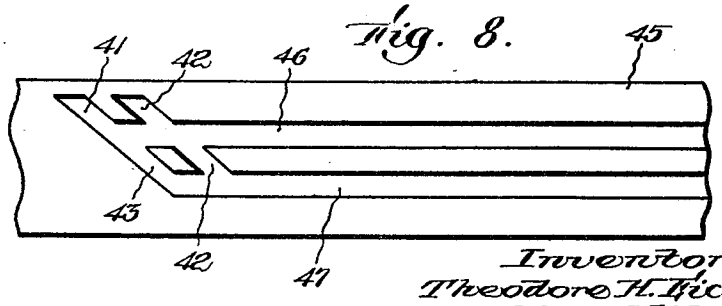


Fig. 8.



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UNITED STATES PATENT OFFICE.

THEODORE H. EICKHOFF AND OSCAR V. PAYNE, OF CLEVELAND, OHIO, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO AUTO-ORDNANCE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

BREECH-CLOSURE.

1,340,943. Specification of Letters Patent. Patented May 25, 1920.

Application filed November 26, 1917. Serial No. 203,887.

To all whom it may concern:

Be it known that we, THEODORE H. EICKHOFF and OSCAR V. PAYNE, citizens of the United States of America, and residents 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 closures for firearms and more particularly to breech closures of the type disclosed in the patent to Blish, 1,131,319, granted March 9, 1915.

Breech closures of the type referred to utilize the breech pressure, that is, the pressure generated by the discharge of the breech-loading piece as the sole factor for locking the breech closer, for actuating the breech closure, to open the breech, for ejecting the cartridge case, obturator, or other ammunition which may remain in the gun after firing, and also, if desired, for reloading the gun. As fully explained in the aforesaid patent these functions are attained by means of a stop or abutment in the rear of the breech, the abutment having a forward surface inclining relatively to the direction of breech pressure, and a locking member disposed between the breech and the abutment, the locking member having an inclined surface engaging the inclining surface of the abutment, the inclination of the surfaces being such that the full breech pressure, say of the order of 50,000 pounds per square inch, causes the said surfaces to adhere together so as to permit no movement of the locking member relatively to the abutment member and at the same time being such that when the breech pressure has diminished below a certain critical value, say of the order of 500 pounds per square inch, the adhesion between the surfaces decreases to such an extent that the component of breech pressure along the inclined surfaces is permitted to force the locking member along the inclined surface of the abutment and unlock the breech.

The principal objects of the present invention are to provide simple and reliable breech closing mechanism, to render a firearm automatic in opening and closing the breech and in ejecting empty cartridge cases, to make the automatic operation substantially independent of the magnitude of the breech pressure, to coördinate the operation of an automatic locking device of the character referred to with the operation of a sliding bolt or other breech-block, to actuate the locking device and breech closure conjunctively, and generally to improve breech closures of the character referred to.

In the accompanying drawings which show certain illustrative embodiments of the invention,—

Figure 1 is a side elevation of one embodiment of the breech closure mechanism;

Fig. 2 is a perspective sectional view of a portion of a firearm adapted to employ the mechanism shown in Fig. 1;

Fig. 3 is a perspective view of the breech closure mechanism shown in Fig. 1, the spring being omitted;

Fig. 4 is a side view of another embodiment of our improved breech closure, parts being shown in elevation;

Fig. 5 is a side elevation of the locking member shown in Fig. 4;

Fig. 6 is a rear end elevation of the locking member and bolt shown in Fig. 4;

Fig. 7 is a side view of still another embodiment of our improved breech closure; and

Fig. 8 is a side view of the inside of the receiver of a firearm adapted to employ the breech closure mechanism shown in Fig. 7.

Our improved breech closure comprises three principal elements, namely, a breech-block, which is preferably in the form of a reciprocatory bolt, a locking member, which for convenience may be termed simply a lock, and a stop or abutment. These elements are so coördinated together that the breech-block is locked in advanced position at relatively high breech pressures, but is unlocked and retracted in response to reduced breech pressure, these functions being attained by the utilization of the principle set forth in the aforesaid patent. The lock is arranged to move both with the block and angularly, laterally or otherwise relatively to the block, and in the preferred applica-

tion of the invention the lock moves longitudinally with and transverse to the block. The lock may be disposed either at or forward of the rear of the block and on either one or more sides of the block, but it is preferably arranged to extend partially or wholly around the block.

