April 14, 1931. J. E. BROWNING 1,801,072

AUTOMATIC FIREARM

Original Filed March 19, 1928 4 Sheets-Sheet 1

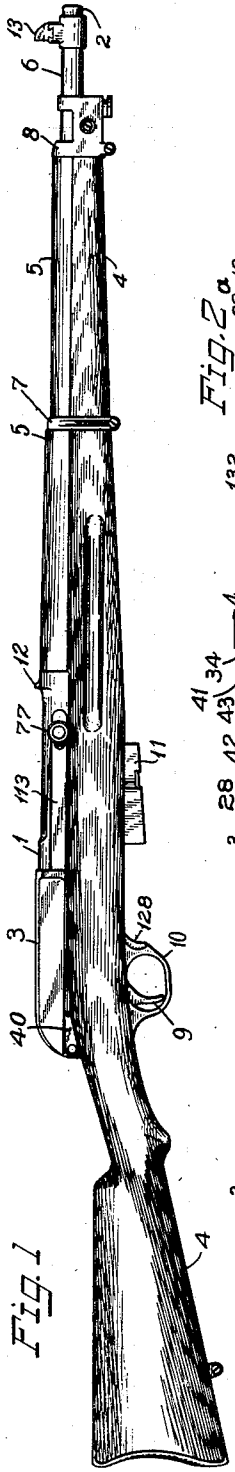


Fig. 1

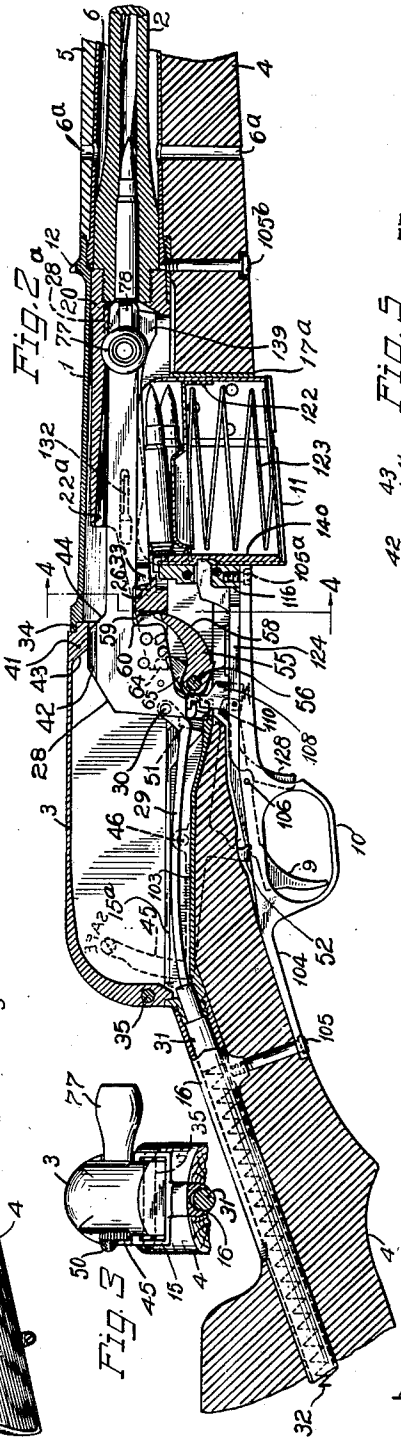


Fig. 2a

Fig. 3

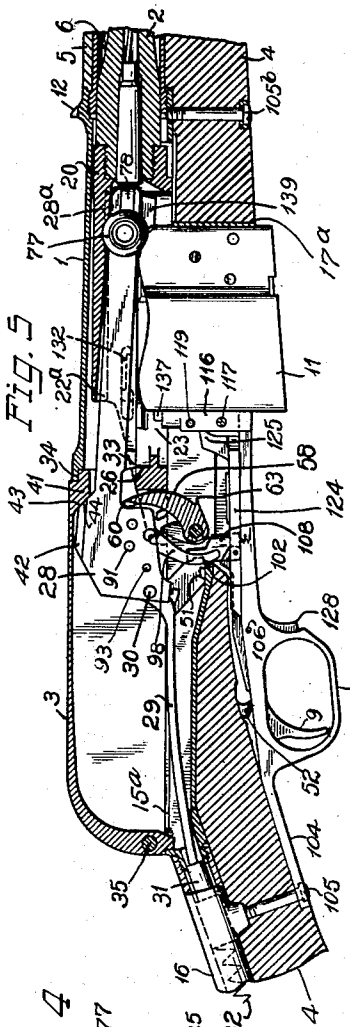


Fig. 5

