

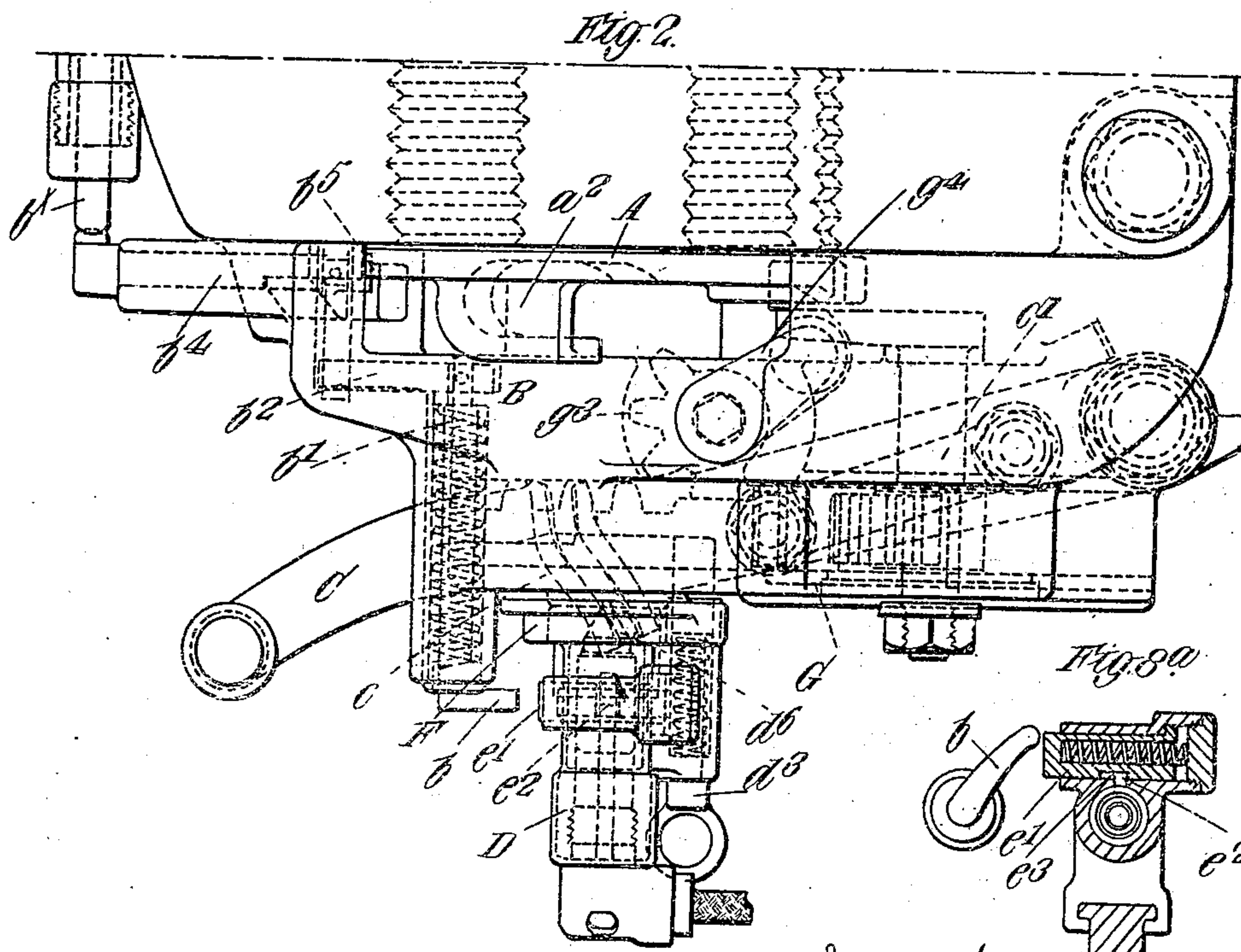
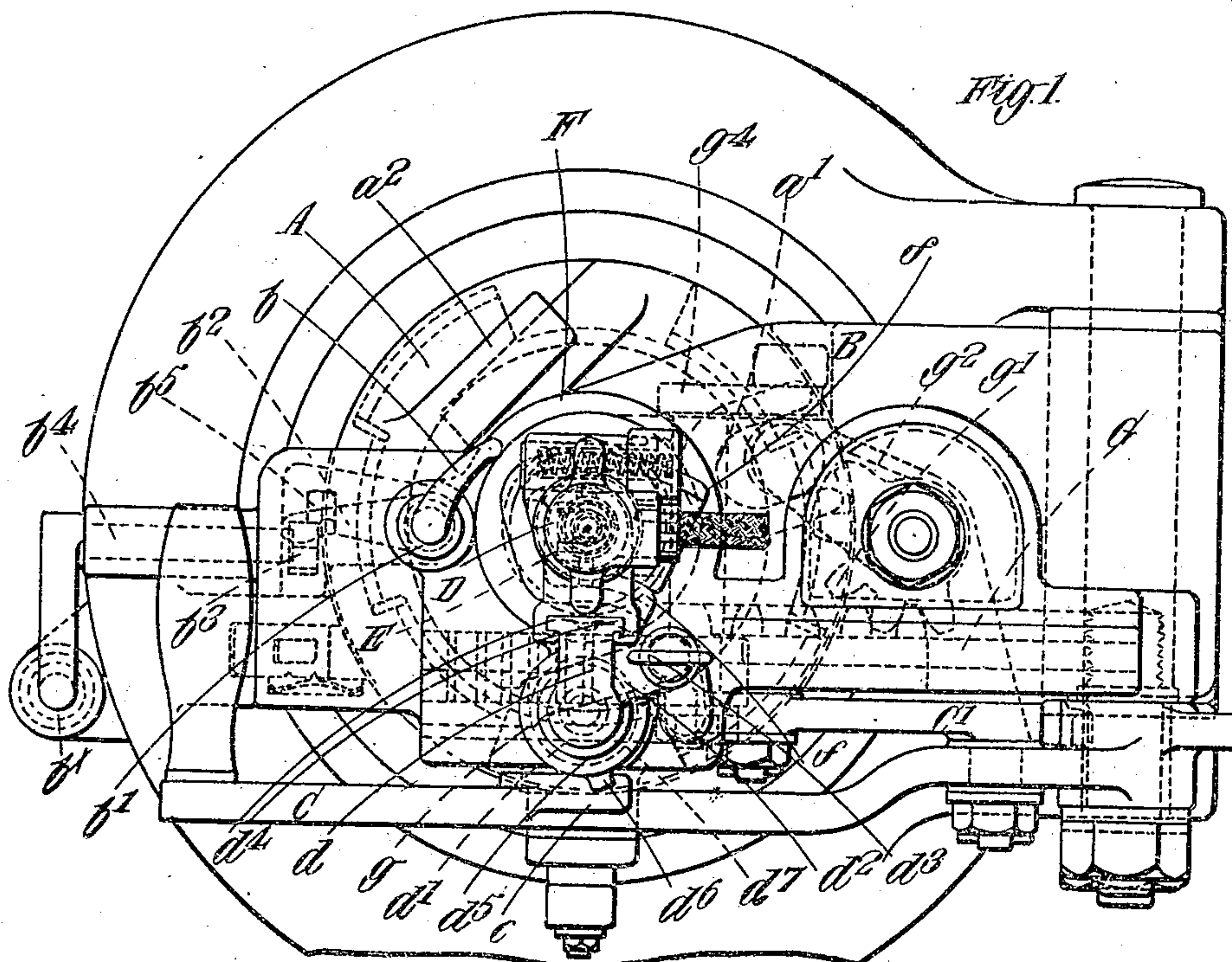
C. HOLMSTROM & A. E. MASCALL.
FIRING MECHANISM OF ORDNANCE.