While the breech-block may be advanced manually, and by inverting the mechanism from the illustrated position gravity will serve to move the locking member transversely into locking position and maintain it there until the firearm is discharged, the present invention in a more limited aspect also includes means for automatically moving the lock and block into breech closing position. This means preferably comprises only a single means rather than separate means acting on the lock and block respectively, and in the preferred embodiment of our invention the means comprises a spring or other yielding means operative upon the lock, preferably through the medium of a follower, to move the lock and block together and to move the lock transversely of the block into locking position.

The present invention involves, in its more specific aspect, inclined surfaces having a critical angle of inclination relatively to the direction of breech pressure according to the principle of the aforesaid patent, the critical angle being of the order of 5° for the standard U. S. service rifle, and in the preferred embodiment of our invention two sets of inclined surfaces are employed, the two sets having different inclinations of such magnitude that the difference between the two inclinations affords an effective inclination of the critical value. This effective inclination is preferably attained by sloping the lock-block surface a certain amount, say 25°, and sloping the lock-stop surface an amount greater than the first amount equal to the critical angle, that is, a total amount of the order of 30° for the example mentioned.

The particular embodiment of our invention illustrated in Figs. 1, 2 and 3 comprises a bolt B constituting the breech-block, a locking member L, and one or more stops or abutments S. A compression spring 1 is arranged to urge the bolt B and locking member L forwardly, the spring 1 acting on the locking member through the medium of a connecting link 2. The bolt B is intended to reciprocate longitudinally of the receiving chamber of a gun such as illustrated in part in Fig. 2, the gun comprising a barrel 3, a firing chamber 4 and a receiver 5. The locking member L is arranged to move longitudinally with the bolt B and also transversely of the bolt, and in the illustrated embodiment the locking member is mounted on the bolt in the following manner. On each side of the bolt near the forward end is provided a guideway 6 sloping downwardly and rearwardly with respect to the axis of the barrel 3. The locking member L is in the form of an inverted U-shaped member having side portions 7 and 8 connected together by a central portion 9, the side portions 7 and 8 fitting into the sloping guideways 6 of the bolt. Projecting outwardly from opposite sides of the locking member L are lugs 10, these lugs being adapted to fit into and to slide along slots 11 in the opposite sides of the receiver 5. As shown in Fig. 2 each of the slots 11 is provided with a longitudinal portion and a forward portion extending laterally and obliquely from the longitudinal portion.

When the bolt B is in forward position closing the breech of the gun the locking member L is in the upper position shown in Figs. 1 and 3 with the lugs 10 disposed in the forward oblique portions of the slots 11. In order to retract the bolt the locking member L must be moved downwardly from in front of the rear walls of the sloping portions of the slot constituting the stops S until the lugs 10 reach the longitudinal portion of the slot 11, whereupon the locking member L and the bolt B may move rearwardly together, the lugs 10 following the longitudinal portions of the slots. The spring 1 acting through the connecting link 2 is adapted to move the bolt and locking member from retracted position into advance position, the locking element traveling forwardly with the bolt until the lugs 10 reach the oblique portion of the slot, whereupon the locking member moves laterally of the bolt into the oblique portion of the slot. The upward movement of the locking member is brought about by the engagement of the lugs 10 with the forward faces of the oblique portions of the slots 11, by the upward inclination of the connecting member 2 whereby an upward component force is applied to the locking member, and also to a slight extent by the engagement of the inclined forward face of the locking member L with the inclined rearward faces of the guideways 6 in the bolt B.

A cardinal feature of the present invention is structuralized in Figs. 1 to 3 by making the inclination of the lugs 10 and slot 11 greater than the inclination of the abutting forward and rearward surfaces of the locking member and bolt respectively; the lock-stop surfaces, that is, the lugs and forward portion of the slot, being inclined approximately 30° with the vertical and the lock-block surfaces, that is, the abutting forward and rearward surfaces of the locking member L and bolt B, making an angle of approximately 25° with the vertical. By virtue of this difference of inclination the rearward thrust of the breech pressure locks

the member L in the position shown in Figs. 1 and 3 until the pressure falls to a predetermined value, according to the principles disclosed in the aforesaid patent, as will now be explained.

