Feb. 15, 1944. T. F. HORAN 2,341,780

AUTOMATIC FIREARM

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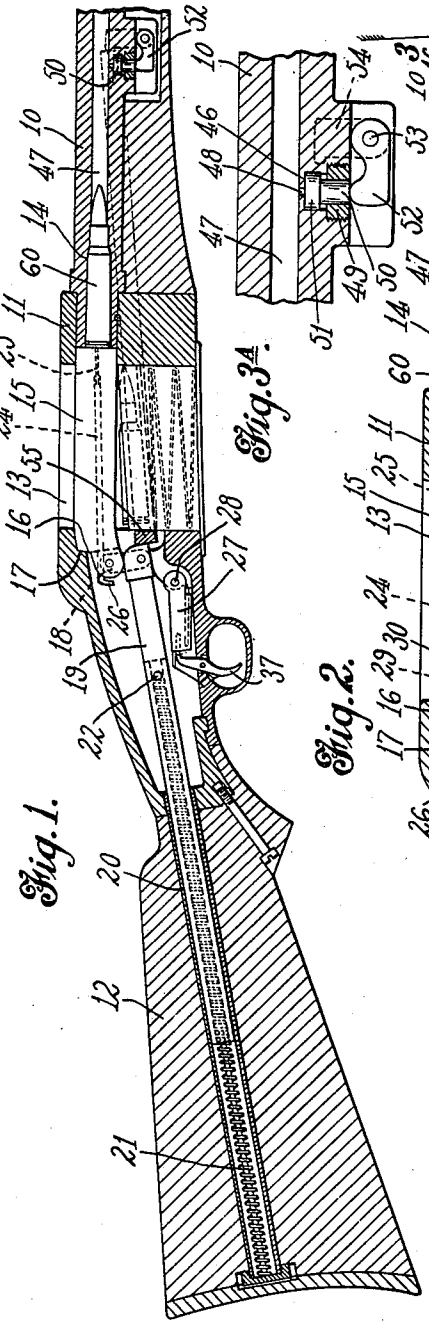

Fig. 1.

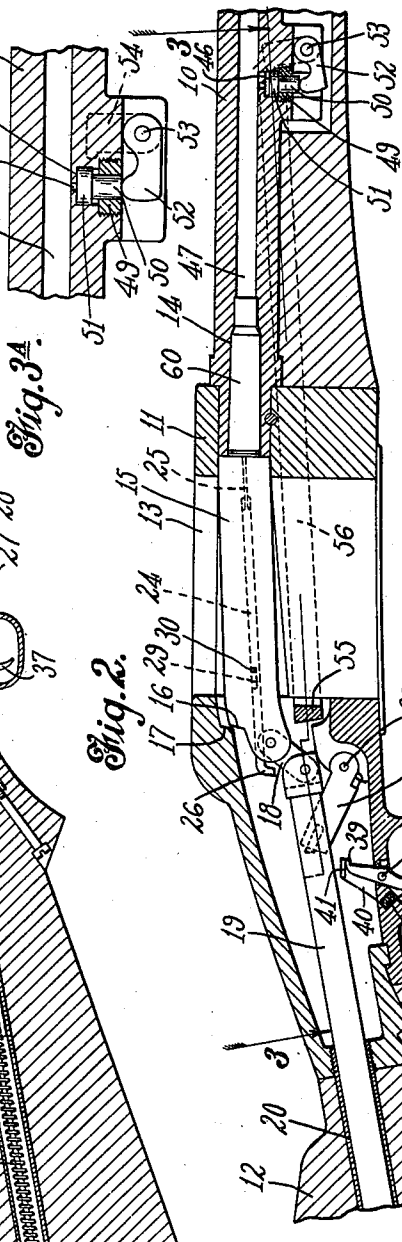

Fig. 3A.

Fig. 2.

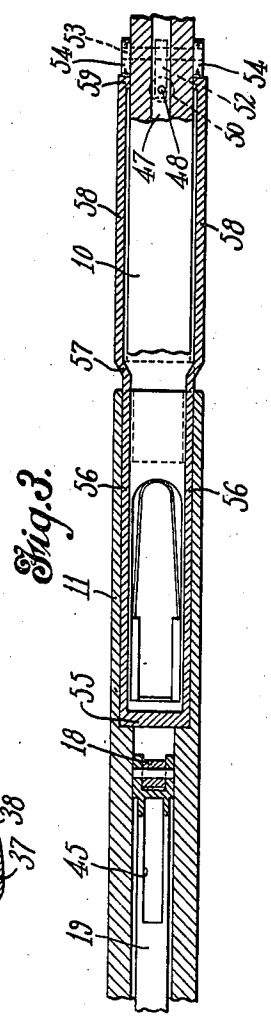

Fig. 3.