APPLICATION FILED APR. 22, 1907.

958,642.

Patented May 17, 1910.

3 SHEETS—SHEET 1.



Witnesses
J. M. Myerhoff
L. R. Newitt

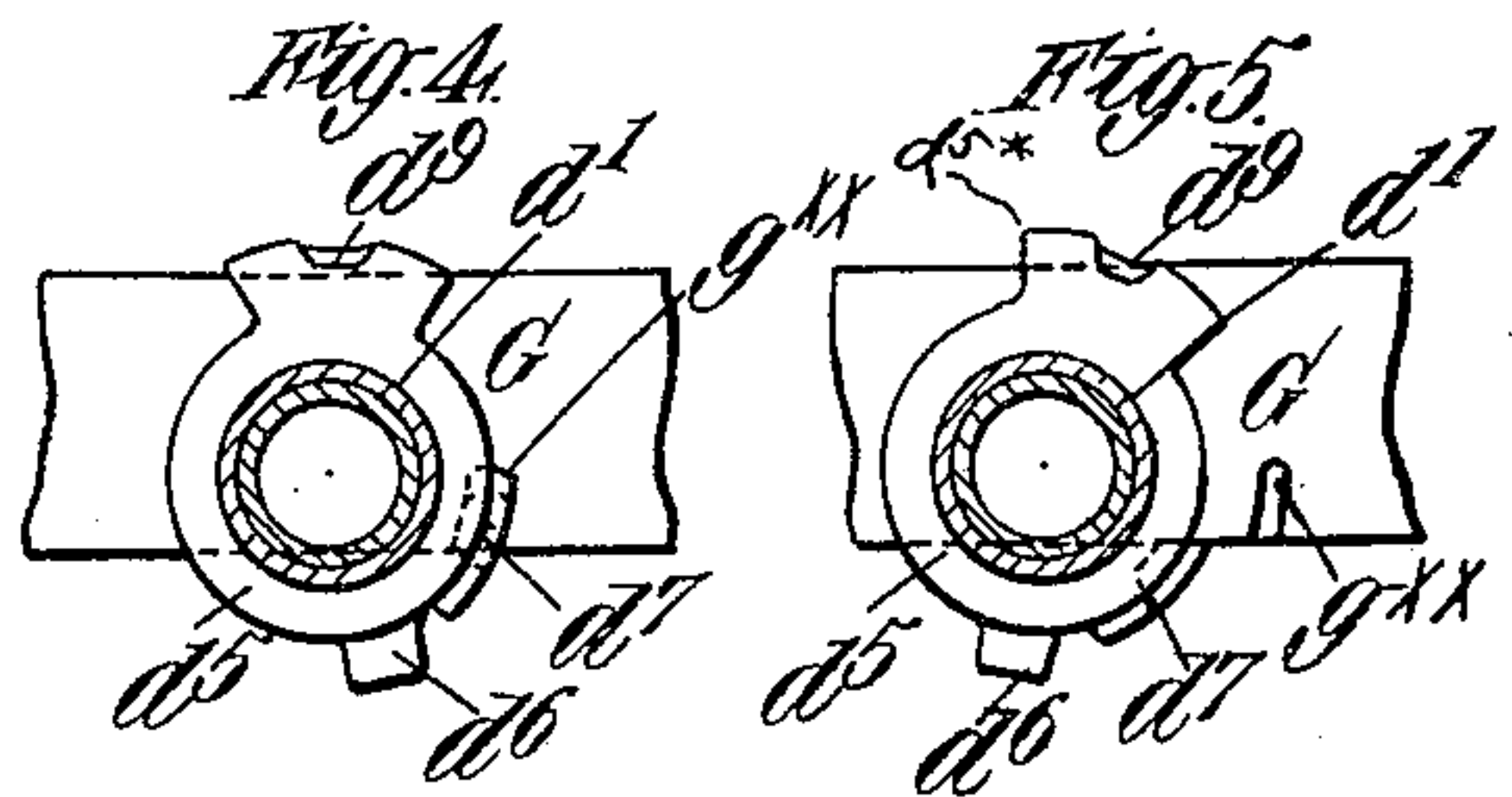
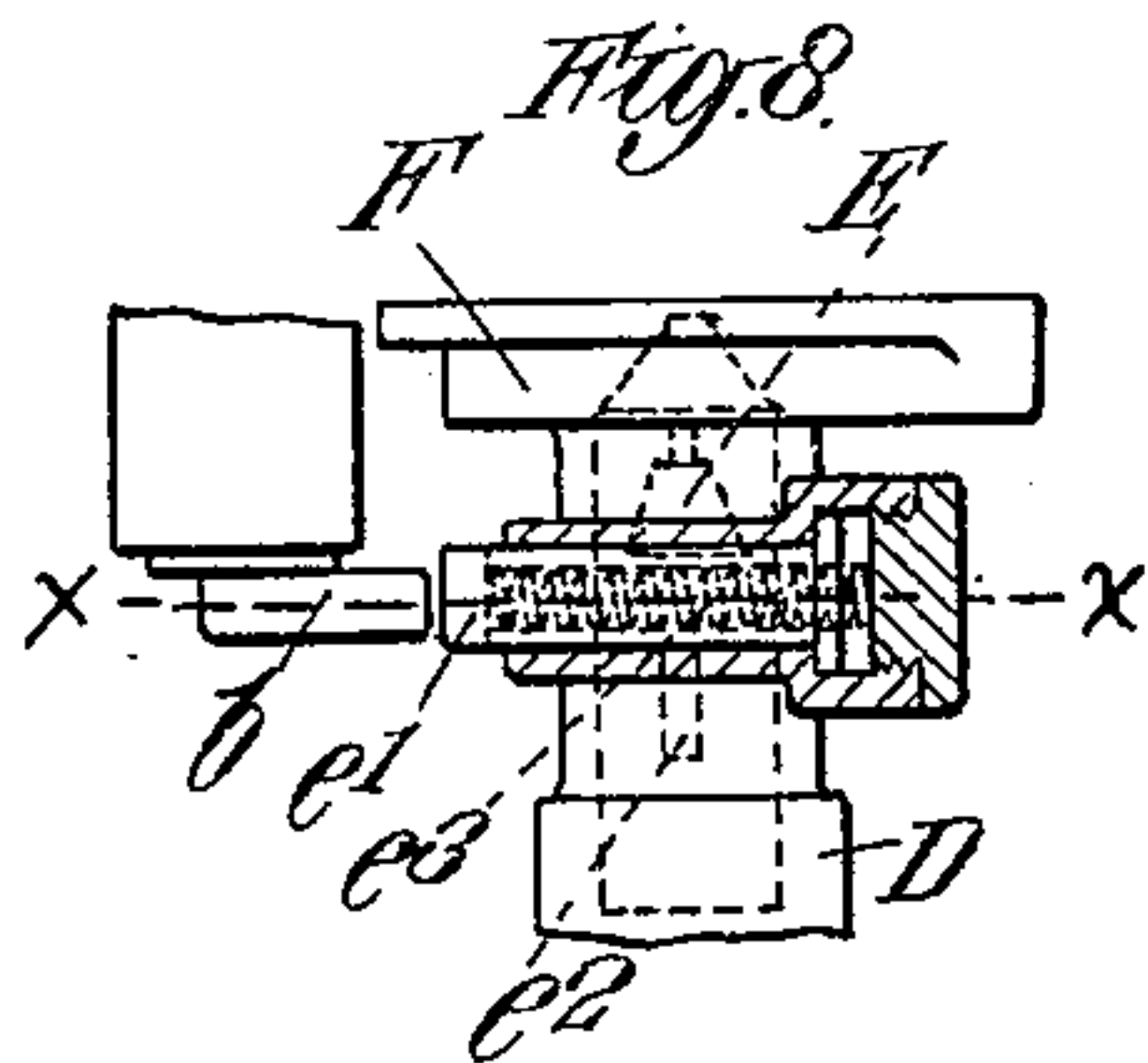
