(No Model.) 3 Sheets—Sheet 1.

J. M. BROWNING.

GAS OPERATED MACHINE GUN.

No. 544,658. Patented Aug. 20, 1895.

Fig. 1.

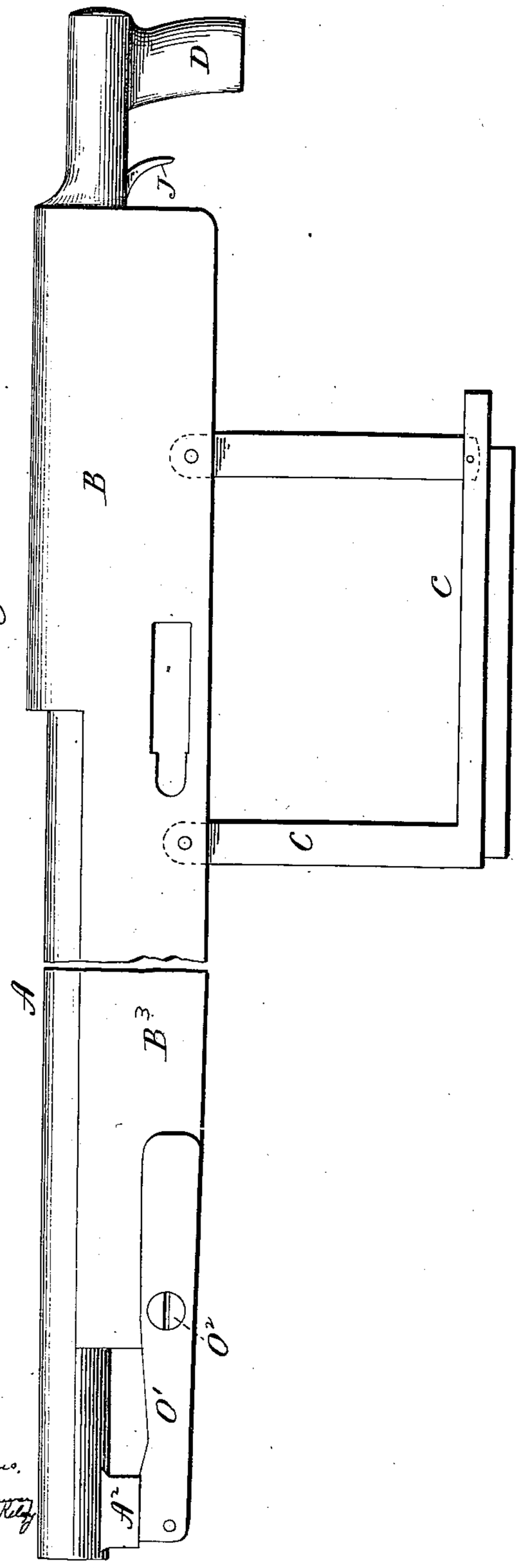
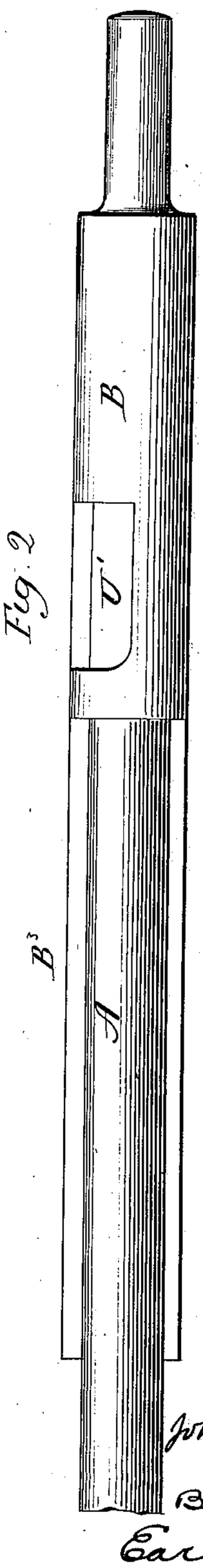


Fig. 2.



Witnesses.
J. H. Shumway
Lillian D. Kelly

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Inventor
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Earle & Seymour

(No Model.) 3 Sheets—Sheet 2.

J. M. BROWNING.

GAS OPERATED MACHINE GUN.

No. 544,658. Patented Aug. 20, 1895.