The rearward thrust of the breech pressure is transmitted to stops S, that is, the rear face of the oblique portion of the slots 11 through the medium of the forward portion of the bolt B and the locking member L. The rearward thrust of the forward portion of the bolt on the locking member tends to force the locking member upwardly owing to the fact that the abutting forward and rearward faces of the locking member and bolt respectively slope downwardly and rearwardly, the forward portion of the bolt tending to lift the locking member as if a wedge were being driven under the locking member. The rearward thrust of the locking member against the forward faces of the oblique portions of the slots tends to force the locking member downwardly for a similar reason. Thus the rearward thrust of the breech pressure produces both an upward and a downward component of force on the locking member. If the inclination of the lock-stop surfaces and the lock-block surfaces were the same these two components of force would be equal, but owing to the difference between the two inclinations these components of force are unequal, the downward component being the greater owing to the fact that the lock-stop surfaces have a greater inclination than the lock-block surfaces.

Briefly described the mechanism functions in the following manner: The full reaction of the breech pressure, which is usually of the order of 50,000 pounds per square inch in the U. S. rifle, creates such a great pressure between the abutting surfaces of the bolt, locking member and stops, respectively, that the parts are locked in normal position in accordance with the principle described in the above cited patent. However, when the breech pressure has diminished to a certain critical value, as explained in the aforesaid Blish patent, the adhesion between the inclined surfaces of the locking member and the bolt and stops respectively decreases to such an extent that the effective downward component of force on the locking member is sufficient to force the locking member downwardly along the oblique forward portion of the slot 11 until the lugs 10 come into alinement with the horizontal portion of the slots, whereupon the bolt and locking member together move rearwardly under the influence of the residual breech pressure against the action of spring 1. After the bolt has been retracted and the breech pressure has been relieved the spring 1 forces the bolt and lock into forward position as above described.

It will be noted that the locking member starts to move transversely of the bolt into locked position before the bolt has reached its advanced position and serves to retard the motion of the bolt just prior to its reaching its advanced position. It will also be observed that the locked member reaches its locked position in the oblique portion of the slot just prior to the bolt reaching its advanced position so that if a premature discharge is produced by the bolt being advanced into breech closing position the bolt is not shot backwardly but is locked in the position in the same manner as in normal firing.

It will be further observed that a single means, namely, the spring 1 and associated parts, is employed for advancing the bolt and for moving the locked member transversely of the bolt. It will also be obvious to those skilled in the art that automatic mechanism for ejecting cartridge cases and for feeding cartridges into the firing chamber may be associated with our improved breech closure, the forward end of the bolt being provided with ejecting means and the reciprocatory movement of the bolt being employed to feed cartridges from a magazine to the firing chamber.

The modified embodiment of our invention shown in Fig. 4 is similar to that shown in Figs. 1 to 3 in that it comprises a reciprocatory bolt B′, a locking member L′ having lugs 20 adapted to coöperate with slots such as shown at 11 in Fig. 2, and a spring 21 for urging the locked member and bolt forwardly, but it differs from the embodiment of Figs 1 to 3 in that the force of the compression spring 21 is transmitted to the locked member L′ through the medium of a sleeve 22 surrounding the reduced end 23 of the bolt instead of through a connecting link such as shown at 2 in Figs. 1 to 3. The forward end 24 of the sleeve 22 is preferably fitted closely around the stem 23 of the bolt B′ to assist in maintaining the bolt in position in the receiver. In order to illustrate one method of associating a firing pin with our improved mechanism we have shown in Fig. 4 a firing pin 25 extending through the bolt to the firing chamber, the stem 23 of the bolt being cut away at 26 and the sleeve 22 being cut away at 27 to permit a hammer 28 pivoted at 29 to swing into engagement with the rear end of the firing pin. Obviously a firing pin could be associated with the embodiment of Figs. 1 to 3 in the same or other suitable manner.

