March 22, 1949. F. F. RUAU 2,465,271

AUTOMATIC BREECH BLOCK

Filed June 15, 1944 3 Sheets-Sheet 1

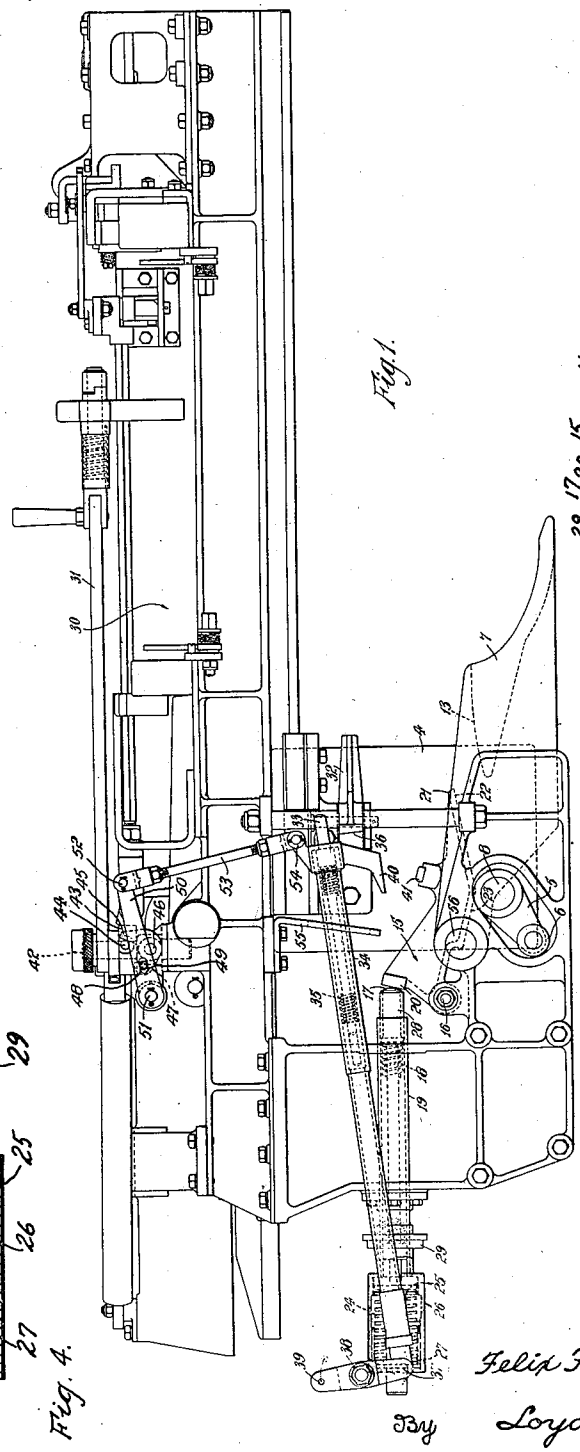


Fig. 1.

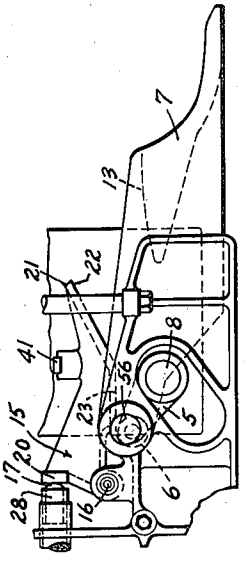


Fig. 5

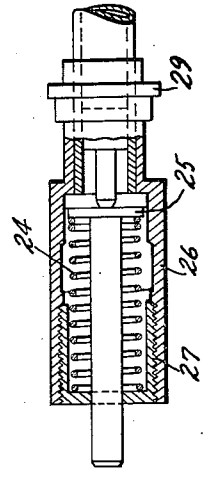


Fig. 4.