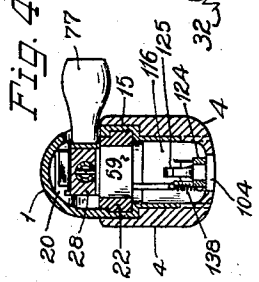


Fig. 4

Inventor
Jonathan E. Browning
By S. Jay Teller
Attorney

April 14, 1931. J. E. BROWNING 1,801,072

AUTOMATIC FIREARM

Original Filed March 19, 1928 4 Sheets-Sheet 2

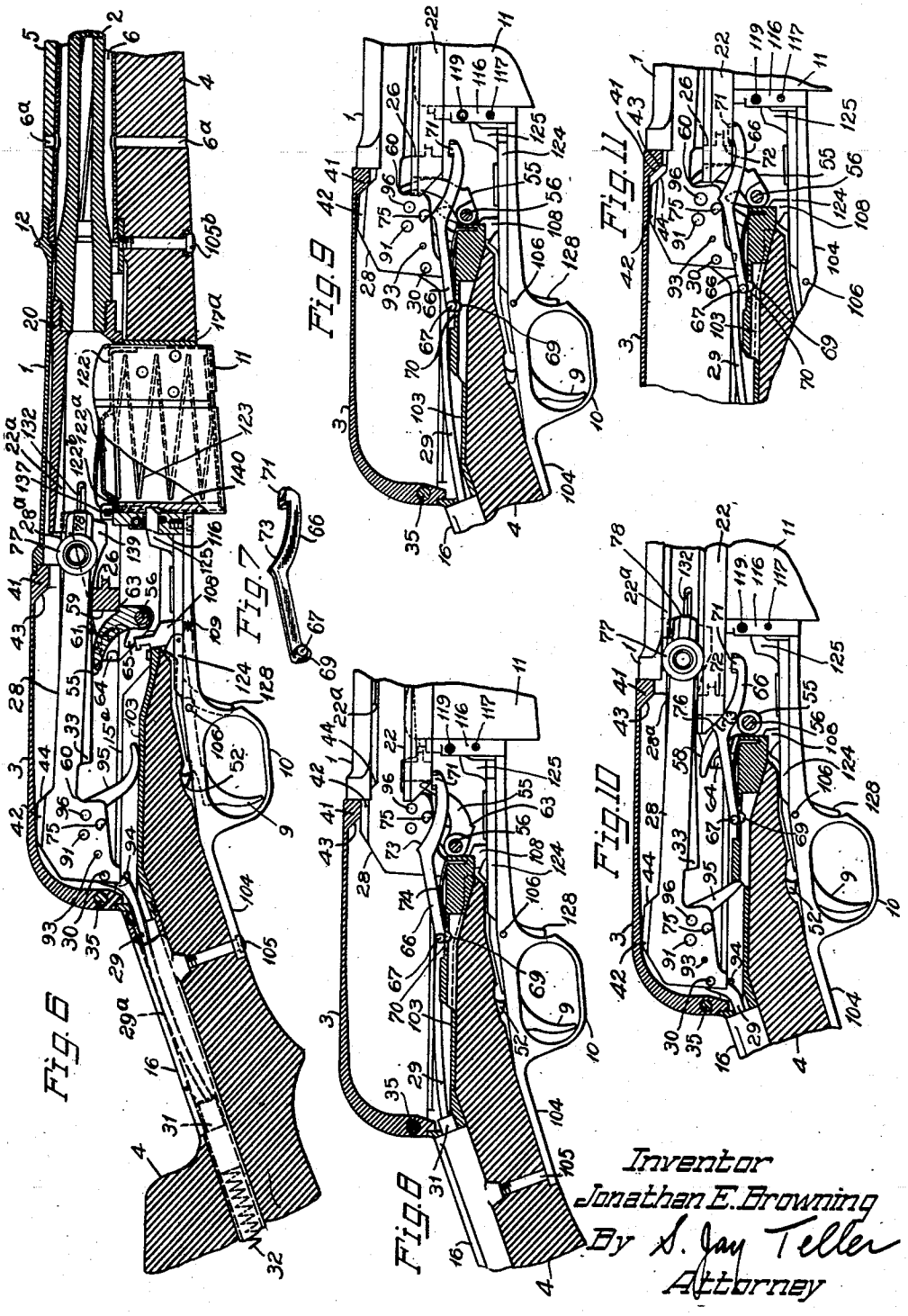


Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