When employing a sleeve in lieu of the connecting link it is obvious that the sleeve exerts no direct upward component pressure on the locking member and that the locking member is moved upwardly into locked position upon the forward stroke of the bolt

wholly as a result of its engagement with the sloping surface of the bolt and slots respectively.

The modification illustrated in Figs. 7 and 8 differs from the above described embodiment in that a plurality of lugs are provided on each side of the locking member in lieu of a single lug. The locking member L'' is provided with four lugs, 31, 32, 33 and 34 respectively on each side, these lugs being adapted to stand in the oblique portions of the slots in the receiver 45 when the locking member is in normal position. When the locking member is forced downwardly by the diminished breech pressure in the above described manner the lugs 31 and 32 move into alinement with and thence along the longitudinal slot 46 and the lugs 33 and 34 move into alinement with and thence along the longitudinal slot 47.

In the several forms herein shown as illustrations of our improvements, the full movement of the locking member involves a moderate angular change of direction as the locking member lugs pass from the longitudinal guideway to the inclined stop or vice versa. The provision of inclined abutting lock-block surfaces reconciles this relatively easy transition from longitudinal to obliquely transverse movement with the establishment of an effective abutment angle, represented by the angular differential between the lock-block surfaces and the lock-stop surfaces, which under high breech pressures causes the breech block to be locked in closed position, and then, when the breech pressure has subsided to a lower value, allows the block and lock to move and open the breech.

We claim:

1. A firearm comprising a receiver, a breech-block, and means including a separate locking member interposed between the receiver and breech-block with oblique surfaces arranged on a plurality of sides of the line of breech pressure for preventing movement of the breech-block relatively to the receiver at high breech pressure but permitting such movement at low pressures, the receiver having means for guiding the locking member into and out of locking position.

2. Breech closure mechanism comprising a breech-block, a stop, and a separate lock normally interposed between the breech-block and stop with surfaces abutting the block and stop respectively, certain of said surfaces being inclined to the direction of breech pressure so that the lock is held in locking position during high breech pressure but is forced from between the block and stop by the breech pressure when the pressure diminishes to a relatively low value.

3. Breech closure mechanism comprising a breech-block, a stop, and a separate lock normally interposed between the breech-block and stop with surfaces abutting the block and stop respectively, certain of said surfaces including the lock-stop surfaces, being inclined to the direction of breech pressure so that the lock is held in locking position during high breech pressure but is forced from between the block and stop by the breech pressure when the pressure diminishes to a relatively low value.

4. Breech closure mechanism comprising a breech-block, a stop, and a separate lock normally interposed between the breech-block and stop with surfaces abutting the block and stop respectively, certain of said surfaces including the lock-block surfaces, being inclined to the direction of breech pressure so that the lock is held in locking position during high breech pressure but is forced from between the block and stop by the breech pressure when the pressure diminishes to a relatively low value.

5. Breech closure mechanism comprising a breech-block, a stop and a separate lock normally interposed between the breech-block and stop with surfaces abutting the block and stop respectively, both sets of said surfaces being inclined to the direction of breech pressure so that the lock is held in locking position by high breech pressure but is forced from between the block and stop by low breech pressure.

6. Breech closure mechanism for firearms comprising a breech-block movable relatively to the firing chamber for closing the breech, a breech-lock movable relatively to said breech-block for locking the breech-block in closed position, and means for moving the breech-block into closed position and for automatically moving the breech-lock into locked position, said means being operative upon said breech-block through said breech-lock, the block and lock having inclined abutting surfaces adapted to move the lock into locked position in response to said means.

7. Breech closure mechanism for firearms comprising a breech-block, a breech-lock for locking the breech-block in closed position, a follower, the block and lock having abutting surfaces and the lock and follower having abutting surfaces, and a spring operative upon said block through said follower and lock, said spring tending to move said lock relatively to said block by virtue of certain of said surfaces being inclined relatively to the direction of spring pressure.