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Fig. 4.

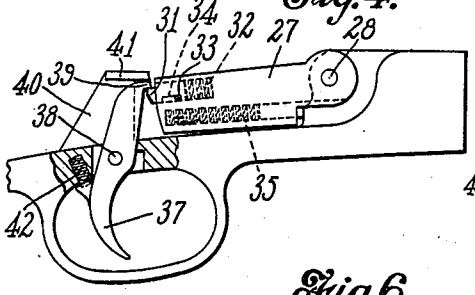


Fig. 5.

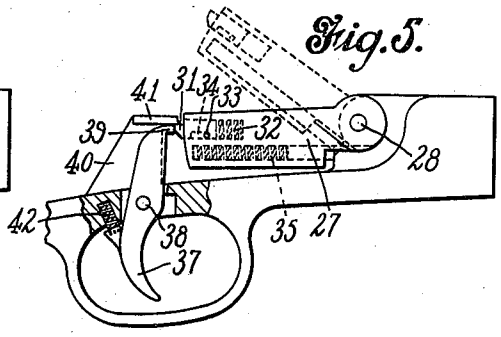


Fig. 6.

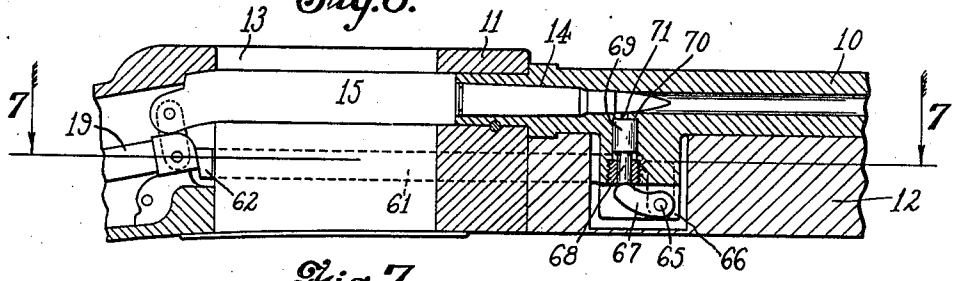


Fig. 7.

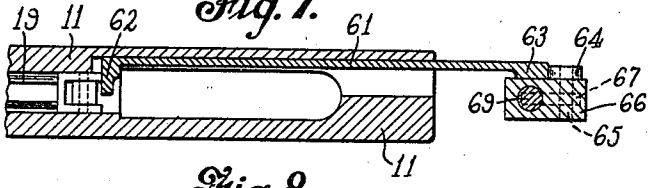


Fig. 8.

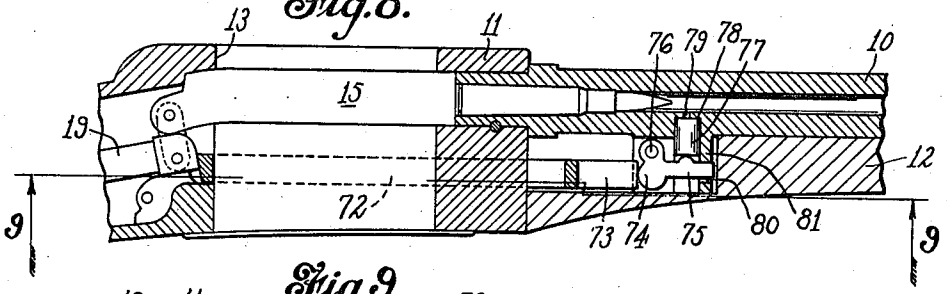


Fig. 9.

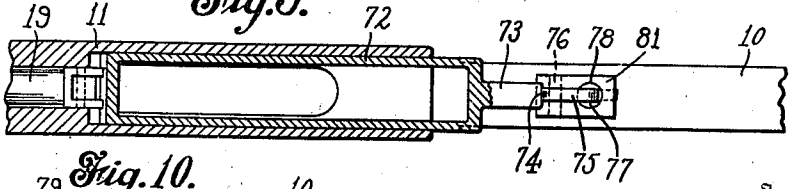
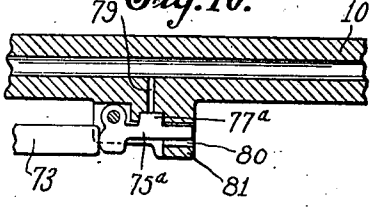


Fig. 10.