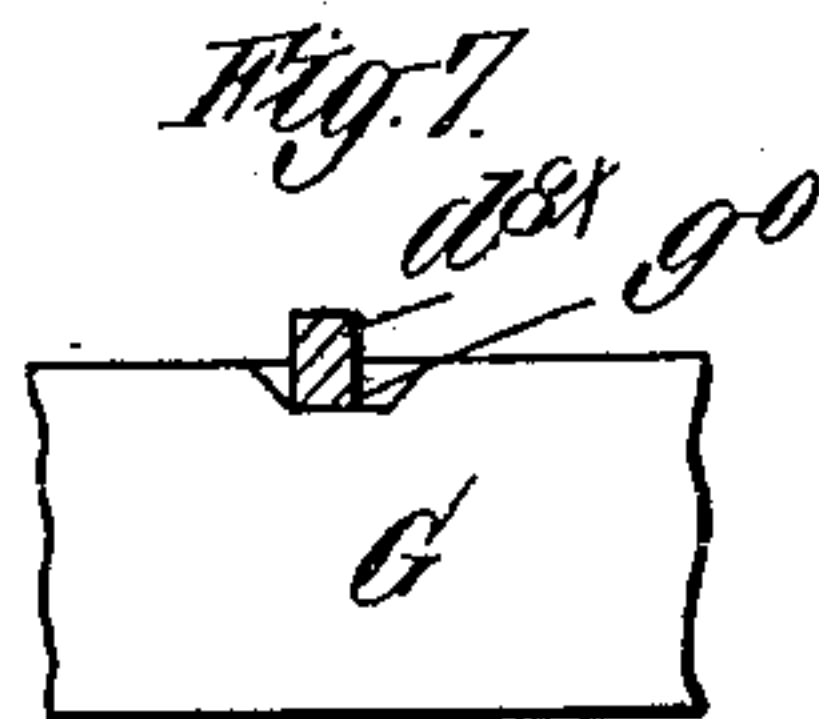
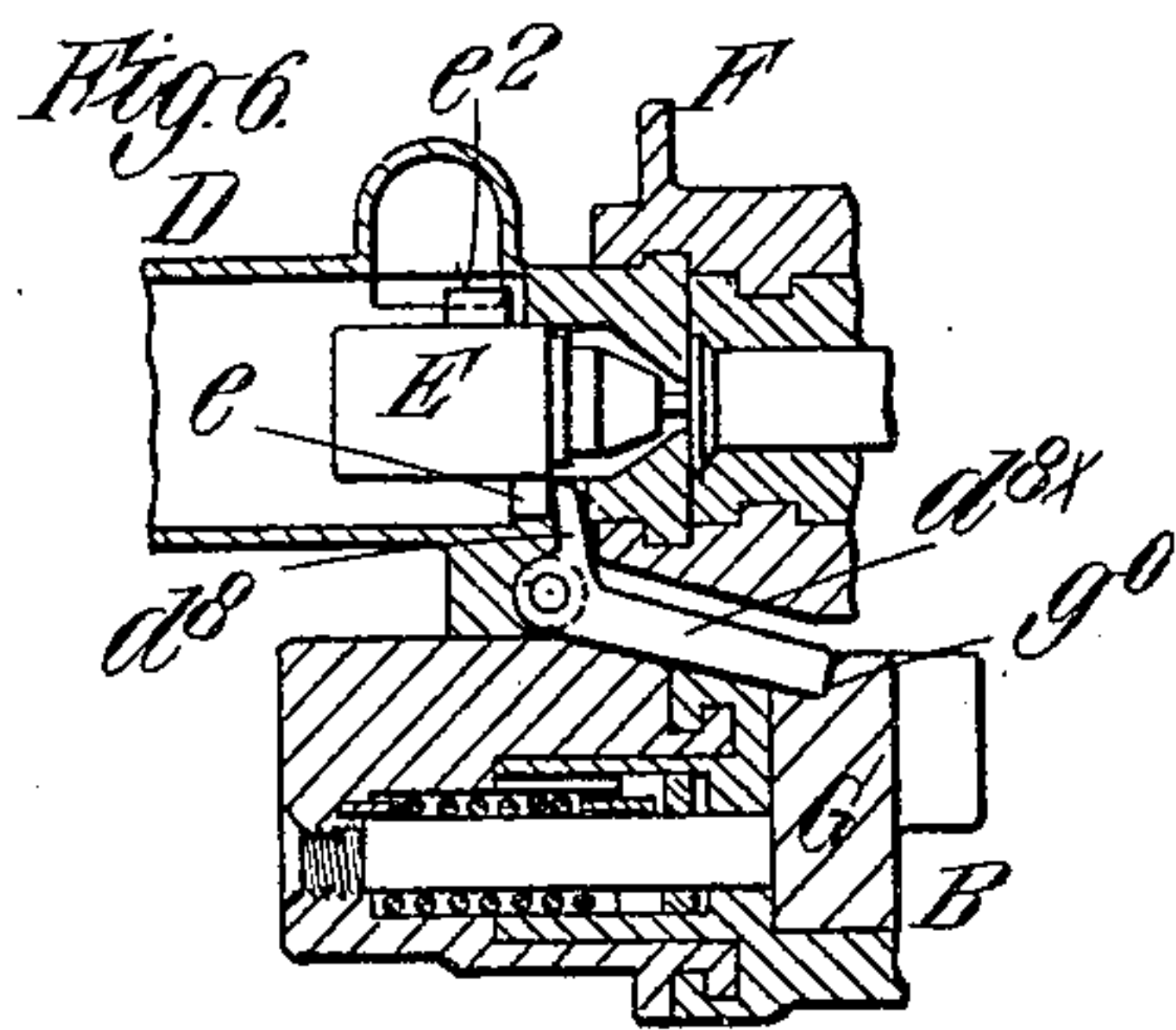
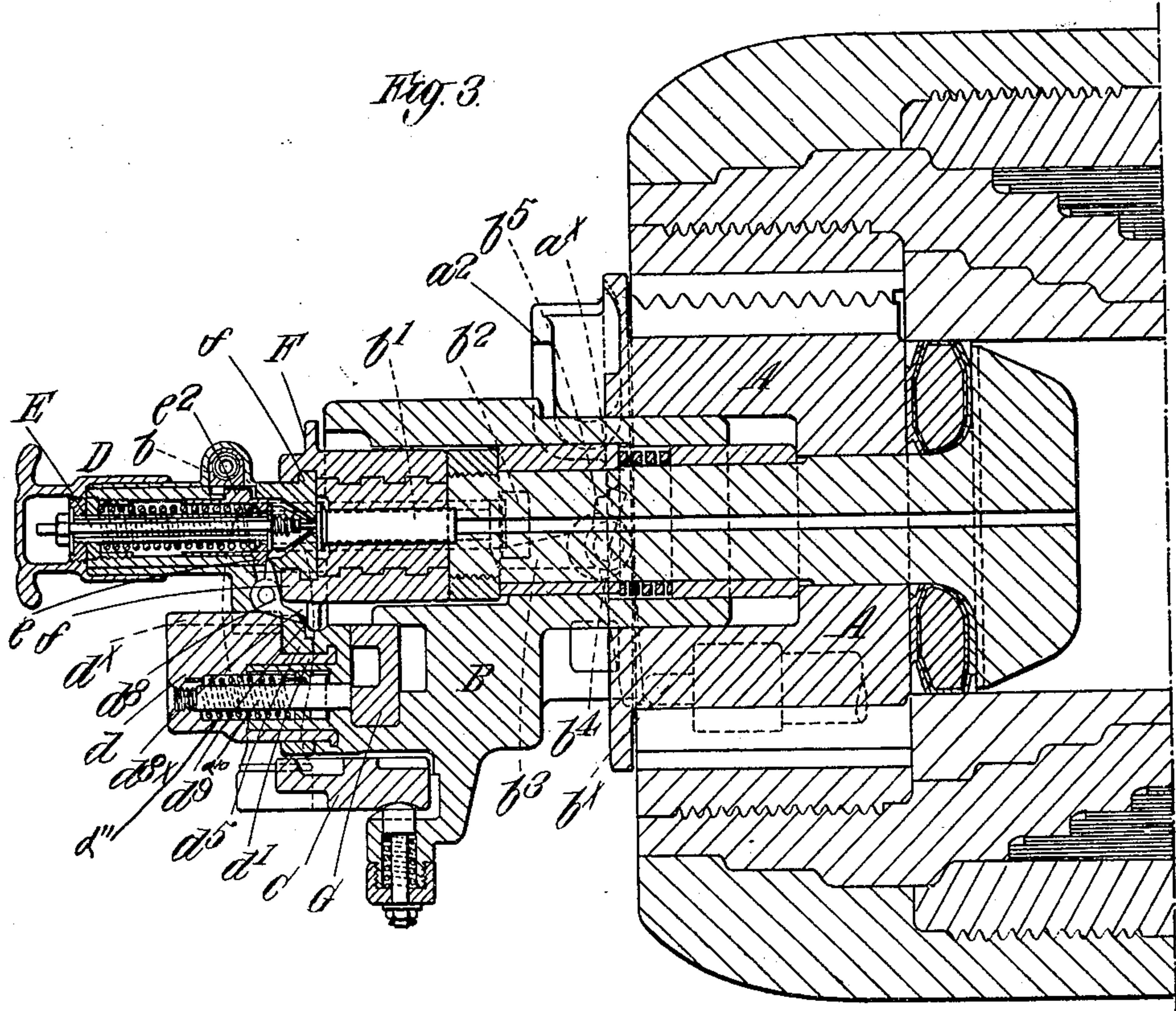
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By Knight Rogers attys