8. A firearm comprising a receiver, a breech block, means including a separate lock interposed between the block and receiver, the lock having bearing surfaces inclined to the line of breech pressure so as to hold the block closed during high breech pressure and to permit the closure to open directly in response to the breech pressure after the pressure has decreased to a rela-

tively low value, and yielding means operative on the block through the medium of the lock for returning the block to closed position, said means being effective to move the lock relatively to the block by virtue of the inclined abutting surfaces between the block and lock.

9. A firearm comprising a firing chamber, a guideway at the rear of the firing chamber, a breech closure member slidably disposed in the guideway, a wedge-block member movable with and transversely of the breech closure member in the guideway for locking the breech closure member in advanced position, the breech closure member, wedge-block member and guideway having abutting surfaces adapted to counteract the breech pressure, certain of said surfaces being inclined relatively to the direction of said pressure so that the wedge-block member is forced laterally of the breech closure to unlock the breech closure when said pressure is partially spent, and means operative upon one of said members to slide the breech closure member in the guideway and to move the wedge-block member transversely of the breech closure member.

10. A firearm comprising a firing chamber, a movable closure member for closing the firing chamber, a stop member, a separate locking member adapted to be interposed between the stop member and closure member when the latter is in normal position for locking the closure member against the breech pressure, the said members having coöperating abutting surfaces certain of which are inclined relatively to the direction of said pressure so that the members are locked together by the full pressure but so that the locking member is forced from between the closure and stop members when the pressure diminishes to a predetermined value, the stop member being arranged to move longitudinally with the closure member.

11. A firearm comprising a firing chamber, a movable closure member for closing the firing chamber, a stop member, a separate locking member adapted to be interposed between the stop member and closure member when the latter is in normal position for locking the closure member against the breech pressure, the said members having coöperating abutting surfaces certain of which are inclined relatively to the direction of said pressure but so that the locking member is forced from between the closure and stop members when the pressure diminishes to a predetermined value, and means operative upon one of said first two members for automatically moving the two members into normal position.

12. A firearm comprising a firing chamber, a movable closure member for closing the firing chamber, a stop member, a separate locking member adapted to be interposed between the stop member and closure member when the latter is in normal position for locking the closure member against the breech pressure, the said members having coöperating abutting surfaces certain of which are inclined relatively to the direction of said pressure so that the members are locked together by the full pressure but so that the locking member is forced from between the closure and stop members when the pressure diminishes to a predetermined value, and yielding means operative upon the locking means for moving the locking member and closure member into normal position.

13. A firearm comprising a firing chamber, a breech closure for closing the firing chamber, a stop, a separate locking member adapted to be interposed between the stop and closure when the latter is in normal position to lock the closure against the breech pressure, the locking member and stop having abutting surfaces inclined to the direction of said pressure so that the members are locked together by the full pressure but so that the locking member is forced from between the closure and the stop when the pressure diminishes to a predetermined value, and means operative upon the locking means for automatically moving the breech closure and locking member into operative position.

14. A firearm comprising a firing chamber, a reciprocatory bolt, a bolt lock mounted on the bolt to move transversely thereof and having a forward surface abutting against a rear surface of the bolt, a stop having a forward surface abutting against a rear surface of the lock when the latter is in normal position to counteract the breech pressure transmitted through the medium of the bolt and lock, the abutting surfaces of the lock and stop being inclined to the abutting surfaces of the bolt and lock, so that the bolt, lock and stop are locked together by the full breech pressure but so that the block is forced transversely of the bolt from in front of the stop when the reaction diminishes to a predetermined value, and yielding means operative upon the lock to advance the bolt and lock into normal position after firing.

15. A firearm comprising a firing chamber, a reciprocatory bolt, a bolt lock mounted on the bolt to move transversely thereof and having a forward surface abutting against a rear surface of the bolt, a stop having a forward surface abutting against a rear surface of the lock when the latter is in normal position to counteract the breech pressure transmitted through the medium of the bolt and lock, the abutting surfaces of the lock and stop being inclined to the direction of said pressure and the abutting

surfaces of the bolt and lock being inclined to said direction a lesser amount, the relative inclination of the two sets of surfaces being such that the bolt, lock and stop are locked together by the full breech pressure and the lock is forced transversely of the bolt from in front of the stop when the pressure diminishes to a certain value, and means operative upon the lock to move the bolt into normal position, the inclination of the abutting surfaces of the lock and bolt being so determined as to move the lock transversely of the bolt into position in front of the stop.