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AUTOMATIC FIREARM

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Fig. 11.

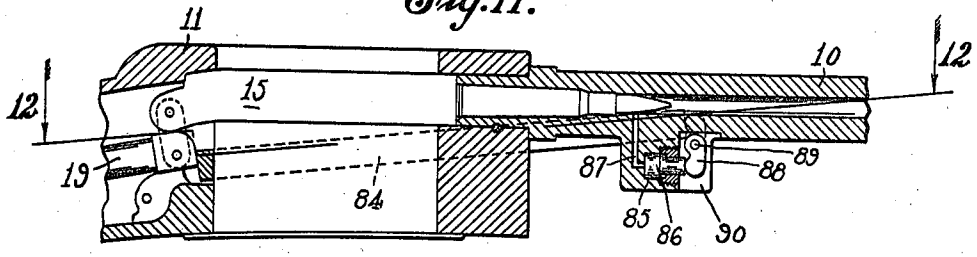


Fig. 12.

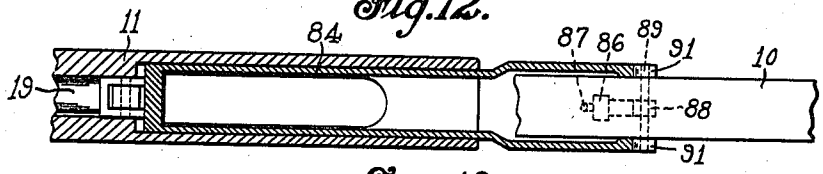


Fig. 13.

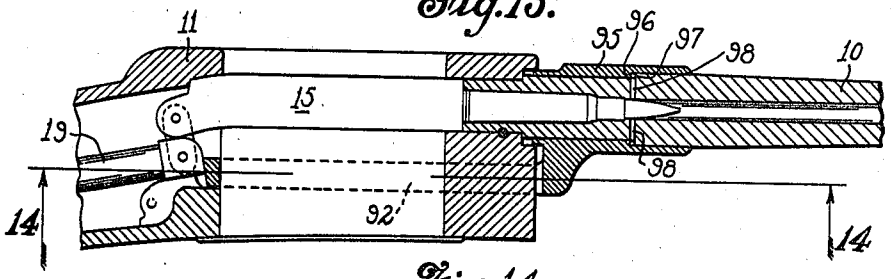


Fig. 14.

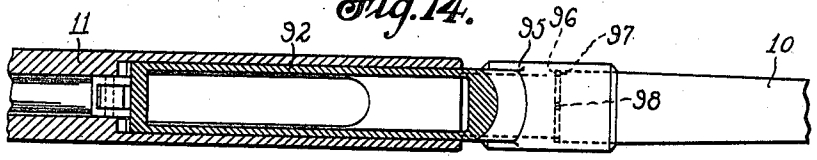


Fig. 15.

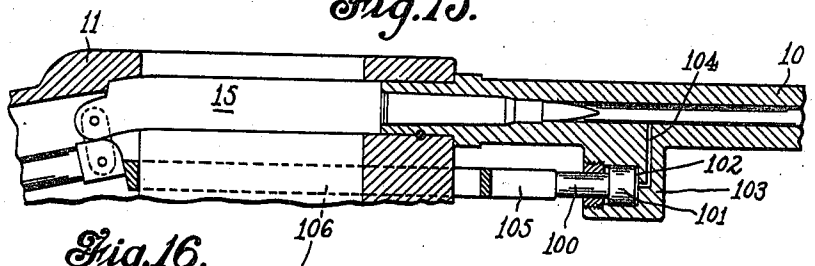
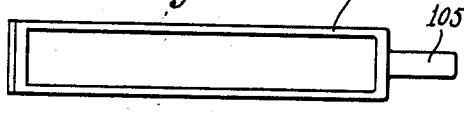


Fig. 16.