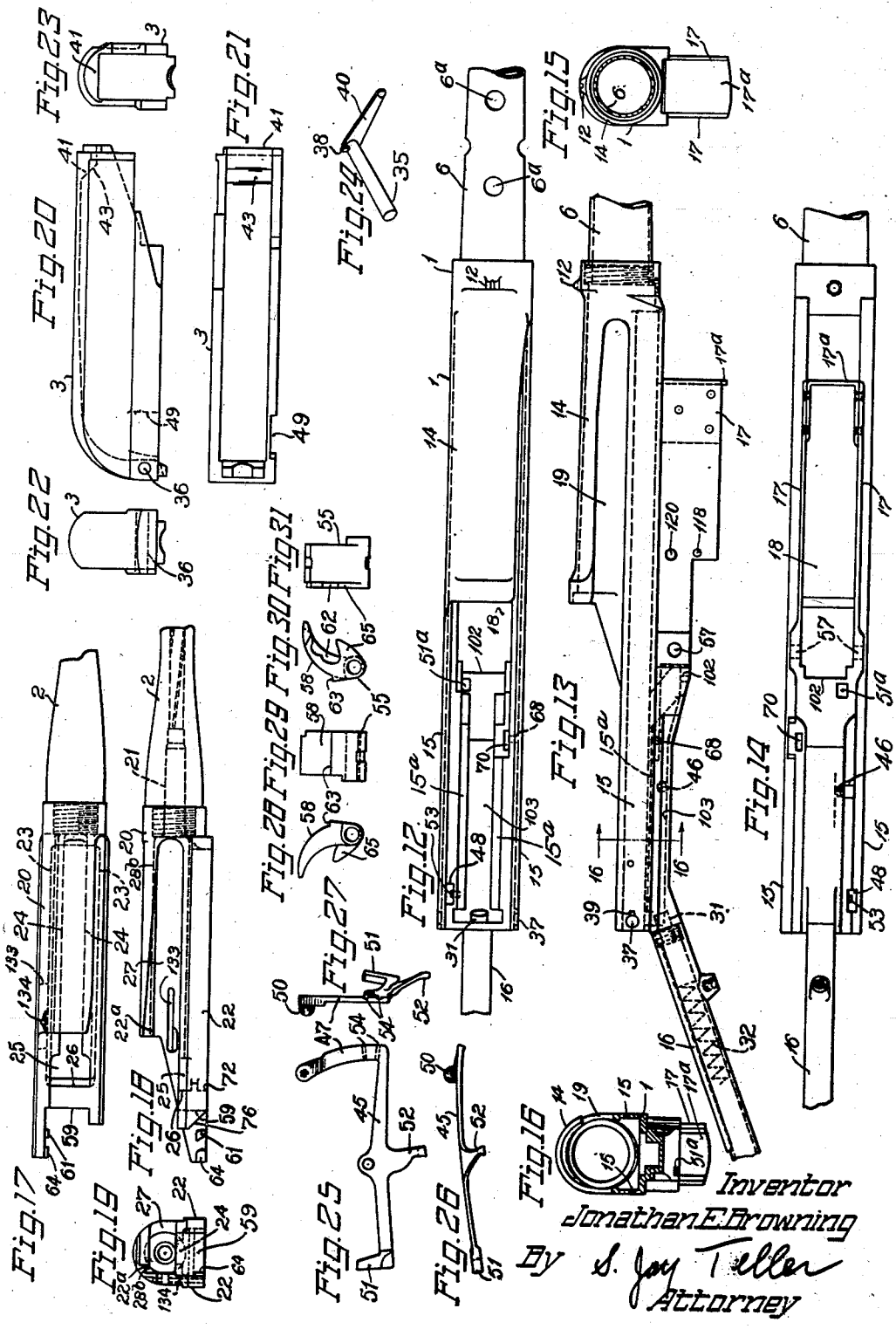
Fig. 11

Inventor
Jonathan E. Browning
By S. Jay Teller
Attorney

April 14, 1931. J. E. BROWNING 1,801,072

AUTOMATIC FIREARM

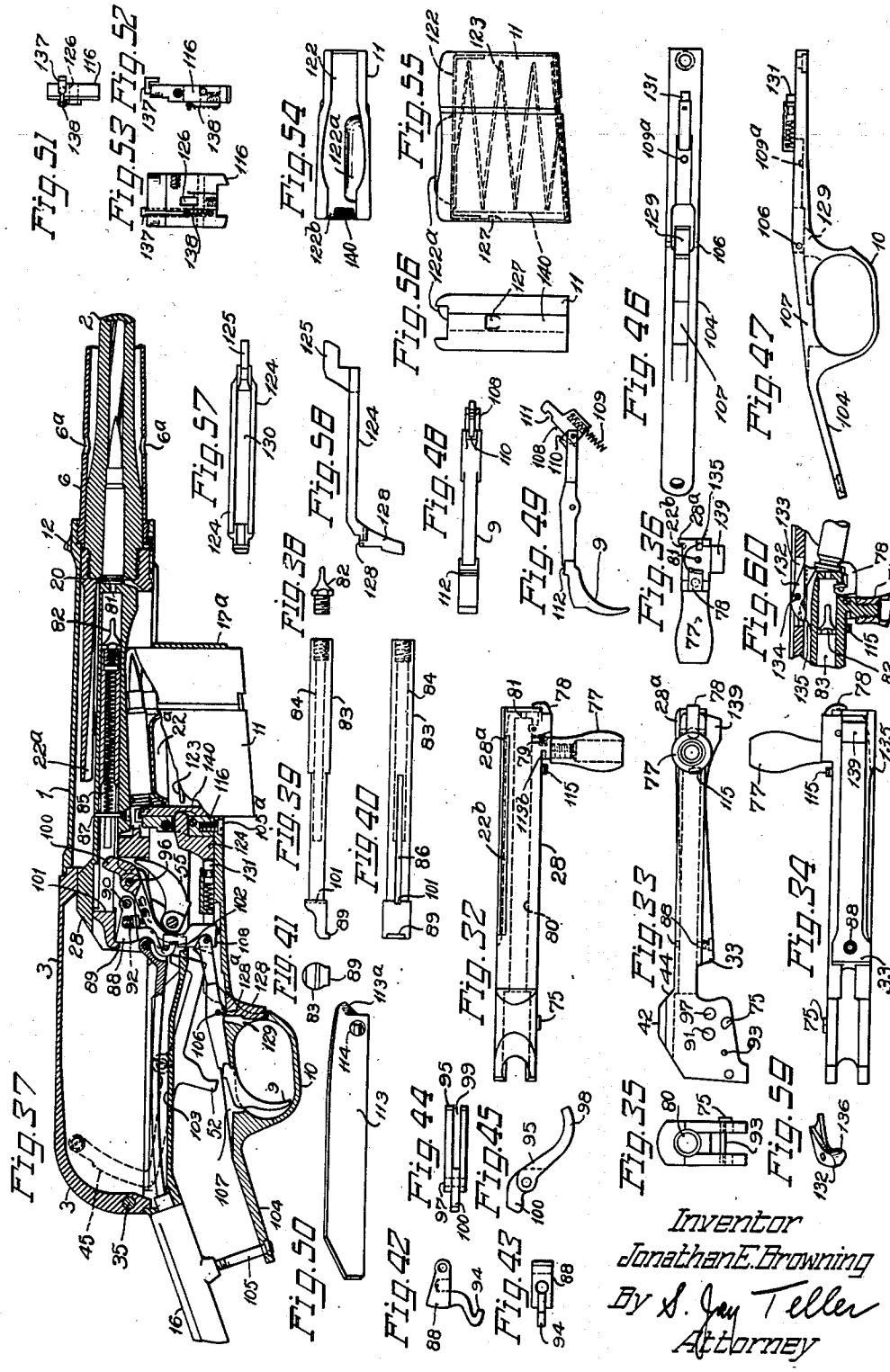
Original Filed March 19, 1928 4 Sheets-Sheet 3