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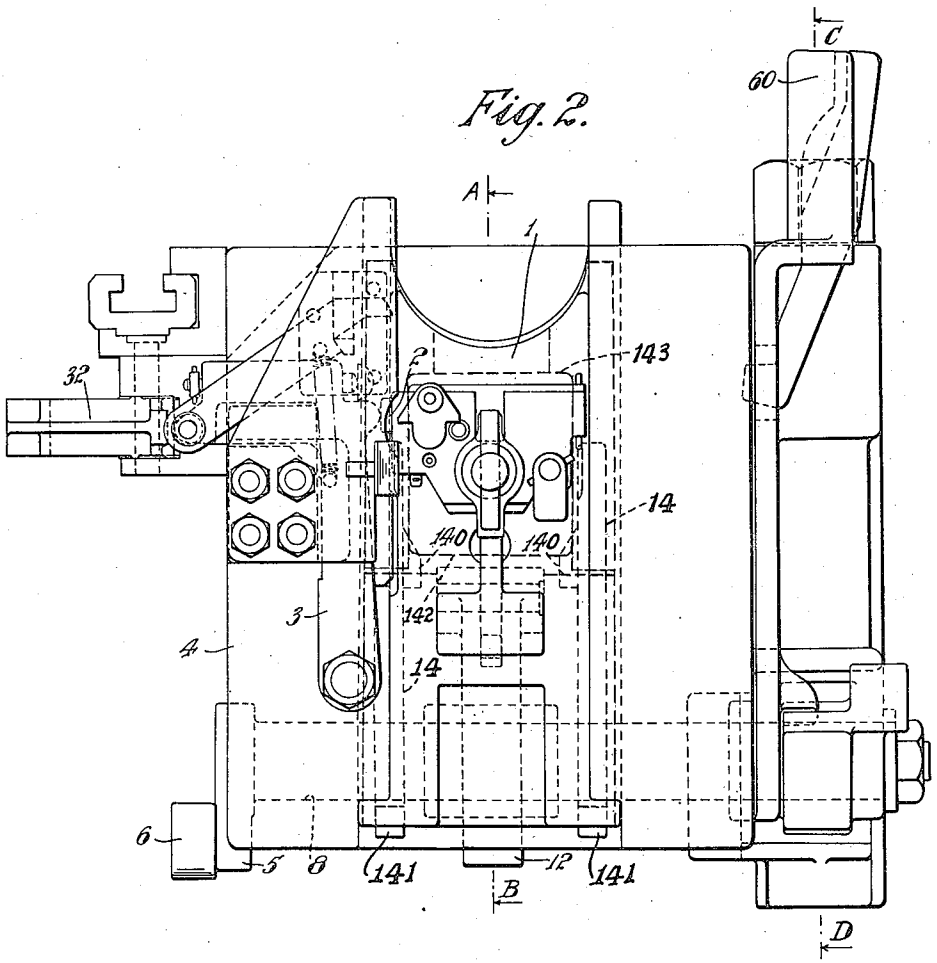
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March 22, 1949. F. F. RUAU 2,465,271

AUTOMATIC BREECH BLOCK

Filed June 15, 1944 3 Sheets-Sheet 2

Fig. 2.



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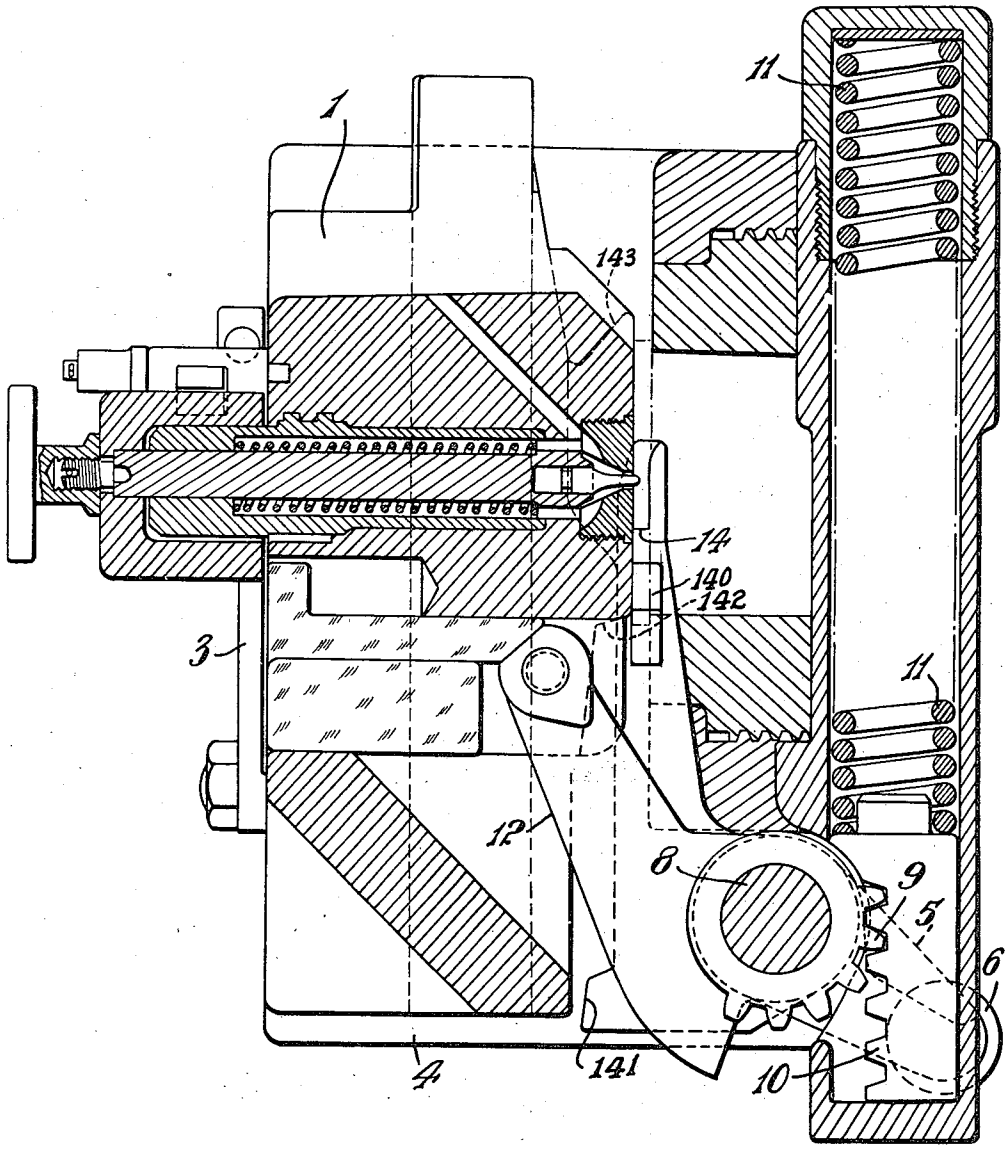
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AUTOMATIC BREECH BLOCK

