A. T. DAWSON AND G. T. BUCKHAM.

LOCK MECHANISM OF ORDNANCE.

APPLICATION FILED JUNE 21, 1917.

1,303,638.

Patented May 13, 1919.

4 SHEETS—SHEET 1.

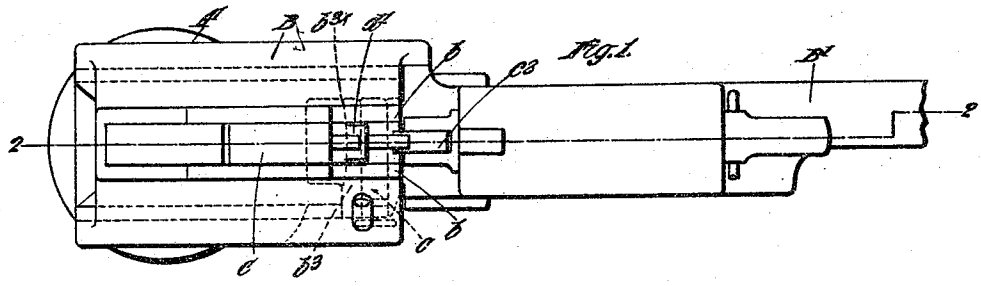


Fig. 1.

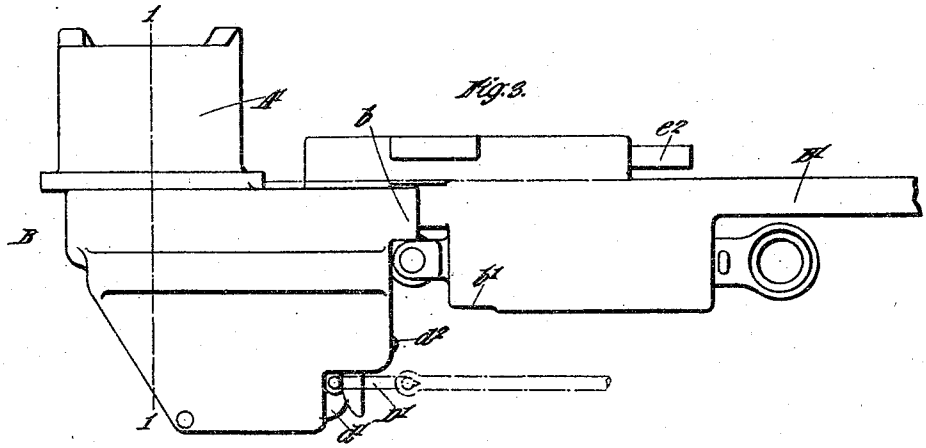


Fig. 3.

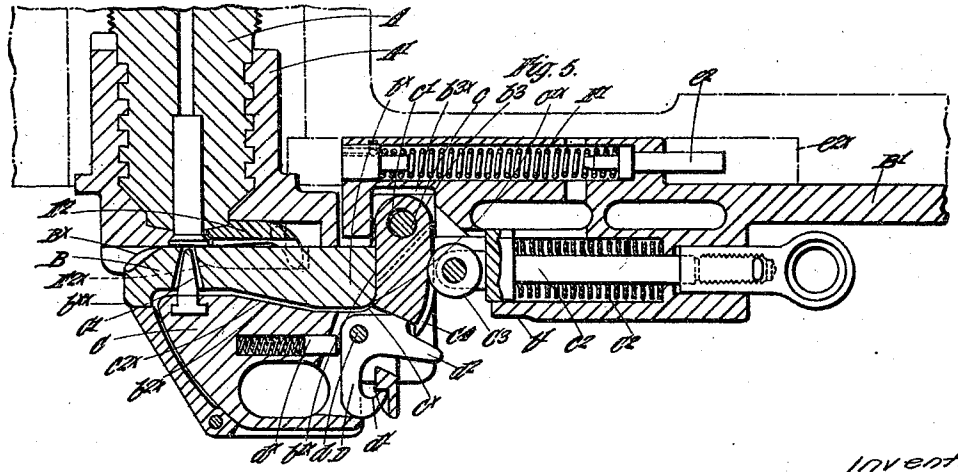


Fig. 5.