April 14, 1931. J. E. BROWNING 1,801,072

AUTOMATIC FIREARM

Original Filed March 19, 1928 4 Sheets-Sheet 4



Inventor
Jonathan E. Browning
By S. Jay Teller
Attorney

Patented Apr. 14, 1931

1,801,072

UNITED STATES PATENT OFFICE

JONATHAN EDMUND BROWNING, OF OGDEN, UTAH, ASSIGNOR TO J. E. BROWNING COMPANY, OF OGDEN, UTAH, A CORPORATION OF UTAH

AUTOMATIC FIREARM

Application filed March 19, 1928, Serial No. 262,818. Renewed October 1, 1930.

The invention is applicable to a shoulder arm of rifle caliber and I have shown such a firearm so constructed as to require the manual operation of the trigger to effect the firing of each shot. In regard to this latter feature, however, I do not necessarily limit myself and as concerns some of its phases the invention is applicable to firearms adapted for full automatic or volley firing.

The invention relates particularly to a firearm of the class wherein the barrel and barrel extension and also the breech slide or bolt move rearward upon recoil to a limited extent and wherein the breech bolt is then permitted to move rearward separately from and to a greater extent than the barrel and barrel extension, being returned to its forward locked position automatically. The separate rearward movement of the breech bolt effects the extraction and ejection of the cartridge shell, effects the cocking of the firing mechanism and effects the transfer of a cartridge from the magazine to the firing chamber.

One of the objects of the present invention is to provide a strong and positive lock between the breech bolt and barrel extension which lock is adapted to be easily released by a movement of the breech bolt transversely or diagonally with respect to the direction of rearward movement of the barrel and barrel extension.

A further object of the invention is to provide a common means or accelerator, which serves not only to effect the unlocking of the breech bolt from the barrel extension but also serves to accelerate the rearward movement of the bolt.

A still further object of the invention is to provide an improved locking means for preventing movement of the barrel extension to its extreme forward position while the breech bolt is unlocked therefrom.

Another object of the invention is to provide an improved safety device for the firearm.

Still another object of the invention is to provide an improved means associated with the magazine for engaging the breech bolt to hold it in its rearward open position after the firing of the last cartridge in the magazine.

Further objects of the invention will be apparent from the following specification and claims.

In the accompanying drawings I have shown the embodiment of the invention which I now deem preferable but it will be understood that the drawings are intended for illustrative purposes only and are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

Fig. 1 is a right side view of a firearm embodying the invention.

Fig. 2 is an enlarged fragmentary longitudinal sectional view taken from the right.

Fig. 3 is a fragmentary rear view on the same scale as Fig. 2.

Fig. 4 is a transverse vertical sectional view taken along the line 4—4 of Fig. 2.

Figs. 5 and 6 are views similar to Fig. 2 but showing the parts in different relative positions.

Fig. 7 is a detail perspective view of the barrel stop lever.

Figs. 8, 9, 10 and 11 are fragmentary longitudinal sectional views showing different positions of the barrel stop lever and of the parts with which the said lever directly cooperates.

Figs. 12, 13, 14 and 15 are top, right side, bottom and front end views respectively showing the receiver and a part of the barrel jacket.

Fig. 16 is a transverse sectional view taken along the line 16—16 of Fig. 13.

Figs. 17, 18 and 19 are top, right side and rear end views showing the barrel extension and a part of the barrel.

Figs. 20, 21, 22 and 23 are right side, bottom, rear end and front end views showing the breech cover.

Fig. 24 is a detail perspective view of the locking pin for the breech cover.

Figs. 25, 26 and 27 are left side, bottom and rear end views of the safety lever and the operating button therefor.

Figs. 28, 29, 30 and 31 are right side, front, left side and rear views of the accelerator.

Figs. 32, 33, 34, 35 and 36 are top, right side, bottom, rear end and front end views of the breech bolt and parts immediately associated therewith.

Fig. 37 is a fragmentary longitudinal sectional view showing the firing mechanism and immediately associated parts.

Fig. 38 is a side view of the firing pin.

Figs. 39, 40 and 41 are right side, bottom and rear end views showing the firing pin extension.

Figs. 42 and 43 are right side and bottom views of the sear.

Figs. 44 and 45 are top and right side views of the cocking lever.

Figs. 46 and 47 are top and right side views of the trigger plate and associated parts.

Figs. 48 and 49 are top and right side views of the trigger and associated parts.

Fig. 50 is a perspective view of a detachable guard or cover.

Figs. 51, 52 and 53 are top right side and rear views of the magazine partition and associated parts.

Figs. 54, 55 and 56 are top, right side and rear views of the magazine.

Figs. 57 and 58 are top and right side views of the magazine latch.

Fig. 59 is a perspective view of the ejector.

Fig. 60 is a fragmentary horizontal sectional view showing the cooperative relationship between the ejector and the breech bolt.