16. A firearm comprising a firing chamber, a guideway behind the firing chamber, a bolt movable longitudinally of the guideway, a lock movable with and transversely of the bolt for locking the bolt in normal position, the guideway being provided with a slot comprising a longitudinal portion and a forward portion extending obliquely from the longitudinal portion, and a guide member projecting from said lock into said slot, the parts being so arranged that the lock travels longitudinally with the bolt when the guide member is in the longitudinal portion of said slot and laterally of the bolt when the guide member reaches said forward portion, and the obliquity of said forward portion of the slot being such that the full breech pressure transmitted through said bolt and said block to the guideway produces no appreciable relative movement of the parts and that when the pressure diminishes to a certain value the lock is forced transversely of the bolt until said guide member passes out of the forward portion of the slot, thereby unlocking the bolt.

17. A firearm comprising a firing chamber, a guideway behind the firing chamber, a bolt movable longitudinally of the guideway, a lock movable with and transversely of the bolt for locking the bolt in normal position, the guideway being provided with a slot comprising a longitudinal portion and a forward portion extending obliquely from the longitudinal portion, and a guide member projecting from said lock into said slot, the parts being so arranged that the lock travels longitudinally with the bolt when the guide member is in the longitudinal portion of said slot and laterally of the bolt when the guide member reaches said forward portion, the obliquity of said forward portion of the slot being such that the full breech pressure transmitted through said bolt and said lock to the guideway produces no appreciable relative movement of the parts and that when the pressure diminishes to a certain value the lock is forced transversely of the bolt until said guide member passes out of the forward portion of the slot, thereby unlocking the bolt, and yielding means operative upon the lock to advance the bolt into forward position and to advance the lock into locking position in the forward portion of said slot.

18. A firearm comprising a firing chamber, a guideway behind the firing chamber, a bolt movable longitudinally of the guideway, a lock movable with and transversely of the bolt for locking the bolt in normal position, the guideway being provided with a slot comprising a longitudinal portion and a forward portion extending obliquely from the longitudinal portion, and a guide member projecting from said lock into said slot, the parts being so arranged that the lock travels longitudinally with the bolt when the guide member is in the longitudinal portion of said slot and laterally of the bolt when the guide member reaches said forward portion, said lock having a forward face engaging a rear face of the bolt and the engaging faces being oblique to the forward portion of said slot, and the relative obliquity of said faces and the forward portion of said slot being such that the full breech pressure transmitted through said bolt and said lock to the guideway produces no appreciable relative movement of the parts but that when the pressure diminishes to a certain value the lock is forced transversely of the bolt until said guide member passes out of the forward portion of the slot, thereby unlocking the bolt.

19. A firearm comprising a firing chamber, a guideway behind the firing chamber, a bolt movable longitudinally of the guideway, a lock movable with and transversely of the bolt for locking the bolt in normal position, the guideway being provided with a slot comprising a longitudinal portion and a forward portion extending obliquely from the longitudinal portion, and a guide member projecting from said lock into said slot, the parts being so arranged that the lock travels longitudinally with the bolt when the guide member is in the longitudinal portion of said slot and laterally of the bolt when the guide member reaches said forward portion, and yielding means operative upon the lock to advance the bolt into forward position and to advance the lock into locking position in the forward portion of said slot, said lock having a forward face engaging a rear face of the bolt and the engaging faces being oblique to said longitudinal portion of the slot in the same direction as the oblique portion of the slot so as to impel the lock upwardly along the oblique portion of the slot when the parts are moved forwardly, and the relative obliquity of said faces and the forward portion of said slot being such that the full breech pressure transmitted through said bolt and said lock to the guideway produces no appreciable relative movement of the parts and that when the pressure diminishes

to a certain value the lock is forced transversely of the bolt until said guide member passes out of the forward portion of the slot, thereby unlocking the bolt.