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Fig. 2.

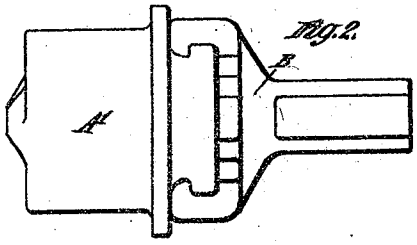


Fig. 1a.

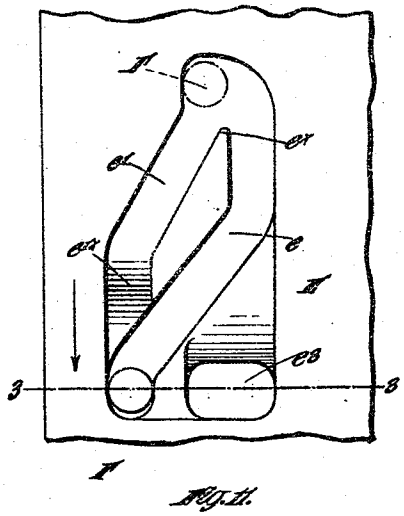


Fig. 4.

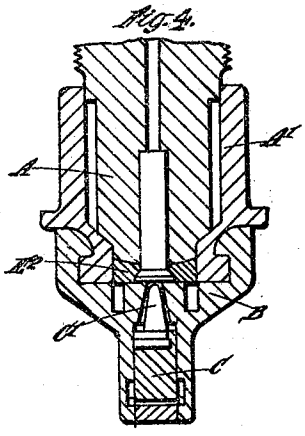
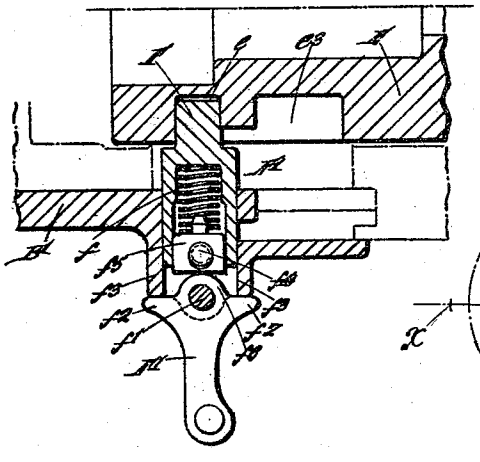


Fig. 1.



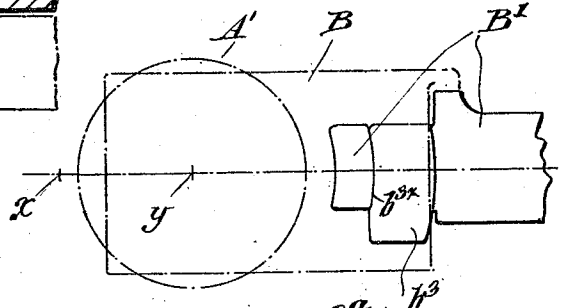


Fig. 3a.

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4 SHEETS—SHEET 3.

Fig. 6.