Fig. 3

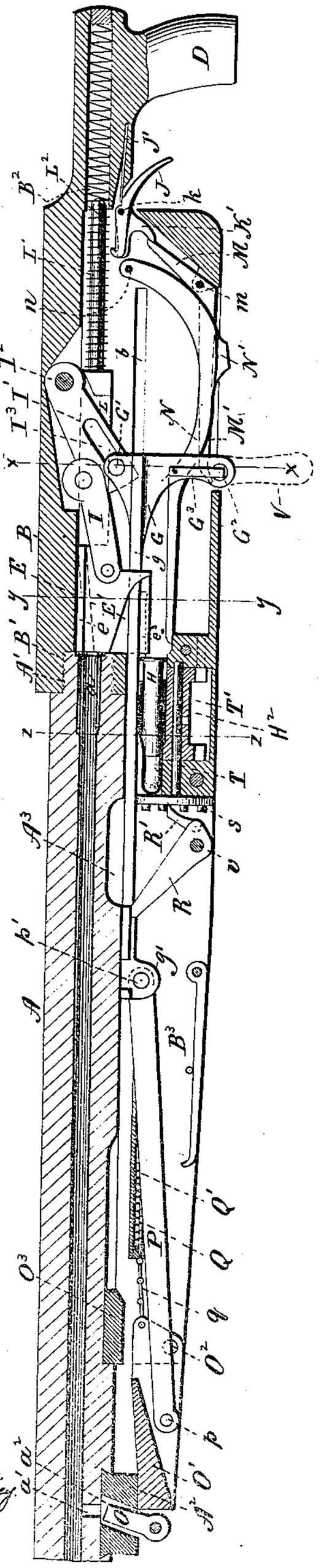


Fig. 4

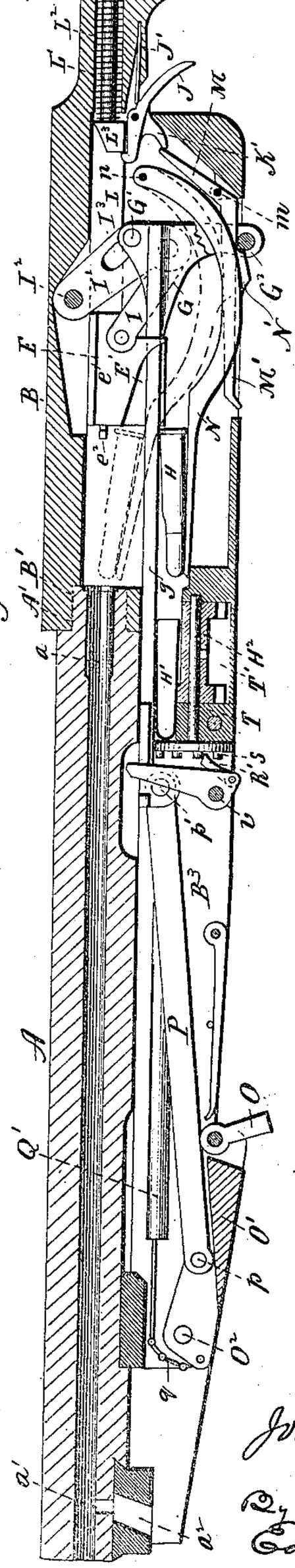


Fig. 7

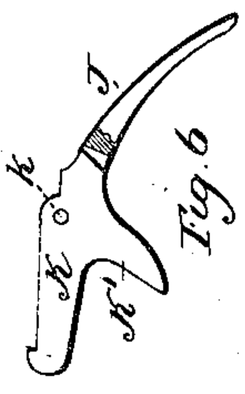
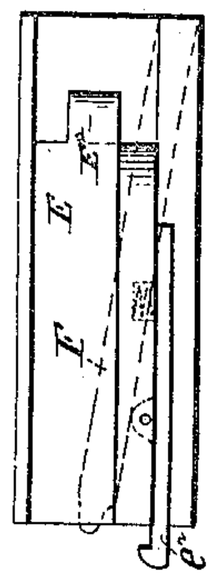


Fig. 6

Fig. 5



Witnesses.
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(No Model.) 3 Sheets—Sheet 3.

J. M. BROWNING.

GAS OPERATED MACHINE GUN.