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AUTOMATIC FIREARM

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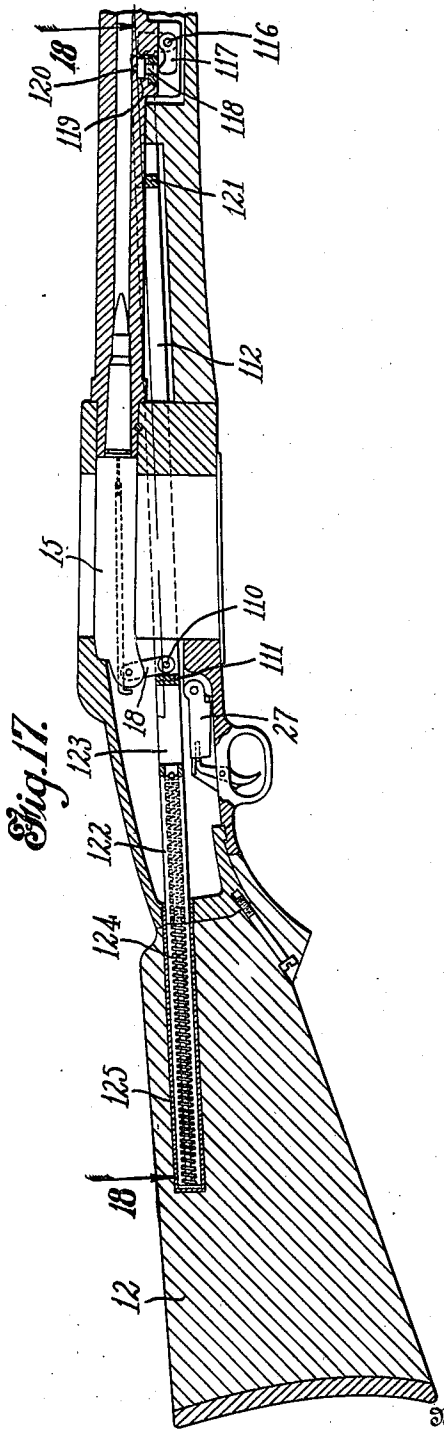

Fig. 17.

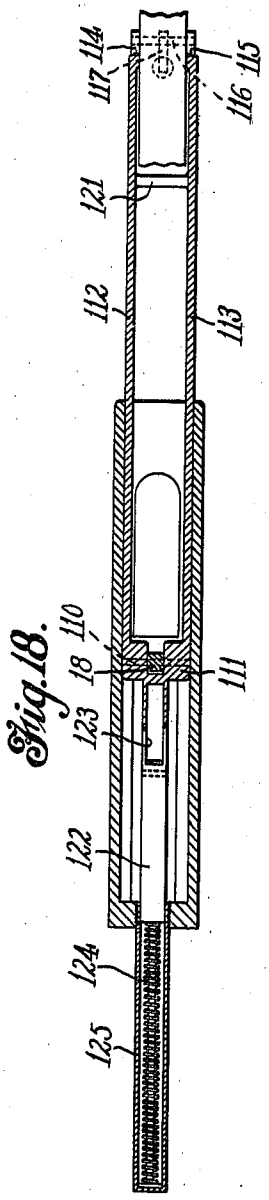

Fig. 18.

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UNITED STATES PATENT OFFICE

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AUTOMATIC FIREARM

Timothy F. Horan, New Haven, Conn.

Application August 26, 1940, Serial No. 354,174

4 Claims. (Cl. 42—3)

This invention relates to firearms, and more particularly to firearms of the automatic or semi-automatic type, in which the discharge of the firearm automatically ejects the discharged cartridge, throws a fresh cartridge into the chamber, closes the breech, and cocks the gun, leaving the mechanism in readiness for a subsequent firing merely upon the pulling of the trigger.

Automatic firearms in general have either been operated by the recoil or firing reaction, or by the pressure of the explosion gases. The present gun is one of the latter type, in that it makes use of the pressure of the explosion gases incident to the discharge of a cartridge to bring about the operation of the mechanism to place the parts in position for a subsequent firing.

One disadvantage of guns employing this principle in the past has been that they are of complicated structure and difficult and expensive to manufacture. In addition, they have usually required the utilization of a large number of parts, and therefore it has been difficult to maintain them in proper working order.

One object of the present invention is the provision of an improved automatic firearm which is of relatively simple construction and which may be economically manufactured as compared with other guns of the same class.

A still further object of the invention is the provision of an improved automatic firearm utilizing the pressure of the explosion gases to bring about the functions of shell ejection, reloading and recocking, and at the same time provide a relatively simple structure which will be efficient and positive in operation, and which will be economical to manufacture.

A still further object of the invention is the provision of a gas-operated automatic firearm employing a plunger or piston operated by the explosion gases, and mechanism to transmit the motion of the piston to the breech bolt and associated structure, which mechanism also serves to change the direction of the motion of the piston so that it is unnecessary to so arrange the latter that it will move in the same direction as the bolt, i. e., rearwardly with respect to the chamber.

A still further object of the invention is to provide a gas-operated gun having a gas chamber and a piston movable therein, the piston being movable in a direction other than that of the rearward movement of the bolt, and to provide mechanism which will not only transmit the motion of the piston to the bolt, but will change the direction of this motion, so that the movement of the piston by the pressure of the explosion gases will bring about the movement of the breech bolt in the proper direction.