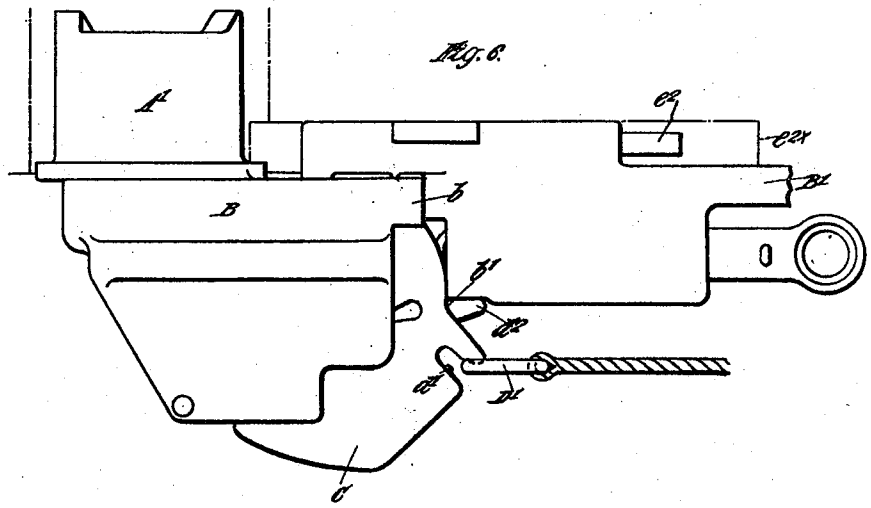
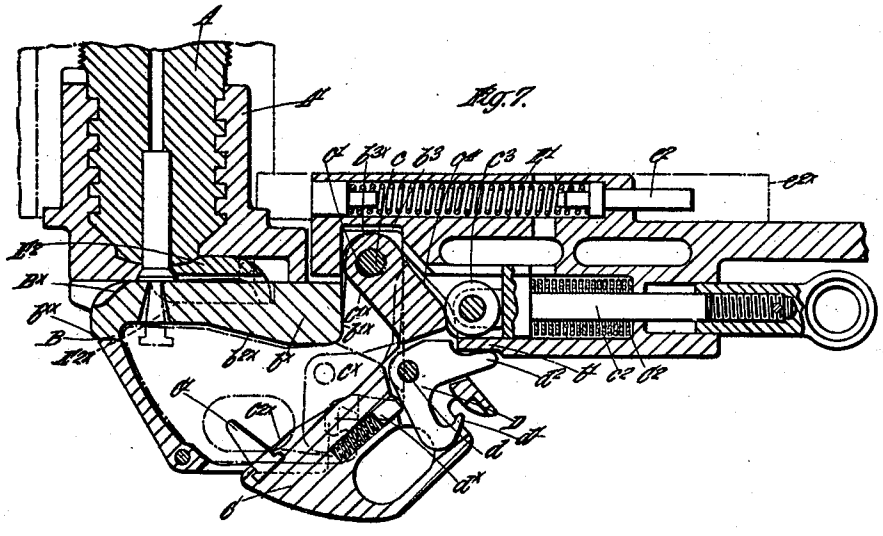


Fig. 7.



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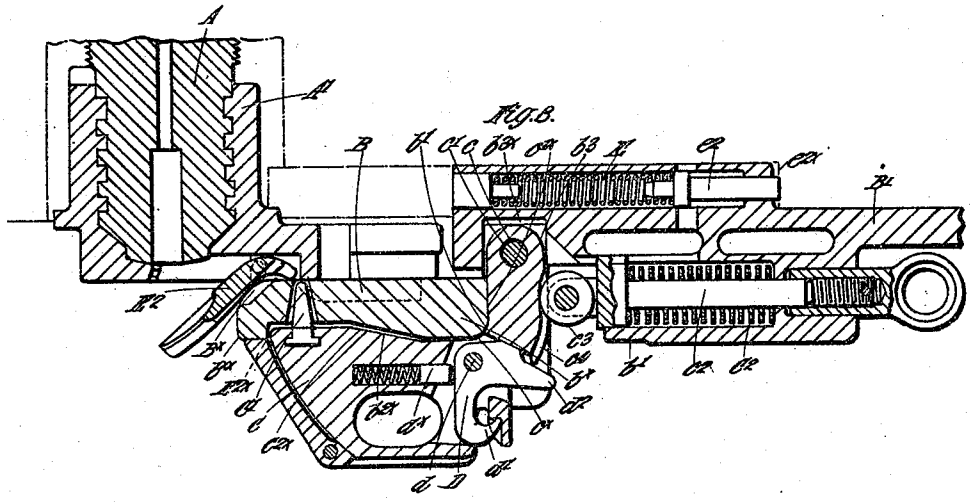


Fig. 8.