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Fig. 3.



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UNITED STATES PATENT OFFICE

2,465,271

AUTOMATIC BREECH BLOCK

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Application June 15, 1944, Serial No. 540,492
In Great Britain June 15, 1943

8 Claims. (Cl. 89—167)

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This invention concerns improvements in or relating to ordnance and in particular to the breech and firing mechanisms for ordnance in which rounds are fed automatically into the breech and in which the breech is opened automatically during the run-out to eject a spent cartridge and is caused to close automatically on the insertion of a round. Such ordnance is referred to hereinafter for convenience as "an automatic gun."

The breech described above is known and referred to as a semi-automatic breech, and is held in the open position by a catch or catches and is opened by a breech-opening-lever which engages a cam on the run-out of the gun and is usually caused to operate a pinion working on a rack which compresses a breech-closing spring. Turning of the lever depresses the breech-block through the medium of an interior lever or arm and the closing spring is simultaneously compressed. When the breech-block is fully depressed the breech-retaining-catch or catches hold the breech-block down against the spring and when a round is inserted, the base engages the catch or catches thus releasing the breech-block and allowing the spring to move it up to close the breech. Such breech-blocks are also provided with a hand lever referred to for convenience herein as an "operating handle" which is used to open the breech for loading the first round or at other times where there may be a misfire and where there has been no recoil and run-out so as to enable the breech to be opened automatically.

In view of this construction therefore, the breech-closing spring should not be so strong as to cause undue loading on the cam or breech-opening-lever operated by the cam, and the spring should also be weak enough to enable the breech to be opened by the operating handle. On the other hand, the spring must be sufficiently strong to cause the breech to close with reasonable speed. Certain size springs have heretofore been used, but it is found that when the gun is fired automatically, a breech fitted with such a spring is not altogether satisfactory, in that it does not always close with sufficient speed; and as one of the objects of an automatic gun is to increase the rate of fire, it is an object of the invention to provide means whereby the breech can be caused to close more rapidly than hitherto on the insertion of a round. It is also an object of the invention to obtain this result without increasing the strength of spring normally required. This object is achieved according to the present invention by providing in an automatic gun, means for providing an additional force adapted to operate on the breech-block during the initial part of the closing of the breech so as to increase the speed of closing, said means comprising a movable element adapted to engage the breech-opening-lever during the run-out and after the usual breech-closing-spring has been compressed and the breech held open by its retaining catch or catches, and an auxiliary spring adapted to be compressed by the movement of said movable element when engaged by the breech-opening-lever, whereby on insertion of a round into the breech the auxiliary spring operates simultaneously with the breech-closing-spring to provide an additional force to start the closing movement of the breech-block.

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It will be seen that by this arrangement there is no increased load put on the breech-opening-lever or the cam since the breech-closing-spring and the auxiliary spring are loaded in succession, the latter spring being loaded after the breech-closing-spring has been loaded and the breech held in the open position by its catches. The said movable element is caused to press on the breech-opening-lever in a direction reverse to that in which the lever moves to compress the breech-closing-spring, and thus when the movable element is engaged by the breech-opening-lever the latter applies a pressure to the movable element since a retaining catch or catches hold the breech-block and the interior arm coupled to the breech-opening-lever engages an under surface on the breech-block and tends to lift the latter, but as the block is held, the breech-opening-lever cannot move in the direction opposite to that in which it is applying pressure to the movable member. By this arrangement it will be seen that when a round is inserted and the breech retaining catch or catches release the breech-block the auxiliary spring and the breech-closing spring both operate simultaneously, the auxiliary spring operating only during the initial part of the closing to assist in over-coming the inertia of the mass of the breech-block. This arrangement provides an effective and rapid closing of the breech.