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3 SHEETS—SHEET 2.



Witnesses
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S. R. Nevitt

Inventors
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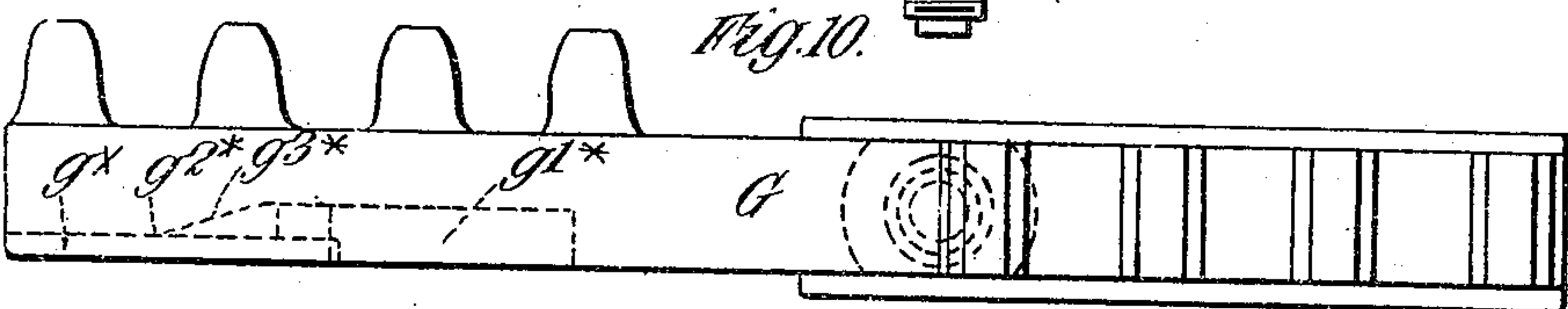