In the drawings Fig. 1 is a right side view of the gun as a whole, the receiver being shown at 1, the barrel at 2, the breech cover at 3, the stock at 4, the barrel cover at 5, and the barrel jacket at 6. The jacket may be provided with vent holes 6^a, 6^a (See Fig. 2) registering with similar holes in the stock and barrel cover for cooling the gun. The stock and barrel cover are connected by means of rear and forward bands 7 and 8. The trigger is shown at 9, the trigger guard at 10, and the magazine at 11. Sights are shown at 12 and 13, but the invention does not relate to the sights and sights of other types may be substituted for those shown.

The relationship between the receiver 1 and certain other parts of the gun is shown in Figs. 2 to 6 and the structural details of the receiver are shown in Figs. 12 to 16. The receiver 1 has a main substantially tubular portion 14 which is open at the rear and front ends and which is adapted to be connected at its front end with the rear end of the barrel jacket 6, a threaded connection being shown. The receiver 1 is provided with parallel longitudinal side walls 15, 15 which are adapted to receive between them the lower part of the barrel extension and to serve as guides controlling the longitudinal movement thereof. At the rear the receiver is connected with the reaction spring tube 16 which extends rearward and downward. At the bottom the receiver is provided with a downward extension 17 having a substantially rectangular opening 18 thereon, this opening serving to receive the magazine 11 and also to contain certain operative parts of the gun as will presently appear. The forward portion of the extension 17 is shown as being a separate piece 17^a, but this is not essential. The tubular portion 14 of the receiver is provided with an opening 19 at one side, ordinarily the right side, positioned to permit the ejection of empty shells therethrough.

The barrel 2 and the barrel extension 20 are shown in operative relation with other parts in Figs. 2 to 6 and their details of construction are shown in Figs. 17 to 19. The barrel and the barrel extension are suitably connected together as by threading and the barrel is provided at the rear with the usual cartridge chamber 21. The barrel extension is formed to receive the breech bolt as will presently appear and it is further formed at the bottom with guide portions 22, 22 adapted to fit between and be guided by the side walls 15, 15 of the receiver. The relationship between the barrel extension and the receiver is clearly shown in Fig. 4. Upon assembly the barrel and barrel extension are inserted from the rear, the barrel extension being guided between the walls 15, 15. When the mechanism is completely assembled the barrel and barrel extension have only a limited movement with respect to the receiver. The barrel extension is provided with a bottom opening which has a relatively wide lower portion 23 adapted to receive the upper part of the magazine 11 as will presently appear and having a narrower upper portion 24 adapted to permit the passage of cartridges therethrough. The portions of the barrel extension at the two sides of the opening 24 constitute parallel spaced guide rails with which the breech bolt engages in the manner to be presently described. Near the rear the wider portion of the opening extends entirely through as shown at 25, thus forming a forward facing shoulder 26. The barrel extension has an opening 27 in the side thereof which normally registers with the opening 19 in the receiver and is adapted for the ejection of empty cartridges.

Fig. 2 shows the breech bolt 28 in its normal relationship with the other parts of the gun, and this figure also shows some of the details of the said breech bolt. Other details will be described later. The main body of the breech bolt 28 is preferably of unitary construction, having all of its parts rigidly maintained in fixed relation to each other. The breech bolt 28 is held in its forward position by means of a strut 29 pivotally connected with the rear portion of the said bolt at 30. The rear end of the strut 29 engages a plunger 31 which is slidable in the reaction spring

tube 16. The reaction spring 32 in the said tube serves to push the plunger 31 forward and thus through the strut 29 serves to push the breech bolt 28 forward.

The breech bolt 28 has a downward projecting lug 33 which normally extends into the opening 25 in the barrel extension, the rear face of the lug engaging the shoulder 26. When the lug and the shoulder are thus engaged the breech bolt and barrel extension are positively locked together in the proper position for firing. Upon recoil unlocking is effected by causing the breech bolt or at least the rear part thereof to move transversely or diagonally with respect to the direction of movement of the barrel extension. Preferably only the rear end of the bolt is thus moved diagonally, the front end moving directly rearward and the bolt being thus given an angular or tilting movement about a transverse axis near the front end thereof.

Figs. 2 and 3 show the breech cover 3 in its operative relationship with the other parts and details of constructon of the cover are shown in Figs. 20 to 23. It will be observed that in assembly the front part of the breech cover is hooked under a portion of the receiver at the rear as indicated at 34 and the side walls of the cover extend down between the side walls 15, 15 of the receiver as clearly shown in Fig. 3. The cover is held in place by means of a transverse pin 35 which extends through holes 36 in the cover and through transverse holes 37 in the said side walls 15, 15. The pin 35 is shown in detail in Fig. 24. The pin 35 carries a locking lug 38 which is passed through a notch 39 in one of the holes 37, the pin then being turned by means of the attached lever 40 so as to bring the locking lug 38 in engagement with the inner face of the corresponding wall 15.

The breech cover 3 has at the front a downward projection 41 which is adapted to engage an upward projection 42 on the breech bolt as shown in Fig. 2, the said projections being provided respectively with inclined cam surfaces 43 and 44. When the two projections are in engagement as shown the breech bolt and barrel extension are held in their described locked relationship, it being impossible for the lug 33 to become disengaged from the shoulder 26.