A still further object of the invention is the provision of a firearm of the character described, having a gas-operated member to effect the rearward movement of the breech bolt and associated mechanism, which member will be limited to a very short stroke as compared with that of the bolt, and to provide mechanism for transmitting the motion of such member to the bolt, this mechanism being of relatively simple character whereby the gun may be economically manufactured and easily maintained in efficient operating condition.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a sectional view of an automatic firearm embodying my invention;

Fig. 2 is an enlarged view similar to Fig. 1 but showing the parts in a slightly different position;

Fig. 3 is a sectional view on line 3—3 of Fig. 2;

Fig. 3A is an enlarged sectional view of the gas-operated plunger and associated parts;

Figs. 4 and 5 are detail views showing the operation of the hammer and trigger mechanism;

Fig. 6 is an enlarged longitudinal sectional view similar to Fig. 1 but showing a modified form of my invention;

Fig. 7 is a sectional view on line 7—7 of Fig. 6;

Fig. 8 is a view similar to Fig. 6, showing a further modification;

Fig. 9 is a sectional view on line 9—9 of Fig. 8;

Fig. 10 is a detail sectional view showing a modified form of plunger;

Fig. 11 is a sectional view similar to Fig. 6 showing a further modification;

Fig. 12 is a sectional view on line 12—12 of Fig. 11;

Fig. 13 is a view similar to Fig. 11, showing a still further modification;

Fig. 14 is a sectional view on line 14—14 of Fig. 13;

Fig. 15 is a sectional view similar to Fig. 11 and showing a further modified form of the invention;

Fig. 16 is a detail plan view of the driver employed in the mechanism shown in Fig. 15;

Fig. 17 is a sectional view of a further modified form of gun; and

Fig. 18 is a sectional view on line 18—18 of Fig. 17.

In illustrating some preferred forms of my invention, I have shown in Fig. 1 a firearm having

a barrel 10, a receiver 11, and a stock 12, the receiver having an opening 13 for a cartridge clip (not shown) of the usual form. As the present invention is not concerned with the type of cartridge clip employed, or the particular mechanism for moving a fresh cartridge into position in front of the chamber, it is unnecessary to show these features in detail. It will suffice to say that it is contemplated that a cartridge in a clip or magazine in the opening 13 will be moved into the cartridge chamber 14 in the barrel 10 by the operation of the gun, as will be presently described.

The cartridge chamber 14 may be closed by a breech bolt 15, this bolt being provided with a shoulder 16 designed to lock against a shoulder 17 provided in the upper wall of the receiver. It will be understood that the shoulders 16 and 17 are slightly beveled so as to facilitate the unlocking of the bolt when the gun is fired.

At its rear end the bolt has pivoted thereto one end of a link 18, the other end of which is pivoted to a rod-like inertia member 19 projecting into and guided by a tube 20 in the gun stock. Also mounted in this tube is a spring 21 which extends forwardly into a bore in the inertia member 19 so as to act against a pin 22 in this member, and normally urge the inertia member to its forward or breech-closing position, as shown in Fig. 1. It may also be stated at this time that when the member 19 is moved rearwardly, as will presently be described, it will, by means of the link 18, first move the rear end of the bolt 15 downwardly, thus disengaging the shoulder 16 from the shoulder 17, as shown, for example, in Fig. 2, and thereupon a continued rearward movement of the member 19 will move the bolt rearwardly to a position in the receiver in which the bolt will lie rearwardly of the magazine chamber 13, so that a fresh cartridge may be moved to a position in front of the bolt, to be inserted in the cartridge chamber 14 of the barrel.

The bolt 15 is provided with a central opening in which is slidably mounted a striker 24 having on its forward end the usual firing pin 25, and projecting from the bolt at its rear end, where it is provided with a downwardly turned portion 26 adapted to be engaged by a hammer 27 pivoted at 28 to the receiver. The movement of the striker may be limited by the provision of a slot 29 therein, the ends of which contact a pin 30 mounted in the bolt.

The hammer and trigger mechanism is shown more especially in Figs. 4 and 5, from which it will be seen that the hammer 27 is provided at its free end with a plunger 31 urged to a protracted position by a spring 32, but retained in a recess in the plunger by means of the engagement of the pin 33 secured to the hammer and disposed in a slot 34 in the plunger. A spring 35 serves to move the hammer in a clockwise direction about its pivot 28, and therefore throws it upwardly to strike the firing pin when the hammer is released by the trigger.