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Fig. 10

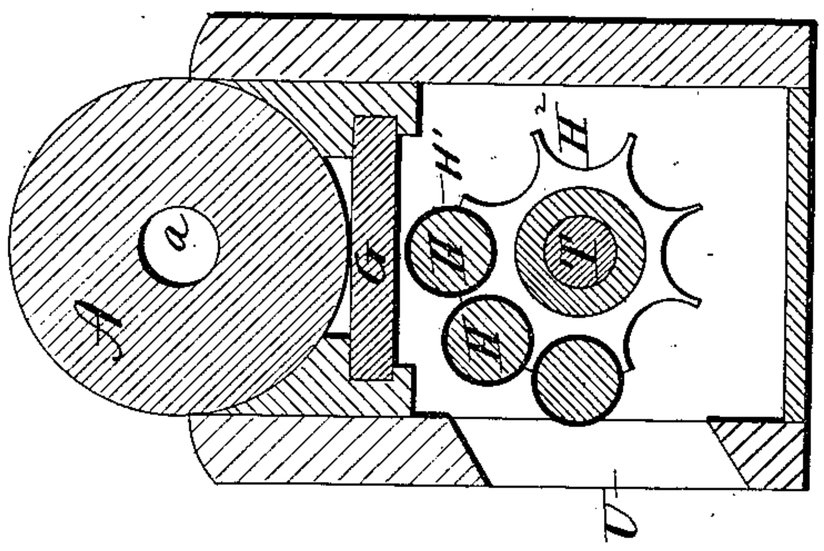


Fig. 13

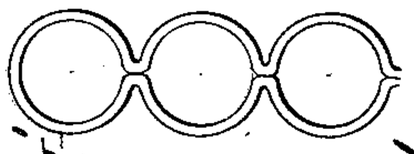


Fig. 11

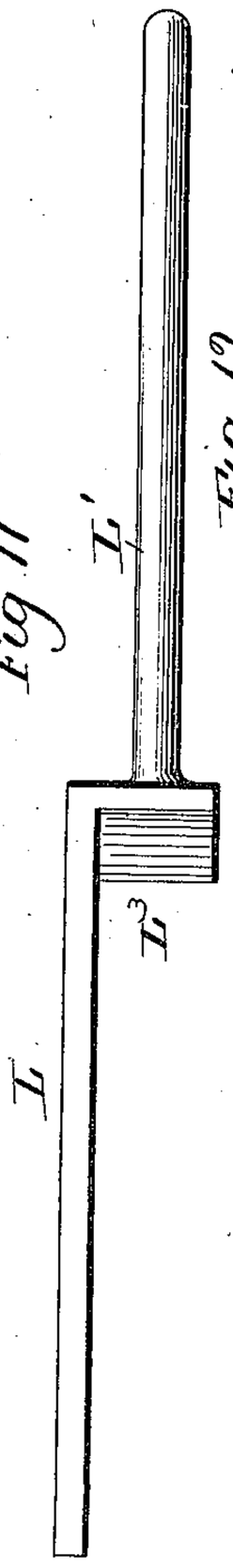


Fig. 12

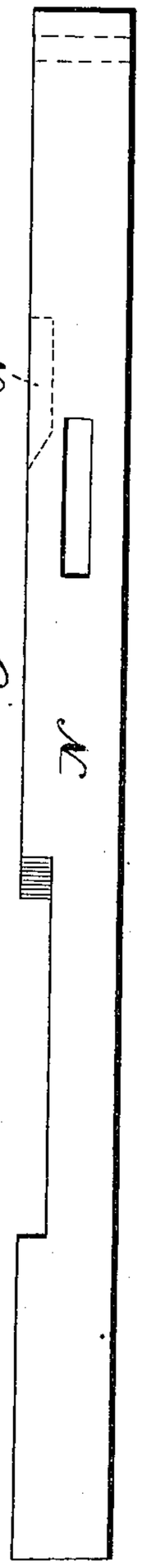


Fig. 9

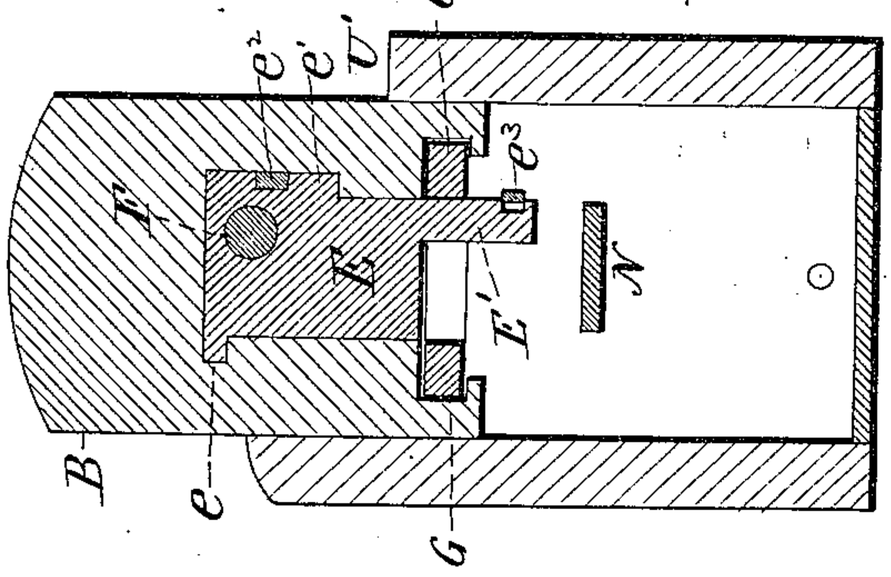
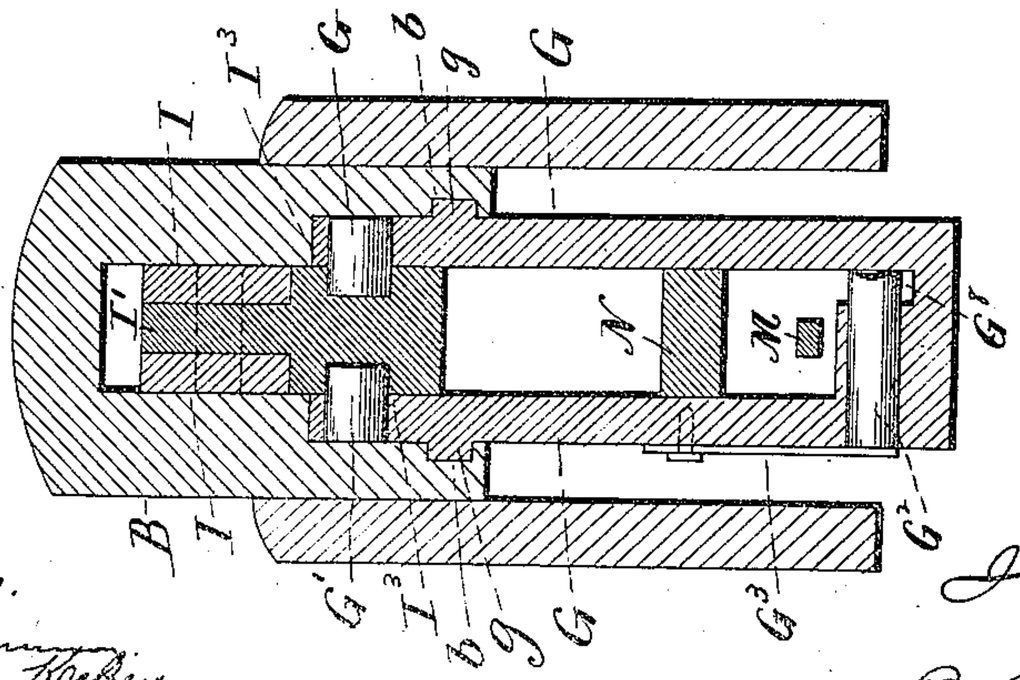


Fig. 8



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By Atty
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UNITED STATES PATENT OFFICE.

JOHN M. BROWNING, OF OGDEN, UTAH TERRITORY.

GAS-OPERATED MACHINE-GUN.

SPECIFICATION forming part of Letters Patent No. 544,658, dated August 20, 1895.

Application filed March 15, 1893. Serial No. 466,029. (No model.)

To all whom it may concern:

Be it known that I, JOHN M. BROWNING, of Ogden, in the county of Weber and Territory of Utah, have invented a new Improvement in Machine-Guns; and I do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a view in side elevation showing one form which a machine-gun containing my invention may assume; Fig. 2, a plan view thereof; Fig. 3, a view of the gun in substantially central vertical longitudinal section, showing the parts of the gun in the adjustments due to them just before firing; Fig. 4, a similar view showing the said parts in the positions which they are moved into in consequence of the explosion of a cartridge in the gun; Fig. 5, an enlarged detached reverse plan view of the breech-block; Fig. 6, a detached plan view of the trigger and sear; Fig. 7, a view thereof in side elevation with one side of the forward portion of the trigger broken away; Fig. 8, an enlarged view in vertical transverse section on the line *x x* of Fig. 3, and showing in particular the operating-slide in its