It is sometimes desirable in an automatic gun of the kind described and provided with the auxiliary spring device set forth above to prevent firing taking place automatically and to ensure that there will be a separate conscious manual operation in the firing of each round, such an arrangement being intended to ensure that the gun is properly laid for each shot. This object is

achieved according to the invention by providing an automatic gun having fire-control-mechanism adapted to operate the breech trigger mechanism, wherein a part of said fire-control-mechanism is movable from an operative position to an inoperative position and wherein means is provided to move said movable part during a part at least of the run-out to the inoperative position. The said movable part may have a push-rod for operating the trigger-mechanism, which rod is caused to be actuated on manual control and is adapted to engage an abutment (e. g. a part of the fire-control-mechanism) to prevent its return to the operative position until the rod is moved out of the way thereof. The said movable part of the fire-control-mechanism may comprise a pivotally mounted tube in which the push-rod is mounted and a spring within the tube to press the rod outwards and afford a spring-urged push-rod, and manually controlled liquid-pressure-means may be provided to move the rod clear of the abutment and thereafter to cause it to operate the trigger mechanism. By this arrangement unless the manually controlled means is operated after each shot, so as to move the rod clear of the abutment, the movable part of the fire-control-mechanism will be held in the inoperative position and will remain in that inoperative position until the manually controlled means is operated. On such operation the rod will be moved clear of the abutment and will move down into the operative position and further manipulation of the manually controlled means will cause the rod to move again and cause a further round to be fired.

It is also an object of the invention to ensure that in an automatic gun having an auxiliary breech closing spring as set forth above and having a magazine comprising a member adapted to engage and to be movable with the rounds in the magazine (e. g. a pressure device to feed the rounds) that the firing mechanism will under normal conditions be rendered inoperative after the last round has been rammed. This object is achieved according to the present invention by providing in such an automatic gun an operative connection between said movable member and a part of the fire-control-mechanism, said part being arranged to be movable from the operative to an inoperative position, said operative connection being arranged to move said movable part to an inoperative position when the movable member has moved to a predetermined position due to the last round having been fed from the magazine. The parts are so arranged that withdrawal of the movable member from the position it occupies after the last round has been fed, will cause the movable part of the fire-control-mechanism to return to an operative position. This arrangement ensures that when the last round in the magazine has been fed so as to be rammed into the breech the round cannot be fired unless the movable part of the fire-control-mechanism is returned to the operative position. This arrangement ensures that the gunner cannot accidentally fire the gun when there are no more rounds in the magazine. This is an important feature since, if that last round is fired, one round has to be hand-loaded into the breech before it is possible to fire the gun again. Thus although the gunner has control over the firing of the last round, if he is unaware that there are no more rounds left, ordinary manipulation of the fire-control-mechanism will show him that the magazine is empty and he can then decide

to charge the magazine with further rounds before firing the round in the breech or, in an emergency, he may decide to fire the last round without placing any further rounds in the magazine.

An automatic gun made in accordance with the invention will now be described by way of example, with reference to the accompanying drawings in which—

Figure 1 is a side elevation of part of a six-pounder gun constructed according to the invention.

Figure 2 is a front elevation of the breech and breech-block of the gun, shown in the closed position.

Figure 3 is a sectional view of Figure 2 the main or left-hand part of the view being a section taken on the line AB Figure 2 and the right-hand part being a section of the barrel which contains the breech-closing spring and taken on the line CD Figure 2.

Figure 4 is a fragmentary view, in section, of the left-hand end of Figure 1.

Figure 5 is a fragmentary view of part of Figure 1 showing certain parts in a different position.

In Figure 1 of the drawings, the parts are shown in the position where the last round has been fed to the breech and latter has closed, for the sake of economy of illustration, but the following description will render clear the operation and disposition of the various parts at different stages in the working of the gun. The gun illustrated is a six-pounder gun having the usual sliding breech-block 1 provided with trigger and firing mechanism as shown in Figures 2 and 3. The sear 2 on the breech-block is adapted to be actuated by a pivoted element 3 on the breech ring 4, the said pivoted element in turn being adapted to be operated by fire-control-mechanism described later. The breech-block has a breech-opening-lever having an arm 5 carrying a roller 6 which is adapted to run up the rear surface of a cam 7, pivoted on a pin 56 which is fixed to the cradle, during the latter part of the run-out or counterrecoil movement of the barrel. This arm is fixed on a shaft 8 pivoted in the breech ring and carries a pinion 9, Figure 3, which is rotated on rotation of the arm 5 and operates a rack 10 to compress the breech-closing-spring 11 and cause an interior arm 12 on the shaft 8 to open the breech-block as the roller of the breech-opening lever runs up the cam. The breech-block is moved downwardly by the arm 12 which is operated by the arm 5 and after the breech-block has been fully lowered, the roller 6 of the arm 5 runs down an oppositely inclined face 13 on the cam so as to allow the breech-block to return to a higher position than that to which it was moved down, which latter position was sufficiently low to allow the usual breech-retaining-catches to move inwardly so that as the breech-block moves upwardly again, as permitted by the last mentioned portion of the cam, it will move up against the breech-retaining-catches and will be held in the open position. The breech-retaining-catches consist of lugs 140 which extend inwardly from the extractors 14, as shown in Figures 2 and 3. The extractors 14 are freely pivoted on the shaft 8. At the lower end of each extractor is an operating lug 141 which is struck by an inclined surface 142 on the breech-block 1 as the latter moves down when the breech is opened by manual actuation of the operating handle 60. This causes the extractors to pivot on the shaft 8 and pull the cartridge case (if present) out of the breech