20. A gun comprising a frame, a firing chamber, a breech closure movable into and out of position to close said chamber, a lock carried by said closure for locking the closure in said position, yielding means operative upon said closure through the medium of said lock for moving the closure into said position, and a guide on said frame oblique to the path of said closure for guiding said lock laterally of said path into locking position as the closure approaches said position.

21. A firearm comprising a receiver, a breech-block, a stop and a lock normally interposed between the breech-block and stop with surfaces abutting the block and stop respectively, certain of said surfaces being inclined to the direction of breech pressure in such degree that the lock is restrained in locking position by high breech pressure, but is forced from between the block and stop in direct response to the breech pressure after the pressure has diminished to a relatively low value.

22. A firearm comprising a receiver, a breech-block, a stop and a lock normally interposed between the breech-block and stop with surfaces abutting the block and stop respectively, certain of said surfaces, including the lock-stop surfaces, being inclined to the dircetion of breech pressure in such degree that the lock is restrained in locking position by high breech pressure, but is forced from between the block and stop in direct response to the breech pressure after the pressure has diminished to a relatively low value.

23. A firearm comprising a receiver, a breech-block, a stop and lock normally interposed between the breech-block and stop with surfaces abutting the block and stop respectively, certain of said surfaces, including the lock-block surfaces, being inclined to the direction of breech pressure in such degree that the lock is restrained in locking position by high breech pressure, but is forced from between the block and stop in direct response to the breech pressure after the pressure has diminished to a relatively low value.

24. Breech closure for firearms, comprising a breech block, a stop, and a locking member in slidable engagement with both breech block and stop, the surfaces of engagement being inclined to the line of breech pressure in the same direction at different angles, the angular differential being such that the locking member is held in locking position during high breech pressure but moves between the breech block and stop by low breech pressure.

25. A firearm comprising a firing chamber, a guideway at the rear of the firing chamber, a breech closure member slidably disposed in said guideway, a locking member movable with and transversely of the breech closure member in the guideway for locking the breech closure member in advanced position, the breech closure member, locking member and guideway having abutting surfaces inclined to the line of breech pressure in the same direction at different angles so that the locking member is moved transversely of the breech closure member to unlock it when breech-pressure is partially spent, and means operative on one of said members to slide the breech closure member in the guideway and to move the locking member transversely of the breech closure member.

26. A firearm comprising a firing chamber, a movable closure member for closing the firing chamber, a stop-member, a separate locking member adapted to be interposed between the stop member and closure member when the latter is in normal position, for locking the closure member against breech pressure, the said members having coöperating abutting surfaces inclined in the same direction to the line of breech pressure at different angles, the angular differential being such that the members are locked together by full breech pressure, but released for and actuated to relative movement when the pressure diminishes to a predetermined value, the locking member being arranged to move longitudinally with the closure member.

27. A firearm comprising a firing chamber, a movable closure member for closing the firing chamber, a stop-member, a separate locking member adapted to be interposed between the stop member and closure member when the latter is in normal position, for locking the closure member against breech pressure, the said members having coöperating abutting surfaces inclined in the same direction to the line of breech pressure at different angles, the angular differential being such that the members are locked together by full breech pressure, but released for and actuated to relative movement when the pressure diminishes to a predetermined value, the locking member being arranged to move longitudinally with the closure member, and means operative on one of said members to move them into breech closing position.

28. A firearm comprising a firing chamber, a reciprocatory bolt, a bolt lock mounted on the bolt to move transversely thereof and having a forward surface, inclined to the line of breech pressure, abutting against a similarly inclined rear surface of the bolt, a stop having a forward surface, inclined to the line of breech pressure and to

the said rear surface of the bolt, abutting against a similar inclined rear surface of the lock, the inclination of all said surfaces being in the same direction referred to the line of breech pressure, the angular differential between the bolt-lock surfaces and the lock-stop surfaces being such that the bolt and lock and stop are locked together by full breech pressure but free and actuated to move in response to a diminished breech pressure.