relations to the breech-block, the carrier, and the firing-lever, all of which it operates; Fig. 9, a similar view on the line *y y* of Fig. 3, and showing in particular the breech-block; Fig. 10, a similar view on the line *z z* of Fig. 3, and showing in particular the feed-wheel from which the cartridges are fed to the breech-block; Fig. 11, an enlarged detached plan view of the firing-hammer; Fig. 12, a similar view of the carrier; Fig. 13, an edge view of a section of the cartridge-carrying belt.

My invention relates to an improvement in machine-guns of that class in which the gases produced in the explosion of the cartridges are utilized in operating the mechanism of the gun, so that the cartridges are continuously and automatically fed into it, exploded, and ejected.

My present invention is an improvement upon two guns of the same class for which I now have applications pending in the United States Patent Office, the same having been serially numbered 445,651 and 451,181, respectively. In the gun disclosed by the first of those applications the breech-block was suspended at its forward end, so as to have an up-and-down movement in its vertical plane, in addition to a longitudinal reciprocal movement, while in the gun shown by the second of those applications the breech-block was arranged to have, in addition to its longitudinal reciprocal movement, a lateral swinging movement.

In my present improvement the breech-block is confined to longitudinal reciprocal movement; and the object of my invention is to simplify and improve the mechanism of the gun, with particular reference to its breech-block, the operating-connections thereof, the firing-hammer, the firing-lever, the carrier, the operating-slide, and the trigger and sear.