and eject it. The pivoting movement of the extractors moves the catches 140 outwardly away from the breech into positions above ledges 143 on the upper portion of the breech-block so that, as the latter moves up a little, as above mentioned, it will be caught and held by the catches until a new round is rammed home into the breech and releases the catches as explained hereinafter.

After the breech-block is so held the gun has still further to travel to finish the run-out, and in moving this further distance the roller 6 of the breech-opening-lever engages a pivoted member located on the opposite side of the lever to that adjacent the cam 7. This pivoted member comprises a bellcrank lever 15 (having two arms 20 and 21 referred to later) which is pivoted at 16 on the cradle and adapted to engage a plunger 17 to compress a compression-spring 18 in a cylinder 19. The plunger 17 is guided in the end of the cylinder by a sliding bush 28. The roller 6 of the breech-opening-lever presses against the pivoted member 15 and as the breech-block is held in its lowest position by the retaining catches 140 the pressure is positive and causes the pivoted member 15 to rotate on its pivot and its arm 20 to push in the plunger and compress the above-mentioned compression spring 18. This spring is called, for convenience, an auxiliary spring and it will be seen that when the run-out is completed the pivoted member will be raised by the roller 6 on the end of the breech-opening-lever so that the pivoted member will be applying a force derived from the auxiliary spring, tending to close the breech. The effect of the auxiliary spring may be augmented by a further spring as described later.

It will be apparent from the description given so far that the arm 21 of the bellcrank lever 15 constituting the pivoted member is raised by the breech-opening-lever as the latter travels forwardly during the last portion of the run-out. In order to enable the gun to complete the run-out, it is necessary to provide the arm 21 of the pivoted member which is engaged by the breech-opening-lever with a portion which, after the auxiliary spring is compressed, occupies a position parallel to the direction of movement of the gun during the run-out. Thus this arm of the pivoted member is provided with two faces 22 and 23 respectively which engage the roller on the breech-opening-lever, one face being arranged at an angle to the direction of movement so that as the breech-opening-lever moves towards the pivot of the pivoted member the latter will be swung upwardly to compress the auxiliary spring and the other face is such that when the spring has been compressed sufficiently the roller on the breech-opening-lever will engage that face which, due to the turning of the pivoted member, will at that moment be parallel to the axis of the gun. This will be better understood from Figure 5, which shows the gun position at the instant the counterrecoil has finished, but before a round strikes the extractors, so that the breech is still open. On breech-closing the arm 5 will swing down to the position shown in Figure 1. Thus there is not sufficient resistance offered by the pivoted member and the auxiliary spring to prevent the completion of the run-out and consequently the gun barrel can, by this arrangement, move up to its final forward position.

At the end of the run-out the roller 6 is still pressing on the surface 23 unless a round has been fed into the breech in which case the breech-

block would close and the arm 5 and roller 6 would move down to the position shown in Figure 1.

As soon as a round is inserted and its flange strikes the extractors 14 the breech-retaining-catches 140 are moved clear of the breech-block and the latter is caused to move upwardly by the breech-closing-spring 11 plus the auxiliary spring 18. The latter spring operates only on the initial part of the closing of the breech and assists in overcoming the inertia of the mass of a sliding breech-block. It will be seen from the construction so far described that there is no extra load required to open the breech since the two springs, namely the usual breech-closing spring and the auxiliary spring, are operated upon in succession, and further the breech-opening-lever is held (by the catches 140 holding the breech-block in the open position) against turning under the influence of the auxiliary spring while compressing the latter. When the breech-block is closed, the arm 5 and roller 6 are brought to the position shown in Figure 1.

A second spring 24, Figures 1 and 4, is provided to increase the force of the auxiliary spring 18 when necessary and is arranged in tandem with the auxiliary spring for reasons given below.

The spring 24 surrounds a stud 25 and is enclosed in a tube 26 having an externally threaded adjusting cap or bush 27. As will be seen from Figure 1 the rear end of the plunger 17 presses on the head of the stud 25 so that normally both springs are compressed together as the bell crank lever swings on its pivot. There are, however, times when it is necessary to be able to open the breech-block by hand, for example, in order to remove a round when action ceases. To do this the lever 60 is pulled down so as to turn the shaft 8 and as will be clear from the foregoing description the arm 5 will rise from the position shown in Figure 1 and the roller 6 will engage the surface 23 of the bellcrank lever 15. But the strength of the two springs is much too great to enable them to be compressed manually in this way so the tube 26 is arranged to be detachable by a spring-latched joint formed in the part 29. The gunner therefore detaches the tube 26 when he desires to open the breech manually.