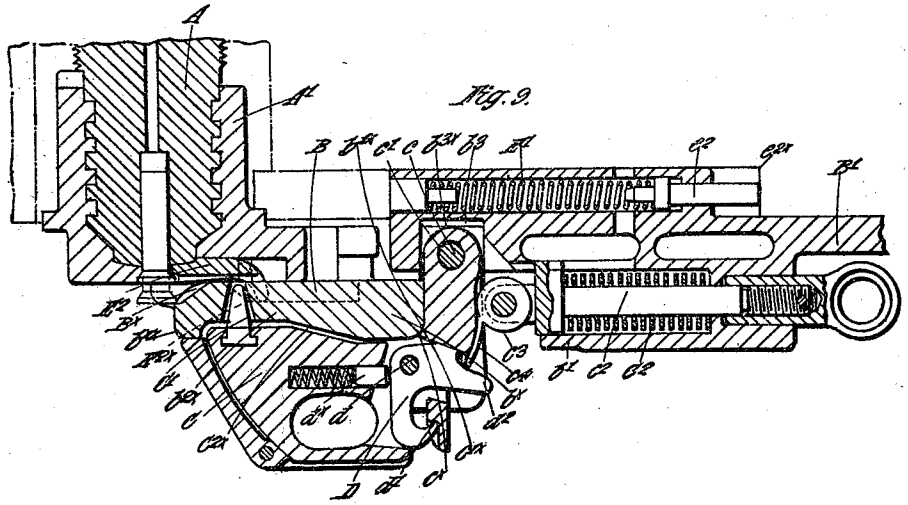


Fig. 9.

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UNITED STATES PATENT OFFICE.

ARTHUR TREVOR DAWSON AND GEORGE THOMAS BUCKHAM, OF WESTMINSTER, LONDON, ENGLAND, ASSIGNORS TO VICKERS LIMITED, OF WESTMINSTER, LONDON, ENGLAND.

LOCK MECHANISM OF ORDNANCE.

1,303,638. Specification of Letters Patent. Patented May 13, 1919.

Application filed June 21, 1917. Serial No. 176,107.

To all whom it may concern:

Be it known that we, Sir ARTHUR TREVOR DAWSON, knight, and GEORGE THOMAS BUCKHAM, both subjects of the King of Great Britain, residing at Vickers House, Broadway, Westminster, in the county of London, England, have invented certain new and useful Improvements in or Relating to the Lock Mechanism of Ordnance, of which the following is a specification.

This invention relates to ordnance lock mechanism particularly of the kind in which the firing pin forms part of or is mounted on a spring controlled pivoted or rocking hammer carried by the lock frame and in which the final firing movement is effected by momentum, this movement taking place against the resistance of a spring which brings the point of the firing pin within the front face of the lock frame.

According to the invention the pivoted or rocking hammer and its main spring are so constructed and arranged that one end of the spring, viz. that which urges the hammer forward to fire the gun, is caused to be displaced in the reverse direction by the momentum of the hammer during its final forward movement to retract the hammer and bring the point of the firing pin within the front face of the lock frame. The said hammer during its forward movement under the influence of the main spring, turns about one fulcrum and during its final forward movement under the influence of momentum turns about another fulcrum. For this purpose the hammer may be connected to the lock frame by a pivot pin and an elongated hole or slot, the main spring tending to hold one surface of this slot constantly against the pivot pin or the pivot pin against the said surface. As the hammer approaches the end of its forward or firing movement under the influence of the main spring, a portion of the hammer comes against a projection on the lock frame; the action of the spring is thereby arrested and the hammer completes its forward movement under the influence of its momentum as aforesaid this movement taking place about the said projection which then constitutes the second fulcrum for the hammer. The rocking action of the hammer about this fulcrum is permitted owing to the aforesaid pin and slot connection between the lock frame and the hammer.

The above described firing mechanism is preferably of the slip type and the lanyard hook or eye or other device which retracts the hammer and between which and the hammer the slip action takes place, is normally retained in its operative engagement with the hammer by a member or guard which is pivoted or otherwise movably mounted on the hammer and is so constructed and arranged that as the hammer is completing its rearward movement, the guard is moved to liberate the lanyard which by the pull exerted thereon to retract the hammer becomes completely detached from the latter.

The lock frame is of the rectilinearly and laterally sliding type and is connected to the actuating link by a coupling having a curved surface struck from the axis of the gun when the lock frame is in the open position; thus only when the lock frame is in the open position can the box slide be angularly displaced on the axial vent bolt to effect engagement or disengagement between the lock frame and the actuating link.