With these ends in view my invention consists in a machine-gun having certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

As shown in Figs. 1 and 2 of the drawings, my improved gun has a barrel A, a receiver B, a support C, and a handle D, the said parts being of ordinary form and construction. The barrel A of the gun opens at its rear end directly into the receiver B, and is constructed with an exteriorly-threaded hub A′, which fits into a corresponding interiorly-threaded socket B′, formed in the forward end of the receiver. The breech-block E, Figs. 3, 4, 5, and 9, is located within the receiver and confined to longitudinal reciprocal movement therein, being supported in place and guided in movement by a narrow offsetting longitudinal rib *e*, Fig. 9, formed at one of its upper edges, and a much wider longitudinal rib *e′*, formed on its opposite upper edge, both of the said ribs taking into suitable longitudinal grooves formed for them in the receiver. The firing-pin F, located in the said block, is arranged at an acute angle to the longitudinal center of the same, extending from one of the rear edges of the block forward to the center thereof. This arrangement of the firing-pin is made necessary by the construction and arrangement of the firing-hammer, as will appear later on. The rib *e′* of the block is constructed with a longitudinal groove, which re-

ceives the secondary extractor or ejector e^2, the function of which is to draw and eject the spent cartridge-shells from the chamber *a*, formed in the rear end of the gun-barrel. The block also carries the primary extractor or feed-hook e^3, which is located in a finger E′, depending from it and extending downward through the respective members G G of the operating-slide, as shown by Fig. 9 of the drawings, the secondary extractor being better shown in Fig. 5. This primary extractor or feed-hook e^3 is designed to extract the cartridges H from the cartridge-carrying belt H′, which runs over the feed-wheel H^2, and I call it the "primary extractor" or "feed-hook," to distinguish it from the secondary shell extractor or ejector e^2, which draws the spent cartridges from the gun-barrel, because it precedes the same in performing its function as to any one cartridge. The said breech-block is provided upon its under face, at its rear end, with a lug E^2, Fig. 5, by means of which it is pivotally connected with the forward end of the forward link I, which is pivotally connected at its rear end with the forward end of the rear link I′, which is at its rear end pivotally suspended in the receiver on a horizontal pin I^2. For connecting the links I I′ together the forward link is bifurcated at its rear end, as shown by Fig. 8 of the drawings. The rear link is provided in its opposite faces with two longitudinal slots I^3 I^3, located directly opposite each other and respectively receiving studs G′ G′, corresponding to each other and extending inwardly from the upper rear corners of the respective members G G of the operating-slide, the said members being provided upon their outer faces with corresponding longitudinal ribs *g* *g*, which take into grooves *b* *b*, formed to receive them in the receiver, as shown by Fig. 8 of the drawings. When the said slide is moved rearward, it operates through the said studs G′ G′ to swing the said rear and forward links into the positions in which they are shown in Fig. 4 of the drawings, whereby the breech-block is drawn back into its full open position and the firing-hammer pushed back into its cocked position, in which it is engaged by the trigger J and the sear K. The said hammer consists of a forward arm L, (see Fig. 12,) which engages at its forward end with the firing-pin F, and which is rectangular in cross-section, a rear arm L′, circular in cross-section, extending backward into the longitudinal bore B^2, formed in the receiver to contain the coiled hammer-spring L^2, which encircles the forward end of the said arm L′, and a beveled hammer-head L^3, located between and connecting the said arms L and L′, extending transversely to both of them, and constructed and adapted to have its forward end engaged by the trigger J and sear K. It will be noticed that the forward arm L of the hammer is set off to one side of its rear arm L′, so that instead of being centrally behind the breech-block it is behind one edge thereof. This necessitates the peculiar arrangement of the firing-pin before referred to. The trigger J has its forward end bifurcated to receive the sear K, which is hung in the said bifurcation on a horizontal pin *k*, Fig. 7, the forward ends of the trigger and sear being constructed with corresponding hooks to adapt them to have like engagement with the hammer-head L^3 before mentioned.

The spring J′, which operates the trigger, Fig. 3, is longitudinally split for independent engagement with the trigger and sear, so that the same may operate independently. The said sear is provided for its independent operation with a depending finger K′, which is engaged by the rear arm M of the firing-lever, which is hung within the lower portion of the rear end of the receiver on a horizontal pin *m*, its forward arm M′ being bent downward at its extreme forward end, as shown by Figs. 3 and 4 of the drawings.