As shown in Fig. 2 the various parts of the gun are in the normal position ready for firing, which, however, is impossible by reason of the position of the safety lever 45. This safety lever is shown in detail in Figs. 25, 26 and 27. The said safety lever 45 is pivotally mounted at 46 on a stud carried by the receiver at the left side and an upward extension 47 at the rear of the lever extends through a slot 48 in the receiver to an exposed position at the left hand side of the cover 3, the said cover being recessed at 49 to provide space for the said extension. The safety lever carries a detachable button 50 which facilitates manual movement of the lever. At the forward end of the lever 45 is an upward extension 51 which extends through a slot 51^a in the receiver and is adapted to project into the path of movement of the rear end of the breech bolt as clearly shown in Fig. 2. The safety lever 45 is further provided with a downward extension 52 which serves to lock the trigger, as will be hereinafter explained, when the lever is in the position shown in Fig. 2. The safety lever can be manually moved in the clockwise direction, as viewed in Fig. 2, to its firing position wherein the breech bolt and trigger are free for movement. (See Fig. 37.) To yieldably hold the lever in either of its described positions there is provided a detent pin 53 on the receiver adapted to enter either of two notches 54, 54 in the lever.

As already stated the breech bolt and barrel extension are directly locked together when in the firing position. When firing occurs the barrel and barrel extension move rearward under the force of the recoil, and the breech bolt, by reason of the described locked relationship, initially moves rectilinearly in unison with them. As already stated the breech block is unlocked from the barrel extension by moving at least a part thereof away from its initial path of rectilinear movement. When the engagement between the breech block and the barrel extension is by means of a downward projecting lug such as 33, the breech bolt, or at least a part thereof, is moved transversely or diagonally, upward and rearward until the lug 33 is disengaged from the barrel extension. After disengagement the breech bolt continues to move rearward and the motion of the barrel extension and barrel is stopped. The means for effecting the transverse or diagonal unlocking movement of the breech bolt may be varied, but I prefer to provide a single breech bolt operating means serving upon recoil first to unlock the breech bolt as described and then to move it rearward separately from the barrel and barrel extension. By preference I used for this purpose the means shown in the drawings, which means I will now describe.

Mounted in the rear part of the opening 18 of the receiver is a member 55 which serves as the breech bolt operating means and I will refer to as an accelerator, this member being shown in detail in Figs. 28, 29, 30 and 31. The accelerator is pivotally mounted on a transverse pin 56 which extends into bearing apertures 57, 57 in the receiver. The main body portion of the accelerator is curved upward and rearward having a convex forward facing surface 58 which is adapted to cooperatively engage the flat rearward facing surface 59 of the barrel extension. By reason of the engagement of the accelerator with the

surface 59 of the barrel extension the said accelerator is moved in the counter-clockwise direction until the upper end thereof engages the breech bolt at 60. The timing is such that when the accelerator engages the breech bolt as stated the breech bolt has moved rearward sufficiently to permit the flat horizontal surfaces of the projections 41 and 42 to disengage each other, the rear part of the breech bolt then being free to move diagonally upward along a path determined by the engagement of the cam surfaces 43 and 44. Continued pressure exerted by the rearward moving barrel extension on the accelerator causes the accelerator to force the rear part of the breech bolt upward and rearward to the position shown in Fig. 5 in which position the lug 33 is about to disengage the shoulder 26. It will be observed that the front part of the breech bolt does not partake of the diagonal movement but moves in a substantially straight path. The rearward pressure of the barrel extension upon the accelerator continues and the accelerator now serves to move the breech bolt rapidly rearward, imparting to it a velocity which enables it to move in opposition to the spring 32 approximately to the position shown in Fig. 6, being guided in part by the inner surface of the cover. It will be seen that the accelerator serves to transfer the energy of the moving barrel and barrel extension to the said breech bolt, the result being that the movement of the barrel and barrel extension is gradually retarded and finally stopped while the absorbed energy is imparted to the breech bolt to throw it backward to the position of recoil.

During the separate rearward movement of the breech bolt the rear part thereof engages and is guided by ledges 15^a, 15^a formed on the receiver. These ledges are spaced apart and the strut 29 is positioned between them.

As clearly indicated in Fig. 6, the lower surface of the lug 33 of the breech bolt serves as an abutment which remains in engagement with the accelerator during the separate rearward and return movements of the breech bolt. Thus the accelerator is held in its rearmost position as indicated. It will be observed that the lower surface of the lug 33 is so inclined with respect to the main body of the bolt that upon angular movement of the bolt it assumes a position parallel with the direction of the separate rearward movement. Thus, the accelerator is held immovable during such movement.

There is provided a stop 61 on the barrel extension which is engaged by the accelerator 55 when the extreme position is reached, the said accelerator being recessed at 62 to receive the said stop. The engagement of the stop with the accelerator prevents further rotative movement of the latter and at the same time a shoulder 63 on the accelerator engages the bottom of the barrel extension. It will be obvious that the stop 61 serves to hold the barrel extension in its rearmost position until such time as the breech bolt returns forward far enough to release the accelerator.

As soon as the breech bolt reaches its rearmost position as shown in Fig. 6 it is immediately returned in the forward direction by reason of the action of the spring 32 and associated parts. As the breech bolt moves forward the lug 33 releases the accelerator and immediately thereafter the forward facing surface at 60 re-engages the accelerator and causes it to move in the clockwise direction to the position shown in Fig. 5. As the accelerator moves in the clockwise direction the barrel and barrel extension move forward in unison with the breech bolt but at a slower speed. As soon as the position shown in Fig. 5 is reached the cam surfaces 43 and 44 engage each other, the result being that as the breech bolt continues to move forward it is returned to its locked relationship with the barrel extension as shown in Fig. 2. The final movement of the breech bolt in the forward direction carries the barrel and barrel extension with it in locked relationship, thus completely restoring the parts to the relationship shown in Fig. 1. Preferably in order to positively ensure the return of the accelerator to the position shown in Fig. 2 I provide a lug 64 on the barrel extension this lug engaging a tooth 65 on the accelerator to positively move the accelerator to its extreme forward position.