The lock frame is adapted to be opened, during the unlocking of the breech screw, by a rotary cam which may be carried by the breech actuating hand lever shaft or may be operated therefrom through suitable gearing. This cam is of such a character that as the lock frame reaches its fully open position with the breech screw fully unlocked, the lock frame is no longer acted upon by the cam with the result that a spring which was energized during the latter portion of the opening movement of the lock frame will shift the latter toward the closed position until the inner end projects slightly over the tube or primer chamber of the axial vent. This arrangement enables the lock frame to serve as a tube retainer and permits a single piece extractor to be used; the employment of this extractor is possible because the latter is pushed home by the lock frame during its initial closing movement under the influence of the aforesaid spring and before a tube or primer is inserted, whereas in those cases where the insertion of a tube or primer is effected when the lock frame is in the fully open

position, tripping gear is necessary to enable the extractor to be pushed home by the tube or primer.

The handle for operating the guide bolt of the actuating link is so constructed and arranged that whether this handle be moved toward or away from the axis of the gun, the guide bolt will be withdrawn from the member of the breech mechanism that actuates the lock frame.

In order that the said invention may be clearly understood and readily carried into effect, we will describe the same more fully with reference to the accompanying drawings, in which:—

Figures 1, 2 and 3 are respectively an end elevation, a side elevation and a plan of a lock constructed in accordance with our invention.

Fig. 3ª is a diagrammatic rear elevation showing the aforesaid coupling between the lock frame and the actuating link.

Fig. 4 is a section taken approximately on the line 1—1 of Fig. 3.

Fig. 5 is a section taken approximately on the line 2—2 of Fig. 1, showing the lock frame in its closed position and the firing mechanism ready to be fired.

Figs. 6 and 7 are views similar to Figs. 3 and 5, but showing the hammer retracted and on the point of moving forward to fire the gun; Fig. 7 also shows the hammer by chain lines in its forward or firing position.

Fig. 8 is a view similar to Fig. 5 but showing the lock frame in the open position, and

Fig. 9 is a view similar to Fig. 8 but showing the lock frame returning to its partially closed position.

Fig. 10 is a development of the aforesaid cam for actuating the lock frame, and

Fig. 11 is a section taken approximately on the line 3, 3 of Fig. 10.

A is the axial vent bolt, A′ the box slide, B the lock frame, and B′ the actuating link for the lock frame. C is the hammer, C′ the firing pin and C^2 the main spring.

In the example shown the box slide A′ is of simple form, the lock frame B being arranged to slide over the same as is understood. This construction gives great accessibility for insertion of the tube or primer into its chamber in the axial vent bolt.

The firing pin C′ is detachably connected to the hammer C and the latter is pivoted by a pin c and an elongated hole or slot c' to the lock frame B between lugs b, b thereon, these lugs also serving to receive one end of the actuating link B′. The main spring C^2 which is of the helical compression type is carried by the actuating link B′ and operates upon the hammer C through the intermediary of a plunger c^2 carrying a roller c^3 that bears against the hammer. The hammer is grooved at c^4 to receive the roller c^3 in such a manner that the spring plunger c^2 acts as a lock retainer and holds the box slide and lock frame in the assembled position relatively to the actuating link, owing to the fact that the engagement of the roller with the groove prevents angular dismantling movement of the box slide. A ring head is provided on the plunger c^2 to enable it to be pulled back for dismantling the lock, and also to facilitate the assembling of the main spring C^2 and the said plunger.

When the hammer C is retracted against the resistance of the main spring C^2 the parts are in the position shown by full lines in Fig. 7. When the hammer is released the spring C^2 causes it to fly forward until the portion $c^\times$ thereon comes into contact with a corner $b^\times$ on the lock frame. The parts are then in the position shown by Fig. 5, with the face $c'^\times$ of the hammer resting in contact with the surface $b'^\times$ of the lock frame; the spring C^2 cannot therefore continue to move the hammer forward. The momentum of the hammer, however, causes it to rock about the corner $b^\times$ of the lock frame and fire the gun, this movement being permitted by the pin and slot connection c, c'. This position is shown by chain lines in Fig. 7 from which it will be seen that the firing movement of the hammer is limited by a surface $c^{2\times}$ on the hammer coming against a surface $b^{2\times}$ on the lock frame. This final firing movement of the hammer takes place against the resistance of the main spring C^2 which then re-acts to return the hammer to the retracted position shown by Figs. 5, 8 and 9. The firing pin is retained in position when the lock is assembled, by the walls of the lock frame.