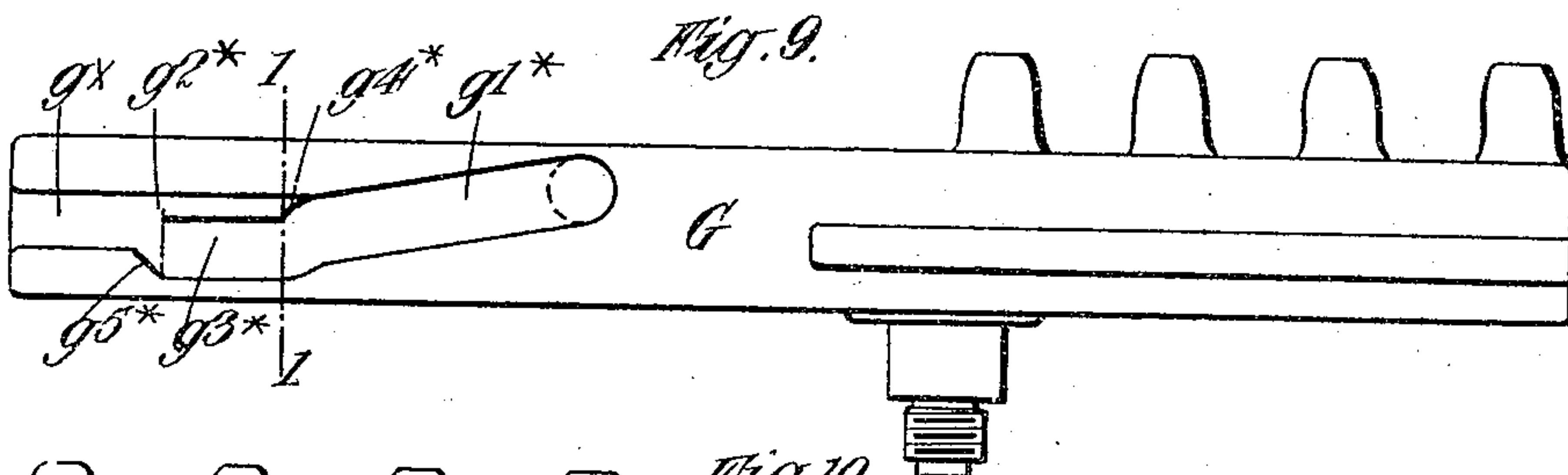
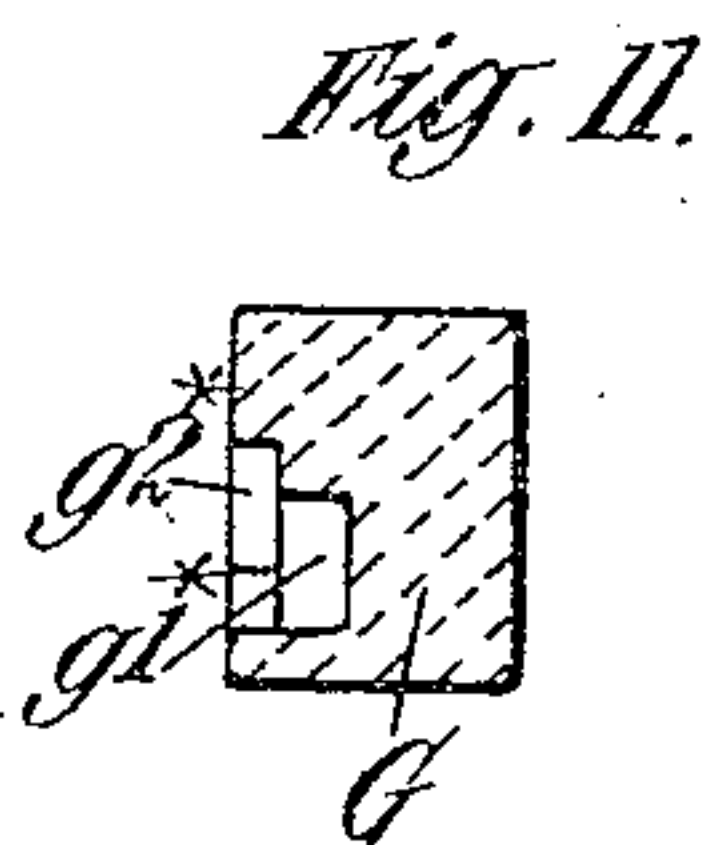
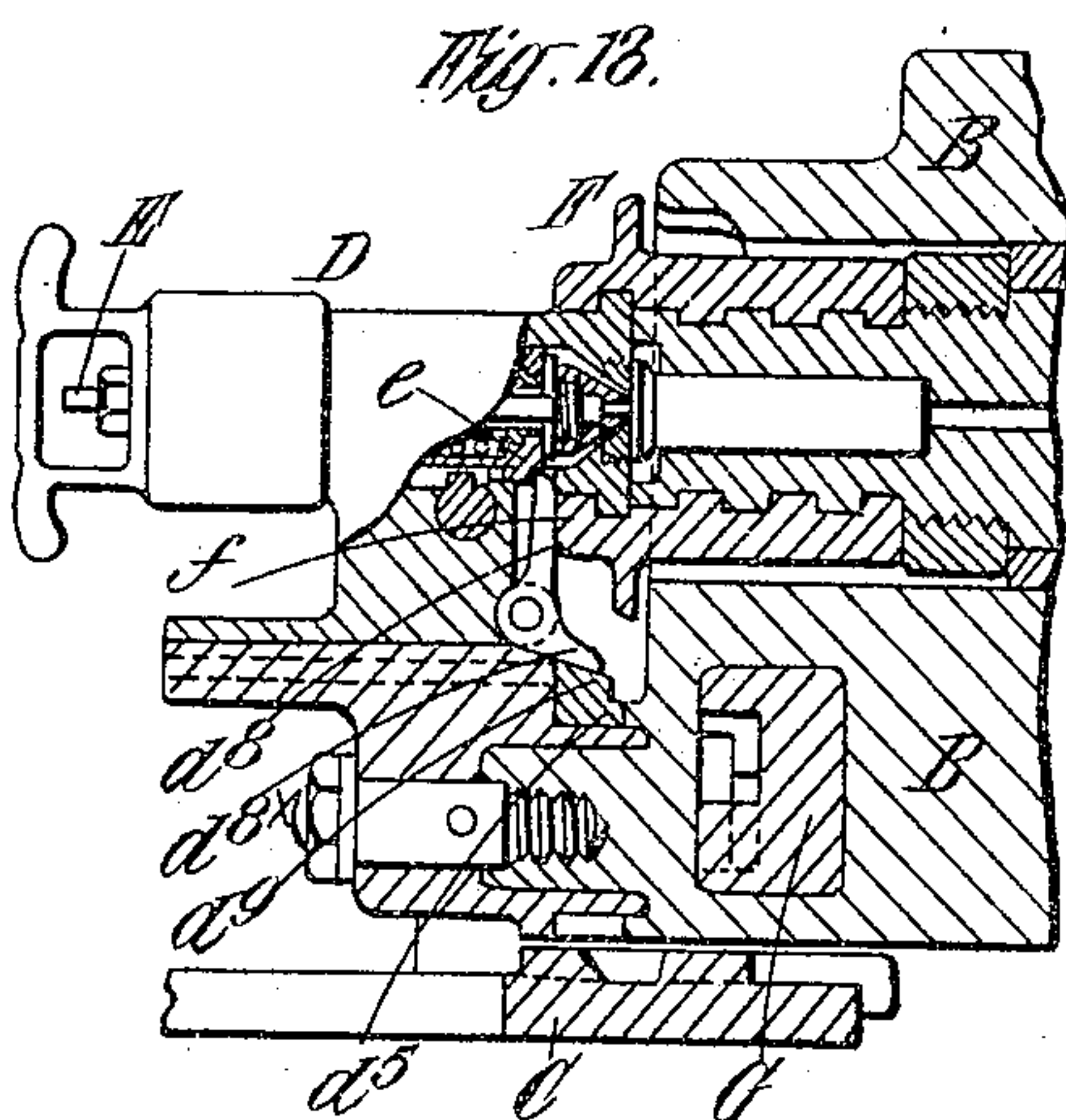
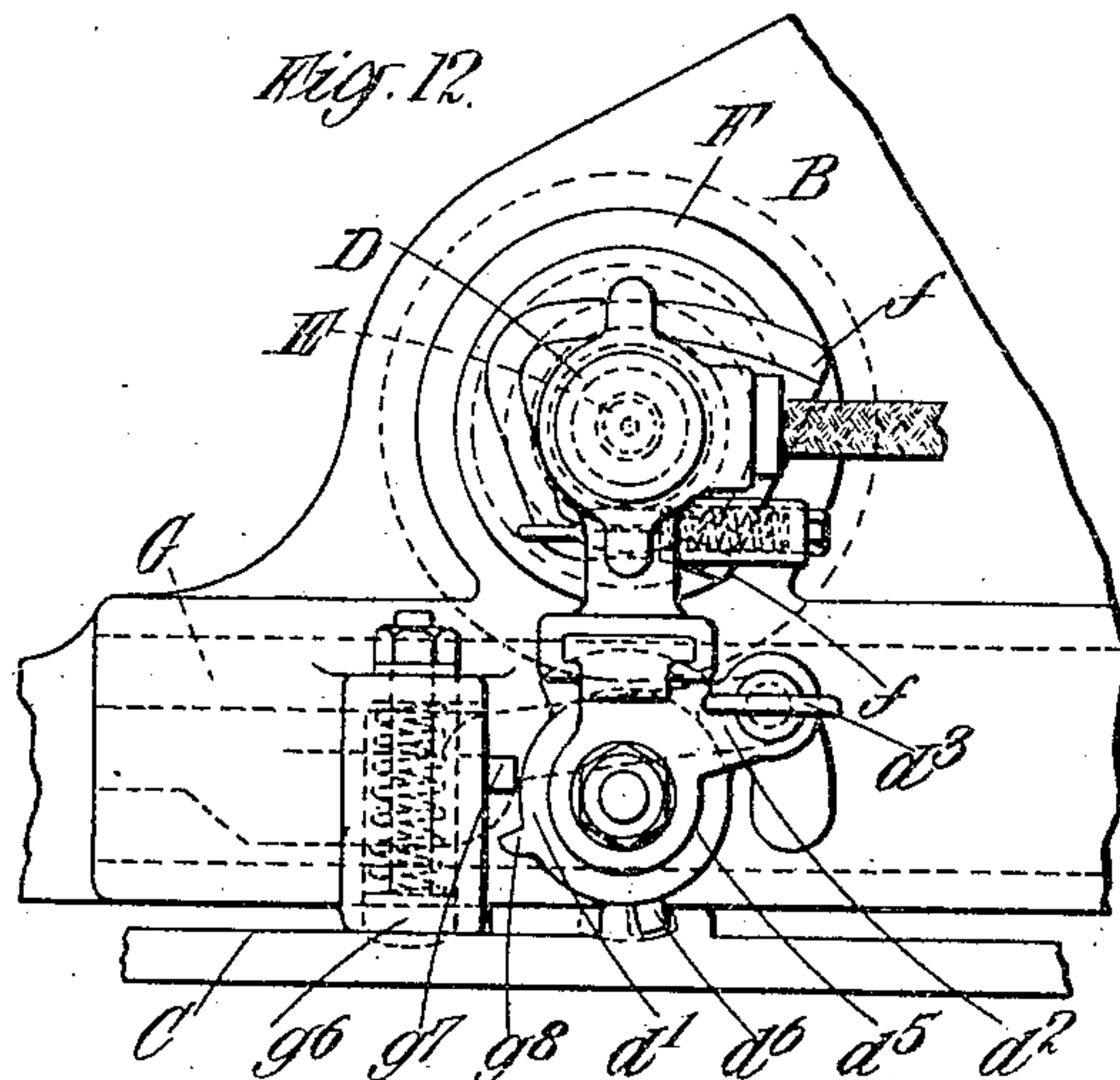
FIRING MECHANISM OF ORDNANCE.