The carrier N of the gun has its rear portion bowed downwardly, and is hung in the rear portion of the receiver on a horizontal pin *n*, located just in front of the forward ends of the trigger and sear. The carrier extends forward between the members G G of the operating-slide, its forward end being straight and forming a horizontal table, onto which the cartridges are drawn by the primary extractor or feed-hook e^3, carried by the breech-block from the belt H′. The downwardly-bowed rear end of the carrier is provided with a lug N′, having its forward end beveled, as shown by Fig. 12 of the drawings. This lug co-operates with a longitudinally-movable pin or firing projection G^2, mounted in the lower rear corners of the two members G G of the operating-slide, as shown in Figs. 3, 4, and 8 of the drawings, and extending at a right angle to the slide and carrier, its outer end being engaged by a spring G^3, vertically arranged and secured to one of the said members G G of the operating-slide, the bottom of which is constructed with a groove G^8, as shown by Fig. 8 of the drawings, to receive the operating-lug N′. (Shown by Figs. 3, 4, and 12 of the drawings. When the said operating-slide is moved rearward, and just before it reaches the limit of its said movement, the beveled forward end of the lug N′ engages with the pin G^2 and pushes the same to one side against the force of the spring G^3, which snaps the pin back into its normal position as soon as the same, in the rearward movement of the slide, passes the rear end of the lug N′. Now, when the slide moves forward the pin will engage with the square rear end of the lug, which will then be forced to ride up over the pin, thus lifting the forward end of the carrier from the position in which it is shown in Fig. 3 of the drawings into the position in which it is shown in Fig. 4 thereof, whereby the cartridge drawn out upon its forward end is presented in front of the breech-block E, which is at this time open in position to be engaged by the same

and pushed into the chamber *a*, formed to receive it in the butt of the gun-barrel A. The height to which the forward end of the carrier will be lifted depends of course upon the depth of the lug N', which will be proportioned rightly. Just before the operating-slide reaches the limit of its forward movement the said movable pin or firing projection G^2 engages with the downwardly-bent forward end of the arm M', of the firing-lever, whereby the upwardly-extending rear arm M thereof is borne down upon the operating-finger K' of the sear K, which turns on its pin *k*, so as to have its hooked forward end disengaged from the hammer-head L^8.

The automatic operating mechanism of the gun, as well as the feeding mechanism therefor, may be of any approved form and construction. As herein shown, the gun-barrel is constructed with a radial downwardly-extending opening *a'*, through which the gases of explosion will issue with considerable force after a cartridge has been fired, the said opening being surrounded by a circular housing A^2, fixed to the lower face of the gun-barrel, and constructed with a forwardly-inclined opening a^2, registering with the outer end of the opening *a'* and made somewhat larger in diameter than the diameter of a pin O, which enters the said opening and normally stands against the opening *a'* in the gun-barrel. The said pin O is pivotally secured at its opposite end to a lever O', hung on a horizontal pin O^2, located in the extreme forward end of the forward extension B^8 of the receiver B of the gun. An operating-rod P is hinged at its forward end to the lever O', by a pin *p*, and at its rear end by a pin *p'* to the forward end of the operating-slide, the extreme forward ends of the members G G thereof being thereto constructed with depending ears *g'*, which support the opposite ends of the said pin *p'*. A spiral spring Q, located within a cylinder Q', fixed to the said extension B^8 of the receiver B, is connected at its forward end by a chain *q* with the extreme rear end of the lever O', and operates to throw the same back into its normal position in which the pin O enters the opening a^2 formed in the housing A^2. The slide is therefore moved back when the lever O' is turned backward on its pivot by the gases of explosion and forward by the spring Q. This movement of the slide is utilized to operate the feeding mechanism. Thereto I employ a lever R, hung at its lower end on a horizontal pivot *v*, located in the extension B^8 of the receiver, the upper end of the said lever being arranged to be engaged with the operating-slide and clearance being provided for it by means of a recess A^3, formed in the gun-barrel. The lower end of the lever R carries a small pawl R', which engages with the pins *s* of a ratchet-wheel S, mounted upon the forward end of the shaft T of the feed-wheel H^2, over which passes the belt H', constructed with pockets to receive the cartridges H. The said shaft T has bearing at its opposite ends in the receiver B and in the extension B^8 thereof. An opening U, Figs. 1 and 10, formed in one of the the sides of the receiver, is provided for admitting the said belt to the said wheel, while an opening U', formed on the opposite side of the receiver, Figs. 9 and 2, permits the cartridges to be ejected from the arm as fast as they are extracted by the secondary extractor e^3, carried by the breech-block. The automatic feeding apparatus just described will be found to be fully illustrated and described in my pending application, filed May 7, 1892, and serially numbered 451,181. I do not, however, limit myself to these particular mechanisms in connection with my improved features with which other mechanisms for accomplishing the same purpose might also be used, if desired.

In Fig. 3 of the drawings I have indicated by broken lines a handle V, to show where a handle might be attached to the operating-slide for moving the same manually in case it was desired to fire blank cartridges not affording sufficient gases of explosion to operate the gun automatically.