D represents the aforesaid member or guard for retaining the lanyard hook or eye D′. This guard is pivoted at d to the hammer C and is controlled by a spring plunger $d^\times$ carried by the hammer; it has a hook shaped projection d' against which the lanyard hook or eye D′ bears and which normally fits in a recess in the contiguous portion of the hammer. The guard also has an arm d^2 which by its contact with a portion b' of the actuating link B′ causes the lanyard to be liberated as aforesaid (see Fig. 7). The pivot pin d of the guard is retained in position, when the lock is assembled, by the walls of the lock frame.

The actuating link B′ is slidably mounted in the breech screw carrier and is assembled by insertion from the left hand side, before the box slide A′ is in place on the axial vent bolt A. The said actuating link is connected to the lock frame by a coupling comprising a curved projection b^3 on the lock frame engaging with a correspondingly curved slot or groove $b^{3\times}$ in the actuating link (see particularly Fig. 3ª). The curvature of the projection and the slot or groove is struck from the center x at a distance from the

axis of the gun (which axis is indicated by y) equal to the distance through which the lock frame moves in assuming its open position. When the lock frame reaches its open position the center x of the curvature of the projection and the slot or groove coincides with the axis y of the gun. Thus the box slide can be angularly displaced for dismantling or assembling only when the lock frame is in the open position as, at any other time, the projection will jam in the curved slot or groove owing to the fact that the axis y about which it is endeavored to turn the box slide does not coincide with the center x of the curvature of the said projection and the said slot or groove.

E is the aforesaid rotary cam for moving the lock to the open position. F is the guide bolt with which this cam engages and f is the spring for controlling this guide bolt. E′ represents the spring for partly closing the lock frame as aforesaid this spring being carried by the actuating link B′. E^2 is the extractor which as aforesaid is in a single piece and is actuated by inclines $E^{2\times}$ on the lock frame as is well understood, these inclines giving the necessary powerful initial wedging action followed by rapid ejection of the tube or primer. The spring E′ is of the helical compression type and bears against a plunger e^2 which, after the lock frame has performed a predetermined portion of its opening movement, bears against a projection $e^{2\times}$ on the breech screw carrier so that the spring is energized during the final portion of the opening movement of the lock frame as aforesaid. The cam E is in the form of a grooved member with the grooves e, e' of which the guide bolt F engages. The guide bolt is in the position shown by full lines in Fig. 10, when the lock frame is closed; when the breech mechanism is being opened, the cam moves in the direction indicated by the arrow in Fig. 10; during this movement the groove e operates upon the guide bolt to displace the lock frame to the open position, the final portion of this movement taking place against the resistance of the spring E′ as aforesaid. When the part $e^\times$ of the member E moves clear of the guide bolt F the spring E′ displaces the lock frame into the partly closing position shown by Fig. 9 in which it overlaps the primer chamber.

The new tube or primer is then inserted, the lock frame during such insertion being slightly displaced outwardly against the resistance of its spring E′ by the engagement of the tube or primer head with an inclined or rounded surface $b^{\times\times}$ on the lock frame, the spring then re-acting to cause the lock frame to overlap the primer chamber and retain the tube or primer in place. The guide bolt F at this time occupies the position shown by chain lines in Fig. 10 so that when the breech mechanism is being closed the groove e' engages with the guide bolt F and displaces the lock frame to its closed position, the guide bolt during the final locking movement of the breech mechanism ascending an incline $e'^\times$ in the groove e' and dropping into the groove e. During the closing of the lock frame, an incline $B^\times$ thereon completes the insertion of the tube or primer. The said lock frame operating gear is of great simplicity and is comparatively free from outside fittings or projections.