As the gun is fired the barrel with its breech-ring 4 recoils and as the roller 6 travels to the right, Figure 1, the cam 7 swings upwards on its pivot 56 on the cradle to permit this.

The gun is provided with a magazine 30 in which a row of rounds is placed and in which the rounds are fed by means of a spring urged presser-arm 31 to a feeding station at which they are engaged by a ramming device (not shown) which rams them in succession into the breech. Such feeding mechanism is not new and is not part of the present invention, but if desired reference may be made to United States patent application Serial No. 488,454, and now Patent No. 2,418,656 dated April 8, 1947, for an illustration of the automatic feeding and ramming mechanism. Figure 1 of the accompanying drawings is a view of the gun similar to Figure 5 of the said specification and may easily be compared therewith.

The firing mechanism as previously stated includes the usual trigger 2 carried on the sliding breech-block, and the pivoted element 3 which is mounted on the breech-ring and adapted to be actuated to operate the trigger on the breech-block. This pivoted element on the breech-ring is adapted to be moved inwardly by a bellcrank lever 32 which is part of the fire-control-mechanism,

the bellcrank lever in turn being actuated by a push-rod 33 mounted in a pivotally mounted tube 34 and provided with a cushioning spring 35 to reduce shocks in operation. The rear end of this tube is adapted to swing upwardly from a position in which the push-rod is in alignment with a face 36 of the said bellcrank lever in the fire-control-mechanism to a position in which it is out of alignment therewith (i. e. a little lower than the position shown in Figure 1) so that in the latter case the push-rod lies above and on top of the bellcrank lever, and will prevent the pivoted tube from swinging downwardly until the rod is moved to the left, Figure 1. The tube 34 is pivoted at 37 to a double-armed lever pivoted on a fixed pivot 38. A rod or cable of any suitable kind is pivoted to the upper arm of the lever at 39 and coupled to liquid-pressure-means e. g. a hydraulic device (not shown) by means of which the lever can be oscillated from the position shown in Figure 1 to a position where the pivot 39 is moved one inch to the right. The movements take place each time a trigger or similar manually controlled device coupled to the liquid-pressure-means is operated by the gunner. The clock-wise movement of the double-armed lever, Figure 1, causes the push-rod and tube to be moved to the left and thus the rod is brought clear of the end of the bellcrank-lever 32 which is provided with the face 36 and can fall down into alignment with said face, being guided and controlled in this movement by a slotted bracket 55. The hydraulic pressure is provided by any known means, but is as above stated manually controlled, so that when the pivoted tube is in its lower or operative position and the push rod is in alignment with the aforesaid face 36 of the bellcrank lever another operation of the manual control device will cause the double armed lever to move anticlockwise and the push-rod to move to the right and strike the face 36 of the bellcrank lever which in turn moves the pivoted element 3 on the breech-ring to strike against the trigger 2 on the breech-block.

The particular firing mechanism shown in Figure 2 is the same as that described in the co-pending United States patent application Serial No. 495,522 and a full description of the parts shown is given in said specification and need not be repeated here.

In order to ensure that the hydraulic mechanism shall be controlled and manually operated for each shot so as to ensure that the gun is properly laid for each shot, the pivoted tube is provided with an abutment 40 which is adapted to engage a cooperating abutment 41 on the pivoted member 15 previously mentioned which loads the auxiliary spring. Thus at the end of each run-out the pivoted member 15 raises the pivoted tube of the fire-control-mechanism into the inoperative position and when the breech-block closes and the bell crank lever 15 moves down again to the position shown in Figure 1 it allows the pivoted tube to move downwardly (subject to further control by the position of the presser arm 31 as described later) to the operative position. It will be seen that as the breech-block moves up it is assisted by the auxiliary spring which causes the pivoted member 15 to swing downwardly and it is this lowering of the pivoted member which allows the pivoted tube to swing down, provided the rod 33 thereof has been moved to the left in the manner described.

If, however, the manual control device of the hydraulic mechanism has not been manipulated, so as to move the pushrod and the pivoted tube 34 to the left, then the rod will rest on top of the bellcrank lever 32 so that the fire-control-mechanism is inoperative. If and when, however, the hydraulic mechanism is manipulated to cause the rod and tube to be moved to the left after the breech is closed then further manipulation of the hydraulic mechanism will cause the rod to move to the right and strike the bellcrank-lever 32 of the fire-control-mechanism which in turn moves the pivoted element 3 on the breech ring and that in turn operates the trigger 2 on the breech-block.