APPLICATION FILED APR. 22, 1907.

958,642.

Patented May 17, 1910.

3 SHEETS—SHEET 3.



Witnesses
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Inventor
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By *Knight Bros* attys

UNITED STATES PATENT OFFICE.

CARL HOLMSTROM AND ARTHUR EDWARD MASCALL, OF LONDON, ENGLAND, ASSIGN-
ORS OF ONE-THIRD TO ELIAS MIDDLETON, OF SHEFFIELD, ENGLAND.

FIRING MECHANISM OF ORDNANCE.

958,642.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed April 22, 1907. Serial No. 369,675.

To all whom it may concern:

Be it known that we, CARL HOLMSTROM and ARTHUR EDWARD MASCALL, both subjects of the King of Great Britain, residing at 25 Victoria street, Westminster, in the county of London, England, engineers, have invented certain new and useful Improvements Relating to the Firing Mechanism of Ordnance, of which the following is a specification.

This invention relates to the firing mechanism of ordnance and is adapted for either electric or percussion firing and is so arranged that the gun cannot be fired until the breech is properly closed and locked.

The invention is more especially although not exclusively intended for use with firing mechanism of the kind in which the electric and percussion lock is inclosed in a casing mounted on an arm which is adapted to rock about a pivot on the swinging carrier in a plane parallel to that of the rear face of the breech block. The said casing works in curved guides formed in the box slide or nut and arranged concentric with the said pivot, the said arm being provided near its pivot with a shorter arm carrying a spring guide-bolt which engages with a suitably shaped groove in the rear face of the breech block, so that the movement of the block relatively to the carrier, in the opening and closing of the breech, will cause the required rocking movements of the lock. In some cases the said block receives both an angular and a rectilinear movement during the opening and closing of the breech, by means of an ordinary breech actuating lever which operates a transversely sliding or reciprocatory bar suitably combined with rods or links and cranks; this arrangement does not however form part of the present invention, except in combination with the features hereinafter described.

According to one feature of the present invention the rocking movement of the lock is effected from the aforesaid sliding bar instead of from the block and the pivotal arm carrying the lock is made in two parts of which the upper part is capable of sliding longitudinally with respect to the axis of the gun during the rectilinear movements of the block, so that the said lock, in accordance with our present arrangement, participates in both a rocking and a rectilinear movement.