As shown in Figs. 1, 2, 4 and 5, the trigger 37 is pivoted at 38, and is provided with a forwardly projecting lug or finger 39 adapted to engage the plunger or sear 31 when the hammer is in cocked position. Adjacent the trigger an upstanding member 40 is secured to the frame of the receiver, which member is provided at its upper end with a laterally turned lug or shoulder member 41, adapted to engage the upper edge of the plunger sear 31 and hold the hammer in cocked position, as shown in Figs. 1 and 5. The usual trigger spring 42 is provided to return the trigger to its initial position after it has been pulled. It will be apparent that with the parts in the position of Fig. 5, if the trigger is pulled the finger 39 will engage the end of the plunger 31 and force the latter inwardly against the pressure of the spring 32, and thus release the plunger from the member 41, whereupon the hammer spring 35 will throw the hammer upwardly to strike the downwardly turned end 26 of the striker 24. It will be understood that the forward end of the rod or inertia member 19 is slotted or bifurcated, as shown at 45, from a point adjacent the trigger forwardly to permit the hammer 27 to swing upwardly through this slot, or between the two arms of the member 19, as shown in Fig. 2.

The mechanism by which the rearward movement of the inertia member 19 and bolt 15 is effected will now be described. As shown in Figs. 1, 2 and 3A of the drawings, a pressure chamber 46 is provided in the barrel structure below the bore 47 thereof, the chamber being in communication with the bore of the barrel through the port 48. The chamber may be closed at its lower end by means of a threaded plug 49, and through this plug operates a plunger 50 having a head 51 in the chamber 46. Below the barrel and pivoted thereto is a lever 52 secured to the pivot pin 53, which pivot pin projects laterally on each side of the barrel and has secured to its projecting ends arms 54, one upon each side of the barrel.

A driver member is provided which, together with the lever 52 and associated mechanism, transmits the motion of the piston 50 to the inertia member 19 and bolt 15. This driver is shown more especially in Fig. 3, and in this form of the invention is of substantially U-shaped form, having a rearward bight portion 55 designed to contact with the forward end of the inertia member 19, and side arms or legs 56, designed to lie closely against the walls of the receiver and be guided thereby. Adjacent the front end of the receiver the arms 56 may be slightly offset, as shown at 57, so as to provide portions 58 lying alongside of the barrel, the front ends of which portions, as shown at 59, are designed to be engaged by the arms 54.

The operation of the above described gun may now be briefly set forth. As shown in Fig. 1, the gun is in readiness for the discharge of the cartridge 60 lying in the chamber 14. When the trigger is pulled, the hammer will be released, as already explained, and will be moved upwardly by its spring 35 through the forward bifurcated end of the rod 19, to strike the rear end of the striker 24 and cause the firing pin 25 to move against the primer to effect the detonation of the charge. The pressure of the explosion gases will enter the chamber 46 through the port 48, driving the plunger 50 downwardly against the lever 52. It will be noted that the piston 50 has a very short stroke which is limited by the length of the chamber 46, and that the arms 54 and the driver likewise have very short strokes. When the arms 54 contact the forward ends 59 of the driver, the latter is given a sharp though short rearward movement, the energy of which is transmitted to the inertia member 19, as in the closed position of the parts shown in Fig. 1 the rear end 55 of the driver lies against the front end of this member. The impact of the driver against the inertia member 19 drives the latter member rearwardly against the tension of the spring 21,

which rearward motion by virtue of the link 18 first draws the rear end of the bolt downwardly to free it from the locking shoulder 17, and thence draws it rearwardly to extract the discharged cartridge 60 from the chamber, and permit a fresh cartridge to be moved to a position in the magazine chamber in front of the bolt. The very short stroke of the plunger 50 and the driver member will be found to be amply sufficient to drive the bolt rearwardly to clear the magazine chamber 13 for this purpose.

When the parts reach the limit of their rearward movement, the inertia member will be returned to its forward position by means of the spring 21, which has been compressed by the rearward movement of the inertia member, and the latter will push before it the bolt 15 to move the latter against the breech, and thereafter move the rear end upwardly from the position shown in Fig. 2 to the locked position shown in Fig. 1.