It is also desired to ensure that when the last round in the magazine has been rammed into the breech, that round will not be fired unintentionally. This purpose is effected by arranging that the presser-arm 31 which feeds the rounds towards the feeding station is operatively connected to the pivoted tube 34 in such a way that when the presser-arm has moved inwardly to its final position after having fed the last round, the tube and push rod will be raised out of alignment with the face 36 of the aforesaid bellcrank lever of the fire-control-mechanism, that is to the position shown in Figure 1. The arrangement of the parts is such, however, that if the presser-arm is withdrawn, then the pivoted tube is lowered into alignment with the bellcrank lever of the fire-control-mechanism. The mechanism for providing this control is shown in Figure 1. The presser-arm 31 is pivoted on a stud 42 and the boss 43 of the arm is provided with a projecting pin 44. When the presser arm is nearly at the inward limit of its feeding stroke the pin engages an arm 45 of a bell crank lever pivoted at 46. The other arm 47 of the lever is provided with a pin or roller 48 which works in a slot 49 in a lever 50 which is pivoted at 51. The free end of the lever is pivoted at 52 to a link 53 the other end of which is pivoted at 54 to the end of the tube 34. This arrangement thus ensures that when the last round under the control of the presser-arm has been fed into the breech, the gunner, if he desires to fire the round, must pull the presser-arm outwardly to allow the pivoted tube to move down. It is desirable that he should be prevented from firing the last round unintentionally since if that round is fired it is necessary to reload the gun manually as described in United States patent application Serial No. 488,454, and now Patent No. 2,418,656, dated April 8, 1947, and fill the magazine with further rounds before it is possible to make use of the automatic feeding and ramming devices. The arrangement, however, does still leave the firing of the last round under the control of the gunner and, if he finds it necessary to fire that last round or desires to do so, he can do this by first withdrawing the presser-arm and then operating the manual control device of the hydraulic mechanism.

The auxiliary breech-closing spring arrangement forming the subject of this application is also claimed herein in combination with the manual fire control which in copending United States patent application Serial No. 540,494 is claimed per se as well as in combination with the last shot control device claimed per se in co-pending United States patent application Serial No. 540,493. The latter device is also claimed in this application in combination with both the auxiliary breech-closing spring arrangement and the manual fire control.

What I claim as my invention and desire to secure by Letters Patent is:

1. In an automatic gun including a recoiling barrel provided with a breech, a movable breech block for opening and closing said breech, a breech opening lever cooperating with said breech block, means for operating said lever to open the breech during the counterrecoil movement of said barrel, a breech closing spring arranged to be tensioned by the opening of the breech, and releasable means for retaining said block in open position against the tension of said spring, means for providing an additional force to operate on said breech block during the initial part of its breech closing movement comprising a movable element arranged to be actuated by said lever during the counterrecoil movement of said barrel and after said spring has been tensioned by said lever, and an auxiliary spring tensioned by the movement of said element and operable simultaneously with said first named spring during the first part of the breech closing movement of said block to increase the speed of said closing movement when said retaining means is released.

2. In an automatic gun including a recoiling barrel provided with a breech, a movable breech block for opening and closing said breech, a breech opening lever cooperating with said breech block, means for operating said lever to open the breech during the counterrecoil movement of said barrel, a breech closing spring arranged to be tensioned by the opening of the breech, and releasable means for retaining said block in open position against the tension of said spring, means for providing an additional force to operate on said breech block during the initial part of its breech closing movement comprising a movable element arranged to be actuated by said lever during the counterrecoil movement of said barrel and after said spring has been tensioned by said lever, and an auxiliary spring tensioned by the movement of said element and operable simultaneously with said first named spring during the first part of the breech closing movement of said block to increase the speed of said closing movement when said retaining means is released, said element under the tension of said second named spring acting on said lever in a direction reverse to that in whcih said lever moves to tension said first named spring.

3. In an automatic gun including a recoiling barrel provided with a breech, a movable breech block for opening and closing said breech, a breech opening lever cooperating with said breech block, means for operating said lever to open the breech during the counterrecoil movement of said barrel, a breech closing spring arranged to be tensioned by the opening of the breech, and releasable means for retaining said block in open position against the tension of said spring, means for providing an additional force to operate on said breech block during the initial part of its breech closing movement comprising a movable element arranged to be actuated by said lever during the counterrecoil movement of said barrel and after said spring has been tensioned by said lever, an auxiliary spring tensioned by the movement of said element and operable simultaneously with said first named spring during the first part of the breech closing movement of said block to increase the speed of said closing movement when said retaining means is released, a second auxiliary spring supplementing said first auxiliary spring, and means for detaching said last named auxiliary spring from the first auxiliary spring.

4. In an automatic gun including a recoiling barrel provided with a breech, a movable breech block for opening and closing said breech, a breech opening lever cooperating with said breech block, means for operating said lever to open the breech during the counterrecoil movement of said barrel, a breech closing spring arranged to be tensioned by the opening of the breech, and releasable means for retaining said block in open position against the tension of said spring, means for providing an additional force to operate on said breech block during the initial part of its breech closing movement comprising a movable element arranged to be actuated by said lever during the counterrecoil movement of said barrel and after said spring has been tensioned by said lever, an auxiliary spring tensioned by the movement of said element and operable simultaneously with said first named spring during the first part of the breech closing movement of said block to increase the speed of said closing movement when said retaining means is released, breech trigger mechanism and fire control mechanism including a member for controlling operation thereof and arranged to be moved by said element from an operative to an inoperative position when said element is actuated by said lever.