Having now described my improved gun in detail I will proceed to set forth the method of its operation. Assuming that a cartridge has just been fired, the gases of its explosion, issuing through the opening *a'* in the gun-barrel, will act upon the pin O, so as to turn the lever O' on its pivot O^2 until the said lever is almost reversed in position, as shown by Fig. 4 of the drawings. This movement of the lever O' causes the operating-rod P to be thrown back and that in turn pushes the operating-slide back. As the operating-slide moves back, the lever R is raised and its pawl R depressed so as to pass over one of the pins *s* of the wheel S; also as the operating-slide moves back its studs G' G', acting through the rear and forward links I I', draw the breech-block E back into its open position, as shown by Fig. 4 of the drawings. When the links I and I' are being swung rearward, as just set forth, the lower edge of the rear link I' engages with the beveled face of the head L^8 of the hammer and pushes the same back into its cocked position, in which it is engaged by the trigger and the sear, or by the sear alone in case the trigger is held back out of the way. Just before the operating-slide reaches the limit of its rear movement the beveled forward end of the depending lug of the carrier engages with the movable stud G^2, mounted in the slide, and pushes the same to one side against the force of the spring G^8. Then when the slide reaches the limit of its rear movement the said stud snaps back of the rear end of the said lug. Now when the slide begins to move forward, its stud G^2 will engage with the said rear end of the lug N' of the carrier and lift the carrier from its charging position, in which it is shown in Fig. 3 of the drawings, to its discharging position, in which it is shown by

ken lines in Fig. 4 thereof. Assuming now it in the described rear movement of the eech-block its primary extractor or feed-ok e^3 engaged with a cartridge H in the t H′ and drew the same back onto the de-essed forward end of the carrier, the said car-dge will be lifted into range with the gun-rrel. As the slide moves forward, it will op-ate through its studs G′ G′ and the rear and ward links I and I′ to move the breech-block o its closed position. In this movement of e breech-block the said cartridge will be shed forward into the chamber *a*, provided r it in the gun-barrel. As the slide moves rward also, the lever R is pushed forward, ereby its pawl R′ is lifted against one of e pins *s* of the wheel S, whereby the feed-heel is rotated and another cartridge ought into position to be engaged by the imary extractor or feed-book e^3 of the eech-block. Then just before the slide aches the limit of its forward position its ovable stud G^2 will engage with the down-ardly-bent extremity of the forward arm M′ the firing-lever, elevating the said arm of e lever and depressing its rear arm M, which ill in turn co-operate with the arm K′ of e sear, so as to disengage the same from the ead L^3 of the firing-hammer, which will at nce be thrown forward by the hammer-pring L^2 and its forward arm L impinged gainst the rear end of the firing-pin F, which ill in turn strike the cartridge and cause its xplosion. The gases of explosion derived om the firing of this cartridge will again perate the lever O′, which will in turn push e operating-slide back to the limit of its ear movement, and so on, the automatic fir-ng of the gun continuing so long as cartridges re fed to it. It will be understood, however, hat when the gun is being automatically fired ts trigger J is held in position so that it will ot engage with the head L^3 of the hammer. On the other hand, if it is desired to fire the rm manually, its operating-slide may be dis-onnected at its forward end from the auto-natic firing mechanism and the trigger al-owed to engage with the head L^3 of the ham-ner every time the same is cocked. Then the lide is operated by its handle V with one and, while the trigger is held back by the ther hand, or the trigger may be tied back and the slide operated by either hand.

I would have it understood that I do not limit myself to using the particular devices which I have shown and described herein as new in connection with the automatic firing and feeding mechanism, which I have also illustrated and described, but hold myself at liberty to use my improved devices where available in this class of arms and to modify them in form and arrangement within the spirit and scope of my invention.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine gun, the combination with the barrel and the receiver thereof, of a hammer, means for cocking the same, a trigger having its forward end bifurcated and adapted to engage with the hammer, a sear located in the bifurcation of the trigger and having a downwardly projecting operating finger, a firing-lever engaging with the said finger of the sear to operate the same, and means for operating the said firing-lever, substantially as described.

2. In a machine gun, the combination with the barrel and the receiver thereof, of an operating-slide carrying a movable pin, a spring for yieldingly holding the same in place, and a pivotal carrier provided with a lug constructed at its forward end with a bevel, and whereby the said pin is pushed aside by the lug when the slide is moved back, but compels the lug to ride over it and raise the carrier when the slide is moved forward substantially as and for the purpose set forth.

3. In a machine gun, the combination with the barrel and the receiver thereof, of a hammer, means for cocking the same, a trigger, a sear having a depending operating-finger, an operating-slide and a pivotal firing-lever having its rear arm adapted to engage with the said finger to disengage the sear from the hammer, and having its forward arm adapted to engage with the slide when the same is moved forward so as to be elevated thereby, substantially as set forth.