The position of the parts shown in Fig. 2 is that immediately after the gun has been discharged and the rearward movement of the parts has been initiated. It will be seen that the forward end of the inertia member 19 will contact the forward edge of the hammer 27 and cam this member downwardly against the action of the spring 35 to the position shown in Fig. 4, where the plunger 31 will be engaged by the forwardly projecting finger 39 on the trigger, it being understood that the trigger is in its "pulled" position at this time, not yet having been released. The plunger 31 is beveled so that it will be moved inwardly against its spring to permit it to pass the finger 39 and the shoulder 41. As soon as the trigger 37 is released by the operator's finger, the upper end thereof will be moved rearwardly by the trigger spring 42, and the plunger 31, being released from the finger 39, will be immediately engaged with the shoulder 41 to hold the hammer in cocked position ready for a subsequent operation.

In Figs. 6 and 7 of the drawings I have shown a somewhat modified form of my invention, which is similar to the construction previously described in all respects except the construction of the driver and the actuating mechanism therefor. In this case the driver consists of a single longitudinally disposed member 61, having laterally turned end portions 62 and 63, the portion 62 being adapted to engage the forward end of the inertia member 19. The forward end 63 of the driver is adapted to be engaged by an arm 64 secured to a pin 65 rotatably mounted in a lug 66 extending downwardly from the barrel 10, to which pin is secured the lever 67. This lever is adapted to be engaged by the plunger 68 having a head 69 disposed within a gas chamber 70 in communication with the bore 47 of the barrel through the port 71. It will be noted in this case that the port 71 is arranged immediately adjacent the front end of the cartridge 60, so that the explosion gases will be diverted to this chamber immediately following the discharge of the cartridge. The arm 61 of the driver member may, with this arrangement, be considerably shorter than the corresponding driver part in the construction shown in Figs. 1 to 3, wherein the port 48 is arranged at some distance forwardly of the cartridge chamber.

In Figs. 8 and 9 a further modification is illustrated, in which the driver member 72 is of substantially rectangular shape, having oppositely disposed side arms and oppositely disposed end portions, the forward end portion of which has projecting therefrom a pin 73 designed to be engaged by the portion 74 of a lever 75 pivoted to the barrel at 76, which lever is acted upon by a plunger 77 mounted in a chamber 78 in communication with the barrel bore through the port 79. In this instance the lever 75 is provided with an end portion projecting into a slot 80 in the lug 81 on the barrel, so that the movement of the lever will be limited by the length of this slot, the lower portion of the slot serving as a stop. It will be apparent that this limits the lever 75 to a very short movement, and as in the case of the two previous forms of my invention, the driver 72 is limited to a very short movement as compared with that of the bolt and inertia member 19.

In Fig. 10 of the drawings I have shown a further modification which is quite similar to that shown in Figs. 8 and 9, with the exception that the lever 75^a and plunger 77^a are integrally constructed. The lever 75^a acts upon the forward end 73 of the driver member in the manner previously explained in connection with the lever 75. However, as this lever has a very short stroke, it is possible to provide the plunger 77^a directly thereon, the plunger being acted upon by the explosion gases led thereto through the port 79.

In the construction shown in Figs. 11 and 12 of the drawings, the driver member 84 is substantially of the form shown in connection with Figs. 1 to 3, except that the forward portion of this driver is shortened to some extent. In this instance in the pressure chamber 85 is arranged a horizontally disposed plunger 86, the pressure chamber being in communication with the barrel bore through the port 87, the parts being so arranged that the plunger is driven forwardly by the pressure of the explosion gases. This forward motion of the plunger is transmitted to the inertia member 19, and also changed in direction so as to be converted into a rearward movement by means of the lever 88 secured to a pin 89 pivoted to a lug 90 on the barrel, which pin projects laterally from the barrel and has secured to its projecting ends upwardly extending arms 91 designed to contact the driver.

In Figs. 13 and 14 of the drawings I have shown a construction wherein the driver 92 is provided at its forward end with a sleeve 95 adapted to surround the rear portion of the barrel and to be movably mounted thereon. The interior of the sleeve and the exterior of the barrel are provided with opposing shoulders 96 and 97, slightly spaced apart, which space is in communication with the barrel bore through passages 98 to receive the explosion gases therefrom. When the firearm is discharged the explosion gases, carried outwardly through the passages 98, and acting against the shoulder 96, will effect a rearward movement of the sleeve 95 and driver 92, which will cause an impact of the latter against the forward end of the inertia member 19 to actuate the reloading mechanism of the gun.

In Figs. 15 and 16 of the drawings I have shown a construction in which the plunger may act rearwardly directly in line with the motion of the driver, and substantially in line with the motion of the inertia member 19, the piston and driver having very short strokes as compared to the inertia member and bolt. In this instance the plunger 100 has a head 101 mounted in the pressure chamber 102 arranged in a lug 103 at the

lower surface of the barrel and in communication with the barrel bore through the passage 104. The plunger 100 is adapted to engage the forwardly extending finger 105 on the driver 106, which latter member is substantially of the form shown in Figs. 9 and 10. In this instance the pivoted lever used in the other constructions may be omitted, and the driver alone used as the mechanism to transmit the motion of the plunger to the bolt.