To assist in guiding the breech bolt 28 and in securing it firmly in the firing position I have provided a guide rib 28^a at the forward end of the bolt which enters and fits a groove 28^b in the barrel extension. To further assist in guiding the breech bolt I provide a guide rib 22^a on the barrel extension which enters and fits a groove 22^b in the breech bolt. When the breech bolt is in its forward position the rib 28^a and the groove 28^b are effective and in an intermediate position as shown in Fig. 5 the rib 22^a and the groove 22^b are effective.

The strut 29 may be utilized to assist in absorbing the energy of recoil of the breech bolt 28. The said strut may be resilient and so designed as to frictionally engage the tube 16 as shown at 29^a in Fig. 6. The bolt is guided by the ledges 15^a, 15^a for movement in a straight line and as it reaches its rearmost position there is a tendency to flex the strut. This flexing tendency considerably increases the friction at 16^a, and thus the strut acts as a brake to assist the spring 32 in stopping the movement of the bolt.

During counter-recoil movement when the parts approach the position shown in Fig. 5, it is desirable to provide means to prevent movement of the barrel extension forward to

a position in which it could not be reengaged by the breech bolt. I therefore provide a stop mechanism to prevent movement of the barrel extension to its extreme forward position, this mechanism being shown in Figs. 7 to 11. Within the receiver near the right side thereof there is provided a locking lever 66 having a trunnion 67 which extends into a hole 68 in the receiver. The locking lever 66 carries a rib 69 which, when the lever is in operative position, projects into a slot 70 in the receiver and prevents the trunnion 67 from being withdrawn from the hole 68. The locking lever 66 has a tooth 71 which is adapted to hook under and engage a shoulder 72 on the barrel extension and the lever further has an upper cam surface 73. A spring 74 carried by the receiver tends to move the lever in the upward direction.

When the parts are in the position shown in Fig. 8, which is the same position as that shown in Fig. 2, the tooth 71 of the locking lever merely engages the flat bottom surface of the barrel extension, the said barrel extension being thus free to move. Carried by the breech bolt 28 is a lug 75 adapted to engage the cam surface 73 of the locking lever. When the parts are moved rearward to the position shown in Fig. 9, which is the same position as shown in Fig. 5, the lug 75 engages the cam surface 73 to force the lever 66 downward, this downward movement being an incidental one of no functional importance. When the breech bolt moves rearward from the position shown in Fig. 9 to the position shown in Fig. 10, which latter position is the same as that shown in Fig. 6, the lug 75 is entirely free from engagement with the upper cam surface 73 of the lever 66. However, when the parts are in this position the said cam surface 73 is engaged by a cam surface 76 on the barrel extension and is therefore held downward in opposition to the spring 74. However, if the barrel and barrel extension move forward independently of the breech bolt toward the position shown in Fig. 11, the cam surface 76 is disengaged from the locking lever and the spring 74 forces the lever upward, thus causing the tooth 71 thereof to engage the shoulder 72 of the barrel extension and prevent continued forward movement of the said barrel extension beyond the position shown in Fig. 11. As the breech bolt continues to move forward the said lug 75 again engages the lever 66. The parts are so timed that when the front end of the breech bolt is engaged with the barrel and when the lug 33 is entered in front of the shoulder 26, the lug 75 moves the lever 66 downward far enough to disengage the tooth 71 from the shoulder 72 and thus release the barrel extension for forward movement with the breech bolt to the position shown in Fig. 8.

Further details of the breech bolt are shown in Figs. 32 to 36 which figures show not only the breech bolt but certain parts directly associated therewith. The breech bolt carries at the right side a handle 77 which may be used to manually operate the mechanism of the gun. This handle extends laterally through the openings 27 and 19 in the barrel extension and receiver respectively. Adjacent the forward end of the breech bolt and at the right side thereof there is provided a pivoted extractor 78 which is normally pressed into its operative position by means of a spring 79. The breech bolt has a central opening 80 therein adapted to receive the firing pin and firing pin extension, there being a smaller opening 81 at the front through which the firing pin proper extends to engage the cartridge. A vertical longitudinal sectional view of the breech bolt is shown in Fig. 37 which figure also shows various other parts which are closely associated with the breech bolt. The firing pin 82 is shown in detail in Fig. 39 and the firing pin extension 83 is shown in detail in Figs. 39 to 41. The firing pin extension 83 is provided with a central opening 84 for receiving the spring 85. The firing pin 82 is threaded into the front part of the opening 84. The firing pin extension has a transverse slot 86 through which extends a screw pin 87 located in vertical holes 88 in the breech bolt. This pin 87 serves as a rear abutment for the spring 85. The spring 85 reacting against the pin 87 tends to move the entire firing pin and extension forward to firing position. The firing pin and firing pin extension are held in their rearward cocked position as shown in Fig. 37 by means of a sear 88 which engages a shoulder 89 at the rear of the firing pin extension. The sear is shown in detail in Figs. 42 and 43. The sear 88 is pivotally mounted on a transverse pin 90 which is located in transverse holes 91 in the breech bolt. A spring 92 supported on a transverse pin 93 serves to press the sear upward. The sear is provided with a downward hook extension 94 adapted to be engaged by the trigger lever as will presently be described.