According to another feature of our present invention the rectilinear sliding portion of the aforesaid lock is provided with a safety lever for the firing pin or striker, which lever coöperates with a ledge or guide on the rocking part and with a displaceable notched ring or collar surrounding the boss of the rocking part, or with an incline or slot in the aforesaid sliding or reciprocating bar.

According to another feature of our present invention we provide the lock-casing with a spring bolt or catch which, as the firing pin or striker is withdrawn to its cocked position, automatically retains the said firing pin or striker in such position until the spring bolt or catch is released by a pivotal finger actuated by suitable mechanism as hereinafter described.

In order that our 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:—

Figure 1 is an end view and Fig. 2 a plan of the breech end of a gun provided with our improved mechanism. Fig. 3 is a longitudinal central section. Figs. 4 and 5 are front sectional elevations of the aforesaid displaceable notched ring and the sliding bar with which a flange on the ring engages as hereinafter explained. Fig. 6 is a detail sectional view showing a modification in which the aforesaid safety lever for the firing pin or striker coöperates with the sliding bar instead of with the displaceable notched ring. Fig. 7 is a detail view showing the incline or slot in said sliding bar with which the tail of the safety lever engages. Fig. 8 is a sectional plan of the lock casing and shows the spring bolt or catch for the firing pin or striker. Fig. 8^a is a section on the line *x—x* of Fig. 8. Figs. 9 and 10 are respectively a front elevation and a plan of the aforesaid sliding bar, illustrating more clearly than in the preceding figures how this bar is formed for effecting the rocking movement of the lock. Figure 11 is a cross section on the line 1. 1. of Fig. 9. Figs. 12 and 13 are respectively an end view and a longitudinal central section illustrating a slightly modified form of our improved mechanism.

A is the breech block, B the swinging carrier in which said block is mounted, C

the breech actuating hand lever, D the lock casing which is mounted on an arm d adapted to rock about a pivot bolt d^{10} on the carrier B. Said arm is normally held in upright or operative position by tension of spring d^{11} that is coiled about the pivot bolt d^{10} .

E is the firing pin or striker.

F is the box slide or nut which is formed with the curved guides f for the lock casing D to work in.

The arm d has near its pivot a shorter arm d^2 carrying the spring guide bolt d^3 . In the example illustrated in the drawings the block A receives both an angular and a rectilinear movement during the opening and closing of the breech by means of the actuating hand lever C operating the sliding bar G through the intervention of a link C'. This sliding bar is formed with two sets of rack teeth, one set gearing with a toothed segment g' for operating a crank g^2 engaging with a radial slot a' on the block and the other set gearing with a toothed segment g^3 (Fig. 2) for operating cranks g^4 adapted to engage with flanges a^2 on the block, as set forth in the specification of our prior Patent No. 880994.

The aforesaid spring guide bolt d^3 carried by the shorter arm d^2 of the lock, engages with a groove in the transversely sliding bar G, so that the rocking movement of the lock is effected from said sliding bar. This groove can be best seen in Figs. 9 to 11 wherein it will be observed that it has a deep oblique portion g'^* and a shallow horizontal portion g^{2*} and that the transition from one portion to the other is by means of an incline g^{3*} at the bottom of the groove. During the outward movement of the said sliding bar, therefore, the aforesaid spring guide bolt d^3 first travels in the oblique portion of the groove to cause the lock to swing into its open position, and as said guide bolt reaches the incline g^{3*} in said groove, it strikes against a curved shoulder g^{4*} which has the effect of accelerating the final swinging movement of the lock and causing prompt extraction of the empty primer. The said bolt d^3 then rides up the incline g^{3*} and reaches the horizontal portion of the groove in which it travels until acted upon by an inclined shoulder g^{5*} which has the effect of causing the lock to rebound or swing back to an extent sufficient to slightly overlap the primer cavity, so that when an ensuing primer is introduced into place, this overlapping of the lock will prevent the primer from escaping or becoming displaced as is well understood. After the said bolt d^3 has been thus acted upon by the shoulder g^{5*} it enters the narrow part g^* of the horizontal portion g^{2*} of the groove, the width of this part being such that there will exist therein sufficient play for the bolt d^3 to per-

mit of the lock being angularly displaced to the necessary extent for enabling the primer to be inserted and the lock to resume its overlapping position relatively thereto, as above stated. The said pivotal arm d carrying the lock is made in two parts, of which the upper part is capable of sliding on guides d^4 on the lower part in a direction parallel to the longitudinal axis of the gun, when the block performs its aforesaid rectilinear movement.

On the boss d' of the aforesaid rocking arm carrying the lock is the angularly displaceable collar or ring d^5 furnished with a radial projection d^6 with which a cam groove c on the breech actuating hand lever C engages, so that when the said hand lever is operated the collar or ring will be partially rotated. The said collar or ring is also furnished with a segmental flange d^7 (Figs. 4 and 5) which, when the collar or ring is angularly displaced in a direction to swing the lock into its open position, is caused to move from a recess g^{**} in the said sliding bar G and to assume a position in which it will lie beneath the said bar G, (Fig. 5) whereby it will be retained in its shifted position while the breech is open. The rectilinearly movable portion of the rocking arm carrying the lock has pivoted at its forward part the safety lever d^8 , the tail end d^{8*} of which is adapted to engage with the notch or recess d^9 in the periphery of the aforesaid displaceable collar or ring d^5 . This engagement can only take place, however, when said rectilinearly movable portion is in its fully advanced position and the said ring lies with its notch or recess d^9 in a position to receive it, which is the position occupied by the ring, when the breech is properly closed and the block in its locked position. At such times the opposite end or nose of said lever lies in a position to be out of the path of a projection e forming part of the firing pin or striker E and will not then impede the full forward movement of the latter, thus permitting the primer to be fired by the striker when the latter is released from its "cocked" position, if the firing is being effected by percussion, or permitting the nose of the striker to come into contact with the primer if the firing is being effected electrically. At all other times however the said nose of the pivoted lever d^8 operates to withdraw the striker far enough back to keep its nose out of contact with the primer, in which position said striker will be kept during the time that the rectilinearly movable portion of the rocking arm carrying the lock is moving on the other portion, by reason of the said tail end d^{8*} of the lever resting upon the ledge or guide d^4 on the latter portion. It will therefore be seen that the said lever d^8 by its tail end resting on the ledge or guide d^4 , prevents

the striker from advancing during the movements of the rectilinearly movable portion of the rocking arm carrying the lock, and also that the coöperation of the said lever with the displaceable collar or ring d^5 , prevents the striker from advancing unless the breach be properly closed and locked. It thus constitutes an effectual safety device for the striker. In some cases we may arrange the tail end d^{8*} of said pivoted lever to engage with an inclined slot g^0 of the sliding bar G, instead of with the notch in the angularly displaceable ring and then of course the said ring would be dispensed with, the aforesaid function of the ring being performed by the sliding bar. Such an arrangement is shown by Figs. 6 and 7 and would be particularly suitable when the breech mechanism were of the kind in which other means than a breech actuating hand lever were employed for operating said mechanism.