29. A firearm comprising a firing chamber, a reciprocatory bolt, a bolt lock mounted on the bolt to move transversely thereof and having a forward surface, inclined to the lien of breech pressure, abutting against a similarly inclined rear surface of the bolt, a stop having a forward surface, inclined to the line of breech pressure and to the said rear surface of the bolt, abutting against a similarly inclined rear surface of the lock, the inclination of all said surfaces being in the same direction referred to the line of breech pressure, the angular differential between the bolt-lock surfaces and the lock-stop surfaces being such that the bolt and lock and stop are locked together by full breech pressure but free and actuated to move in response to a diminished breech pressure, and yielding means operative on the lock to advance the bolt and lock into breech closing position.

30. Breech closure mechanism, comprising a breech block provided with a surface inclined to the line of breech pressure, a lock embracing said breech block and mounted to slide on said inclined surface transversely of the breech block, a stop having a surface inclined to the line of breech pressure at an angle less than that of said breech-block surface, means projecting from the lock to engage the inclined surface of said stop, the angle between the breech block inclined surface and the inclined stop surface being such as to lock the breech block during high breech pressures and to release the breech block at lower breech pressure.

31. Breech closure mechanism, comprising a breech block provided with a surface inclined to the line of breech pressure, a lock embracing said breech block and mounted to slide on said inclined surface transversely of the breech block, a stop having a surface inclined to the line of breech pressure at an angle less than that of said breech-block surface, means projecting from the lock to engage the inclined surface of said stop, the angle between the breech block inclined surface and the inclined stop surface being such as to lock the breech block during high breech pressures and to release the breech block at lower breech pressure, and yielding means operative on the lock to move the breech block into closing position.

32. Breech closure mechanism comprising a receiver, a breech block longitudinally movable in the receiver, the breech block provided with slots having rearward surfaces inclined to the line of breech pressure, a lock embracing the breech block and slidable transversely thereto on said inclined surfaces, the receiver provided with slots having forward surfaces inclined to the line of breech pressure at an angle less than that of the said inclined surface on the breech block, projections from the lock to engage the said inclined surfaces of said slots, the angular differential between the aforesaid inclined surfaces being adapted to lock the breech block when subjected to high breech pressure and to release the breech block for movement in response to lower breech pressures.

33. Breech closure mechanism comprising a receiver, a breech block longitudinally movable in the receiver, the breech block provided with slots having rearward surfaces inclined to the line of breech pressure, a lock embracing the breech block and slidable transversely thereto on said inclined surfaces, the receiver being provided with slots having forward surfaces inclined to the line of breech pressure at an angle less than that of the said inclined surface on the breech block and with guideways parallel to the breech block, communicating with said slots, projections from the lock to engage the said inclined surfaces of said slots, the angular differential between the aforesaid inclined surfaces being adapted to lock the breech block when subjected to high breech pressure and to release the breech block for movement in response to lower breech pressures.

34. Breech closure mechanism comprising a receiver, a breech block longitudinally movable in the receiver, the breech block provided with slots having rearward surfaces inclined to the line of breech pressure, a lock embracing the breech block and slidable transversely thereto on said inclined surfaces, the receiver provided with slots having forward surfaces inclined to the line of breech pressure at an angle less than that of the said inclined surface on the breech block, projections from the lock to engage the said inclined surfaces of said slots, the angular differential between the aforesaid inclined surfaces being adapted to lock the breech block when subjected to high breech pressure and to release the breech block for movement in response to lower breech pressures, and means operative on said lock to move the bolt into breech-closing position.

35. Breech closure mechanism comprising a receiver, a breech block longitudinally movable in the receiver, the breech block provided with slots having rearward surfaces inclined to the line of breech pressure, a lock embracing the breech block and slidable transversely thereto on said inclined

surfaces, the receiver being provided with slots having forward surfaces inclined to the line of breech pressure at an angle less than that of the said inclined surface on the breech block and with guideways parallel to the breech block, communicating with said slots, projections from the lock to engage the said inclined surfaces of said slots, the angular differential between the aforesaid inclined surfaces being adapted to lock the breech block when subjected to high breech pressure and to release the breech block for movement in response to lower breech pressure, and means operative on said lock to move the bolt into breech-closing position.

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

THEODORE H. EICKHOFF.
OSCAR V. PAYNE.