4. In a machine gun, the combination with the barrel and the receiver thereof, of a hammer, means for cocking the same, a trigger, a sear having a depending operating-finger, an operating-slide, and a pivotal firing-lever having its rear end adapted to engage with the said finger to depress the sear, and having its forward end turned down to be engaged by the slide, and elevated when the same is moved forward, substantially as described.

5. In a machine gun, the combination with the barrel and the receiver thereof, of a hammer, a trigger, a sear having a depending operating-finger, a breech-block, a pivotal carrier, a pivotal firing-lever engaging with the sear to disengage the same from the hammer, and an operating-slide constructed to operate both the firing-lever and the carrier when it is moved forward, substantially as described.

6. In a machine gun, the combination with the barrel and the receiver thereof, of a breech-block, a hammer, an operating-slide, connection between the said slide and the breech-block, a movable stud located in the slide, a spring for yieldingly holding the said stud in place, a trigger and a sear, both adapted to have corresponding engagement with the hammer, and the sear having a depending operating finger, a pivotal carrier adapted to to be engaged and lifted by the said movable stud in the forward movement of the slide, and a firing-lever adapted at its rear end to engage with the operating finger of the sear, and to be engaged at its forward end by the said stud in the forward movement of the

slide, substantially as described, and whereby the said stud in the forward movement of the slide, lifts the carrier and operates the firing-lever to disengage the sear from the hammer.

7. In a machine-gun, the combination with the barrel and the receiver thereof, of a breech-block, a longitudinally movable hammer located in the rear thereof, an operating slide, links connecting the said block and the rear end of the slide, and located between the hammer and the block and above the slide, and a carrier pivoted in the rear end of the receiver below the said slide and links, the said slide being constructed to permit the forward end of the carrier to be lifted up through it into range with the gun-barrel, substantially as set forth.

8. In a machine-gun, the combination with the barrel and receiver thereof, of a longitudinally movable hammer, a breech-block, an operating slide, a primary link pivoted at its forward end to the rear end of the block, a secondary link pivoted at its rear end in the receiver at a point above the hammer, pivotally connected at its forward end with the rear end of the primary link, and constructed with an elongated slot, and connection between the rear end of the slide and the said secondary link through the slot therein, substantially as described.

9. In a machine gun, the combination with the barrel and the receiver thereof, of a breech-block, an operating-slide, links connecting the said block and slide, whereby the former is reciprocated back and forth in the receiver, and a hammer constructed and arranged to be engaged by one of the said links as the operating slide is moved backward, and forced back into its cocked position, substantially as described.

10. In a machine gun, the combination with the barrel and the receiver thereof, of a breech-block, a firing-pin located therein and emerging from its rear end at one side of the center thereof, a hammer having its forward arm located to one side of its rear arm in position to engage with the said rear end of the firing-pin, and means for operating the breech-block, substantially as described.

11. In a machine-gun, the combination with the barrel and the receiver thereof, of a breech-block, means for operating the same, a hammer having a forward and a rear arm located out of line with each other, and a head between the said arms, a sear and a trigger constructed for direct engagement with the said head of the hammer, and a firing-pin located in the breech-block in position to be engaged by the offsetting forward arm of the hammer, substantially as described.

12. In a machine-gun, the combination with the barrel and the receiver thereof, of a breech-block, a longitudinally movable hammer, a carrier pivoted at its rear end, an operating slide furnished at its upper end with two inwardly projecting studs located above the forward end of the carrier, and constructed to permit the same to be lifted up through it into range with the gun-barrel, a primary link pivoted at its forward end to the rear end of the breech block, a secondary link pivoted in the receiver at a point above the hammer, pivotally connected at its forward end with the rear end of the primary link, and constructed in its opposite faces with two corresponding elongated slots which receive the inwardly projecting studs of the slide, substantially as set forth.

13. In a machine gun, the combination with the barrel of a reciprocating breech-block, a slide actuating the breech block, a hammer, a trigger engaging said hammer when the hammer is in cocked position, a sear normally held in position to prevent the forward movement of the hammer, and a firing lever engaging with said sear and also engaging with the slide, whereby said slide in extreme forward position causes the firing lever to actuate the sear to release the hammer, substantially as set forth.

14. In a machine gun, the combination with the barrel and receiver, of a breech block, a slide actuating the breech block, a hammer, a trigger engaging said hammer when the hammer is in cocked position, a sear normally held in position to engage said hammer and prevent the forward movement thereof, a firing projection on the slide, and a firing lever medially pivoted at the side of the receiver, said lever at its rear end engaging said sear and at its forward end engaging with said firing projection of the slide, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN M. BROWNING.

Witnesses:
JOHN E. RAMSDEN,
KATE LINE LAW.