The striker E, when operating to fire by percussion, is adapted to be cocked by exerting a rearward pull thereon by hand and is retained in its cocked position by the spring bolt or catch e' (see Fig. 8^a) automatically engaging with a shoulder e^2 forming part of the striker, these parts being so constructed and arranged that when said spring bolt or catch e' is pushed inwardly, *i. e.* against the resistance of its spring, it releases the striker by bringing a notch or recess e^3 opposite the shoulder e^2 thus permitting the striker to advance under the action of the spring and fire the primer. As the striker completes its advance movement its shoulder e^2 remains in engagement with the notch e^3 of the spring bolt or catch and thus restrains the latter from resuming its engaging position relatively to the striker until the recocking thereof again takes place.

The actuation of the spring bolt or catch to liberate the striker is in the example shown effected by the pivotal finger b on the carrier, which finger is operated through suitable mechanism by the ordinary firing rod b^x or otherwise. We prefer to arrange the said catch actuating finger b at the outer end of a spring controlled longitudinal spindle b' whose inner end terminates in an arm b^2 that lies above another arm b^3 carried by a transverse spindle b^4 whose opposite end is adapted to be operated by the aforesaid firing rod. This other arm b^3 has near its fulcrum a toe-piece b^5 which lies contiguous to the rear face of the breech block. The said block has a notch or recess a^x which is so arranged that when the breech is properly closed and locked, it will lie immediately in front of said toe-piece b^5 and thus permit the latter to enter it when the firing rod is actuated. At other times however the said notch will not occupy this position, so that in the event of

the block not being properly locked, the striker, even if cocked, cannot be liberated. This device therefore constitutes an additional safety device.

The modified form of the mechanism illustrated by Figs. 12 and 13 chiefly differs from the arrangement already described above, in that we dispense with the torsion spring around the pivot about which the lock rocks and thus avoid the difficulty that sometimes arises owing to the breaking of the torsion spring. We are able to dispense with the use of this torsion spring owing to the positive action on the lock which is effected through the guide bolt d^3 and the aforesaid double groove g'^* g^{2*} in the sliding bar G. In this case we provide a spring plunger g^6 having a lateral projection g^7 which lies in the path of a nose g^8 on the boss d' of the swinging lock, the relative position of the lateral projection and the nose being such that these parts will come into contact during the termination of the lock's movement as it swings outward. The small amount of play which is provided, as above stated in connection with Figs. 9, 10 and 11, for enabling the primer to displace the lock from its overlapping position during the insertion of the said primer into place, will thus be under the influence of the said spring plunger g^6 instead of the torsion spring as above described. The said spring plunger is also utilized in the example shown for retaining the breech actuating hand lever C in its inward position while the breech is closed.

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

1. In firing mechanism for ordnance, the combination of a rotary breech block, a swinging carrier for same, a sliding bar adapted to angularly displace the breech block and also to impart a rectilinear movement thereto, means for actuating said sliding bar, a firing lock, an arm carrying the firing lock and adapted to rock upon said carrier, and means carried by said arm and operable through the medium of the sliding bar actuating means for withholding the firing pin until the breech block is in effectively closed position.

2. In firing mechanism for ordnance, the combination of a rotary breech block, a swinging carrier for same, a sliding bar adapted to angularly displace the breech block and also to impart a rectilinear movement thereto, means for actuating said sliding bar, a firing lock, a pivoted arm carrying the firing lock and adapted to rock upon said carrier, and means carried by the rocking arm and automatically operable through the medium of the sliding bar actuating means for withholding the firing pin until the breech block is in effectively closed position.

3. In firing mechanism for ordnance, the combination of a rotary breech block, a swinging carrier for same, a sliding bar adapted to angularly displace the breech block and also to impart a rectilinear movement thereto, means for actuating said sliding bar, a firing lock, an arm pivotally mounted on said carrier and adapted to carry the firing lock, means on said arm engaging the firing pin, and means mounted on and concentric with said arm and adapted to engage the firing pin holding means whereby to withhold said firing pin until the breech block is in effectively closed position.

4. In firing mechanism for ordnance, the combination of a rotary breech block, a swinging carrier for same, a sliding bar adapted to angularly displace the breech block and also to impart a rectilinear movement thereto, means for actuating said sliding bar, a firing lock, an arm pivotally mounted on said carrier and adapted to carry the firing lock, said arm comprising a reciprocating member, firing pin engaging means carried by said member, and means carried by the arm adapted to engage said pin engaging means, whereby to withhold the firing pin until the breech block is in effectively closed position, said pin holding means being operable through the bar actuating means.

5. In firing mechanism for ordnance, the combination of a rotary breech block, a swinging carrier for same, a sliding bar adapted to angularly displace the breech block said bar being provided with a groove having a deep oblique portion that terminates in an incline provided with a curved shoulder and leading to a shallow horizontal portion, means for actuating said sliding bar during the opening and closing of the breech, a spring-controlled arm carrying the firing lock and adapted to rock upon the carrier, and a spring guide-bolt mounted upon the rocking arm and adapted to engage with and slide in the groove in the sliding bar, substantially as described.

6. In firing mechanism for ordnance, the combination of a rotary breech block, a swinging carrier for same, a sliding bar adapted to angularly displace the breech block and also to impart a rectilinear movement thereto, means for actuating said sliding bar during the opening and closing of the breech, a two part arm carrying the firing lock and adapted to rock upon the car-

rier the part of said arm carrying the lock being capable of sliding upon the other part in a direction parallel to the axis of the gun when the breech block performs its rectilinear movements, means for transmitting motion from the sliding bar to the rocking arm, means for operating the firing pin of the lock, and means for preventing said firing pin from being operated unless the breech block is in its fully closed and locked position, substantially as described.

7. In firing mechanism for ordnance, the combination of a rotary breech block, a swinging carrier for same, a sliding bar adapted to angularly displace the breech block and also to impart a rectilinear movement thereto, means for actuating said sliding bar during the opening and closing of the breech, a two part arm carrying the firing lock and adapted to rock upon the carrier the part of said arm carrying the lock being capable of sliding upon the other part in a direction parallel to the axis of the gun when the breech block performs its rectilinear movements, means for transmitting motion from the sliding bar to the rocking arm, means for operating the firing pin of the lock, a notched collar upon the two part arm, a safety lever adapted to engage with the firing pin of the lock and also with the notched collar when the breech block is in its fully closed and locked position, substantially as described.

8. In firing mechanism for ordnance, the combination of a rotary breech block, a swinging carrier for same, a firing lock pivotally mounted upon said carrier, means for swinging said lock into open position as the breech is opened, automatic means for engaging with and retaining the firing pin when it has been moved to cocked position, a firing arm mounted on the gun, means for transmitting motion from the firing arm to the means for engaging with the firing pin, and means controlled by the breech block whereby the means for transmitting motion from the firing arm may be rendered inoperative except when the breech block is in position, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

CARL HOLMSTROM.
ARTHUR EDWARD MASCALL.

Witnesses:

T. SELBY WARDLE,
GEORGE I. BRIDGES.