In Figs. 17 and 18 of the drawings I have shown a further construction in which the driver or the member transferring the movement or energy of the plunger to the bolt mechanism has a long stroke substantially the same as that of the bolt itself. As shown, the bolt 15 has a link 18 pivoted to its rear end, these parts being substantially like the corresponding parts shown in Figs. 1 to 3. The lower end of the link 18 is pivoted at 110 to the end or bight member 111 of a U-shaped driver member having side arms 112 and 113. These arms extend forwardly, as shown, to be engaged by the arms 114 and 115 on the ends of a pin 116 pivoted to the barrel. Secured to this pin is a rocker or lever 117 designed to be actuated by a plunger 118 mounted in a pressure chamber 119, which chamber is in communication with the barrel bore through the port or passage 120. A cross-member 121 may serve to connect the arms 112 and 113 adjacent their forward ends.

To the member 111 is secured a guide plunger 122, this plunger being slotted at its forward end, as shown at 123, to permit the passage therethrough of the hammer 27. The plunger 122 is hollow to receive the spring 124, and extends to a slight extent into a tube 125 mounted in the gun stock 12.

As shown, the plunger 122 is formed integrally with the driver member, although these members may be formed separately and secured together, if desired. In any event, it is contemplated that the driver be connected with the guide plunger, so that it moves rearwardly with the plunger and bolt member. When the gun is discharged the explosion gases will operate the plunger 118, thus causing the arms 114 and 115 to forcibly strike the forward end portions of the side members 112 and 113 of the driver. The driver, being forced rearwardly, will move the rear end of the bolt downwardly, and then move the bolt rearwardly to effect the extraction and ejection of the shell, and the introduction of a fresh cartridge into a position in front of the bolt. The plunger 122 will be carried rearwardly into the tube 125 against the tension of the spring 125, which spring at the end of the rearward movement will return the parts to their forward position, thus effecting the introduction of the fresh cartridge into the chamber, and the locking of the bolt in closed position, as shown in Fig. 17.

While I have shown and described some preferred embodiments of my invention, it will be understood that it is not to be limited to all of the details shown, but is capable of modification and variation within the spirit of the invention and within the scope of the appended claims.

What I claim is:

1. A firearm comprising a barrel member, a receiver, a bolt member movable in the receiver, an inertia member connected to the bolt member to move the latter, means providing a pressure chamber in communication with the barrel member, a plunger in said chamber to be moved by the pressure of the explosion gases, a driver adapted to contact said inertia member, and means to transmit the movement of said plunger to said driver and change the direction of said movement, and said driver having a body portion lying against the wall of the receiver and an end portion turned laterally with respect to the body portion to engage the inertia member.

2. A firearm comprising a barrel member, a receiver, a bolt member movable in the receiver, an inertia member connected to the bolt member to move the latter, means providing a pressure chamber in communication with the barrel member, a plunger slidably mounted in said chamber to be moved by the pressure of the explosion gases, a driver adapted to contact said inertia member and transmit movement to the latter, said driver having a short stroke as compared with that of the inertia member, and a lever pivoted adjacent the barrel and adapted to contact both plunger and driver to transmit motion of the plunger to the driver and change the direction of said motion.

3. A firearm comprising a barrel member, a receiver, a bolt movable in the receiver, an inertia member connected to the bolt to move the latter, a pressure chamber communicating with the barrel member and extending radially with respect to the axis of the barrel member, a plunger movable in said pressure chamber, a lever pivoted to the barrel having a portion adapted to be contacted by said plunger and a second portion, a driver mounted for sliding movement longitudinally of the barrel and adapted to be contacted at its forward end by the second portion of the lever, and the rear end of said driver contacting said inertia member to drive the latter and bolt rearwardly.

4. A firearm comprising a barrel member, a receiver, a bolt member movable in the receiver, an inertia member, a link connecting said inertia member to the bolt member to move the latter downwardly and rearwardly when the inertia member is moved rearwardly, means providing a pressure chamber in communication with the barrel member, a plunger in said chamber to be moved by the pressure of the explosion gases, a driver adapted to contact said inertia member, and means to transmit the movement of said plunger to said driver and change the direction of said movement, and said driver having a body portion lying against the wall of the receiver and an end portion turned laterally with respect to the body portion to engage the inertia member.

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