The operating handle F′ of the guide bolt F is pivoted at f' (Fig. 11) to the guide bolt and has two arms or projections f^2; f^2 one arranged on each side of the pivot f'. Each of these arms or projections lies against a rearward extension f^3 on the actuating link when the guide bolt is in engagement with the aforesaid cam groove e. Thus when the operator, standing at one side of the gun, pulls the handle F′ the guide bolt is lifted out of the cam groove and the actuating link and the lock frame then slide to the open position during which operation the defective tube or primer is extracted. On releasing the handle it returns to its normal position and allows the guide bolt to enter a recess e^3 in the cam member E whereupon the re-action of the aforesaid spring E′ carried by the actuating link, brings the lock frame into the tube loading or partly closed position shown by Fig. 9. After a new tube or primer has been inserted the operator, standing at one side of the gun, pushes the handle F′ thus lifting the bolt out of the recess e^3 in the cam and sliding the lock frame to its closed position, the guide bolt reëngaging in the cam groove e when the handle is released. For dismantling, the guide bolt F, complete with its handle F′ and spring f can be removed intact by simply taking out a spring pin f^4 that passes through the link B′ and through a plug f^5 against which the rear end of the guide bolt spring f bears and which in turn bears against a projection f^6 on the handle F′.

What we claim and desire to secure by Letters Patent of the United States is:—

1. In firing mechanism for ordnance, the combination with a pivoted or rocking hammer, of a main spring and means whereby the end of said spring that urges the hammer forward to fire the gun, is caused to be displaced in the reverse direction by the momentum of the hammer during its final forward movement so as to retract the hammer and bring the point of the firing pin carried thereby, within the front face of the lock frame.

2. In firing mechanism for ordnance, the combination with a pivoted or rocking hammer, of means whereby during its forward movement under the influence of the main spring it turns about one fulcrum and dur-

ing its final forward movement under the influence of momentum the said hammer turns about another fulcrum.

3. In firing mechanism for ordnance, the combination with a spring controlled hammer and the lock frame, of a pivot pin disposed in an elongated hole or slot, the hammer during its forward or firing movement coming against a suitably formed part which serves as a fulcrum during the final firing movement of the hammer by its momentum.

4. In ordnance firing mechanism of the slip lock type, the combination with the hammer, of a lanyard hook or eye or other device which retracts the hammer and between which and the hammer the slip action takes place, a guard which is pivoted or otherwise movably mounted on the hammer and which normally retains said device in engagement with the hammer, of means whereby as the hammer is completing its rearward movement, the guard is moved to liberate the lanyard which by the pull exerted thereon to retract the hammer becomes completely detached from the latter.

5. In ordnance firing mechanism of the slip type, the combination with the hammer, of a lanyard hook or eye or other device which retracts the hammer, and between which and the hammer the slip action takes place, a spring controlled guard pivoted to the hammer, an arm on said guard and a stop against which said arm comes during the retraction of the hammer to move the said guard to its disengaging position.

6. In ordnance lock mechanism, the combination with the lock frame and the actuating link, of a coupling between said parts said coupling having curved surfaces struck from the axis of the gun when the lock frame is in the open position.

7. In ordnance lock mechanism, the combination with the lock frame, of a rotary cam which as the lock frame reaches its fully open position with the breech screw fully unlocked, no longer acts on the lock frame and a spring which was energized during the latter portion of the opening movement of the lock frame, for shifting the latter toward the closed position until the inner end projects slightly over the tube or primer chamber of the axial vent.

8. In ordnance lock mechanism, the combination with a grooved rotary cam, of a lock frame, an actuating link coupled thereto, a slidable guide bolt carried by the actuating link and engageable in the groove in the cam to displace the actuating link during the rotation of the cam, an operating handle for the guide bolt, and means whereby the guide bolt will be withdrawn from the cam groove when the handle is moved either toward or away from the axis of the gun; substantially as described.

9. In ordnance lock mechanism, the combination with a grooved rotary cam, of a lock frame, an actuating link coupled thereto and provided with a pair of spaced extensions, a slidable guide bolt carried by the actuating link and engageable in the groove in the cam to displace the actuating link during the rotation of the cam, and an operating handle pivoted to the guide bolt and provided with a pair of projections located one on each side of the pivot and adapted to bear against the adjacent extension on the actuating link when the handle is moved either toward or away from the axis of the gun so as to withdraw the guide bolt from the cam groove; substantially as described.

In testimony whereof we have hereunto affixed our signatures:

ARTHUR TREVOR DAWSON.
GEORGE THOMAS BUCKHAM.

Witnesses:
JNO. R. CASWELL,
GERTRUDE WHYTE.

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