5. In an automatic gun including a recoiling barrel provided with a breech, a movable breech block for opening and closing said breech, a breech opening lever cooperating with said breech block, means for operating said lever to open the breech during the counterrecoil movement of said barrel, a breech closing spring arranged to be tensioned by the opening of the breech, and releasable means for retaining said block in open position against the tension of said spring, means for providing an additional force to operate on said breech block during the initial part of its breech closing movement comprising a movable element arranged to be actuated by said lever during the counterrecoil movement of said barrel and after said spring has been tensioned by said lever, an auxiliary spring tensioned by the movement of said element and operable simultaneously with said first named spring during the first part of the breech closing movement of said block to increase the speed of said closing movement when said retaining means is released, breech trigger mechanism and fire control mechanism including a member for controlling operation thereof and arranged to be moved by said element from an operative to an inoperative position when said element is actuated by said lever, said last named member including a push rod arranged to engage a part of said trigger mechanism for operating the same and also arranged to engage a part of said trigger mechanism to prevent movement of said rod into said operative relationship with said trigger mechanism, and manually operable means for moving said rod into a position in which it can return to said operative relationship with said trigger mechanism.

6. In an automatic gun including a recoiling barrel provided with a breech, a movable breech block for opening and closing said breech, a breech opening lever cooperating with said breech block, means for operating said lever to open the breech during the counterrecoil movement of said barrel, a breech closing spring arranged to be tensioned by the opening of the breech, and releasable means for retaining said block in open position against the tension of said spring, means for providing an additional force to operate on said breech block during the initial part of its

breech closing movement comprising a movable element arranged to be actuated by said lever during the counterrecoil movement of said barrel and after said spring has been tensioned by said lever, an auxiliary spring tensioned by the movement of said element and operable simultaneously with said first named spring during the first part of the breech closing movement of said block to increase the speed of said closing movement when said retaining means is released, breech trigger mechanism and fire control mechanism including a member for controlling operation thereof and arranged to be moved by said element from an operative to an inoperative position when said element is actuated by said lever, said last named member including a pivotally mounted tube, a push rod movable in said tube, a spring cooperating with said rod to urge the same outwardly with respect to said tube, said rod in one position being in operative relationship to said trigger mechanism and in another position arranged to engage a part of said trigger mechanism and prevent movement of said rod into operative relationship with said trigger mechanism, and manually operable means to move said rod against the action of said spring whereby said rod may return into said operative relationship with said trigger mechanism.

7. In an automatic gun including a recoiling barrel provided with a breech, a movable breech block for opening and closing said breech, a breech opening lever cooperating with said breech block, means for operating said lever to open the breech during counterrecoil movement of said barrel, a breech closing spring arranged to be tensioned by the opening of the breech, and releasable means for retaining said block in open position against the tension of said spring, means for providing an additional force to operate on said breech block during the initial part of its breech closing movement comprising a movable element arranged to be actuated by said lever during the counterrecoil movement of said barrel and after said spring has been tensioned by said lever, an auxiliary spring tensioned by the movement of said element and operable simultaneously with said first named spring during the first part of the breech closing movement of said block to increase the speed of said closing movement when said retaining means is released, breech trigger mechanism and fire control mechanism including a control member for controlling operation thereof and arranged to be moved by said element from an operative to an inoperative position when said element is actuated by said lever, said last named member including a pivotally mounted tube, a push rod movable in said tube, a spring cooperating with said rod to urge the same outwardly with respect to said tube, said rod in one position being in operative relationship to said trigger mechanism and in another position arranged to engage a part of said trigger mechanism and prevent movement of said rod into operative relationship with said trigger mechanism, manually operable means to move said rod against the action of said spring whereby said rod may return into said operative relationship with said trigger mechanism, a magazine for rounds, a movable device movable with the rounds in said magazine, and an operative connection between said movable device and said control member, said connection being operable to restore said control member to operative position upon withdrawal of said movable device from its position taken when the last round has been fed out of the magazine.

8. In an automatic gun including a recoiling barrel provided with a breech, a movable breech block for opening and closing said breech, a breech opening lever cooperating with said breech block, means for operating said lever to open the breech during the counterrecoil movement of said barrel, a breech closing spring arranged to be tensioned by the opening of the breech, and releasable means for retaining said block in open position against the tension of said spring, means for providing an additional force to operate on said breech block during the initial part of its breech closing movement comprising a resiliently actuated element arranged to be moved by said lever during the counterrecoil movement of said barrel after the breech closing spring has been tensioned and to be tensioned to increase the speed of closing movement of the breech block when said retaining means is released.

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