The cocking lever 95 is shown in detail in Figs. 44 and 45 and is shown in its operative relation with other parts in Figs. 37, 2, 5 and 6. This lever is pivotally mounted on a transverse pin 96 which is located in transverse holes 97 in the breech bolt. The lower part 98 of the lever is slotted at 99 for a purpose which will presently appear, and the upper part 100 thereof extends into the before-mentioned slot 86 in the firing pin, being adapted to engage the surface 101 at the rear end of the said slot. When the mechanism is in the firing position as shown in Figs. 2 and 37 the lower end of the cocking lever is inclined toward the rear being located between the rear part of the accelerator and the shoulder 102 of the receiver.

The firing pin and extension are in cocked position as shown so that the surface 101 is out of engagement with the cocking lever.

When the firing pin and firing pin extension are released by the sear 88 to effect firing they are forced forward under the action the spring 85 thus bringing the surface 101 into engagement, or substantially into engagement, with the upper part 100 of the cocking lever. Immediately thereafter the breech bolt is forced rearward by the recoil action as already described, first to the position shown in Fig. 5 and then to the position shown in Fig. 6. As the breech bolt moves rearward the lower part 98 of the cocking lever is forced against the shoulder 102 on the receiver and it then travels along the surface 103 on the receiver as shown in Fig. 6. When the cocking lever reaches the position shown in Fig. 6 the firing pin extension with the firing pin has been forced rearward far enough to permit the sear 88 to engage the shoulder 89 and thus hold the parts in cocked position. As the breech bolt and associated parts return forward to the position shown in Figs. 2 and 37 the motion of the cocking lever is reversed, this lever returning to its original position as described.

The combined trigger plate and guard with associated parts is shown in Figs. 46 and 47 and the trigger with associated parts is shown in Figs. 48 and 49. The trigger plate 104 has the guard 10 formed as an integral part thereof and the said plate is suitably secured in place, screws 105 and 105[a] being shown for this purpose. These screws in cooperation with a third screw 105[b] also serve to hold the stock 4 in place. The plate is of conventional construction and no detailed description is necessary. The trigger 9 is pivotally mounted on the trigger plate at 106, and projects downward through an aperture 107 in the said plate. The trigger has pivotally connected with it at its forward end a link 108 which is normally pressed in the counter-clockwise direction by means of a spring 109 abutting at its lower end against the trigger plate, the spring being held in place by a pin 109[a]. A shoulder 110 on the trigger limits the movement of the said link. The link 108 extends through the slot 99 in the cocking lever 95 and is provided with a notch 111 which is positioned to receive the end of the extension 94 of the sear when the breech bolt and the parts carried thereby are in their forward positions as shown in Fig. 37. It will be obvious that with the parts in the positions shown in this figure the trigger when pulled will transmit motion through the link 108 to pull the sear 88 downward and release the firing pin. It will further be apparent that the sear is free to disengage the link when the breech bolt and associated parts are moved rearward upon recoil.

The trigger is provided with a notch 112 which is adapted to receive the extension 52 on the safety lever when the said lever is in its safe position as shown in Fig. 2. It will be apparent that the safety lever serves not only to lock the breech bolt as already described but also serves to lock the trigger against movement. When the safety lever is moved to its firing position as shown in Fig. 37 it not only releases the breech bolt but also releases the trigger.

Fig. 50 shows a cover 113 which is adapted to be secured to the breech bolt to more effectively close the opening in the side of the gun when the parts are in their normal firing positions. The said cover 113 is provided with an opening 114 therein which is circular at its outer end and which is in the form of a narrow slot at its inner end. Carried by the breech bolt is a stud 115 having a T-head adapted to enter the hole 114 when the cover 113 is in a vertical position with the hole at the top. When the cover is turned to its normal horizontal position the head on the stud 115 lies in the outer circular part of the hole 114 and the cover is locked in position. A projection 113[a] on the cover enters a slot 113[b] in the breech bolt to limit the upward pivotal movement of the cover about the stud 115. The engagement of the projection 113[a] in the slot 113[b] also assists in locking the cover in place. It will be understood that the cover 113 is attached to the breech bolt prior to the insertion of the latter in the barrel extension.

Positioned transversely of the opening 18 in the receiver is a partition 116 shown in detail in Figs. 51 to 53. This partition is held in place by means of a transverse pin 117 extending through holes 118 in the receiver. A screw 119 extending through a hole 120 in the receiver prevents rotative movement about the pin 117.

The magazine 11 is shown in detail in Figs. 54 to 56. The magazine is adapted to enter the receiver at the bottom, being positioned within that part of the space 18 which is in front of the partition 116. The magazine is or may be formed of sheet metal in the usual way and it is provided with a follower 122 which is pressed upward by means of a spring 123. The magazine is somewhat wider at the rear than at the front in order to permit cartridges to be positioned therein in staggered relationship as indicated in Fig. 2. The follower has an upward projection 122[a] at one side which serves to hold the lowermost cartridge toward the opposite side of the magazine.

The latch 124 for releasably holding the magazine in place is shown in detail in Figs. 57 and 58. This latch is slidably movable on the trigger plate 104 being provided with an upward offset tooth 125 which extends through a hole 126 in the partition 116 and into a notch 127 in the magazine. The said

latch 124 is further provided with a downward projecting finger piece 128 which extends through a hole 129 in the trigger plate so as to be conveniently accessible at a point immediately in front of the trigger guard. The latch is provided with a longitudinal slot 130 which is positioned to receive a spring pressed plunger 131 carried by the trigger plate. The trigger 9 and the trigger link 108 also extend into the slot 130 and the rear portion 128[a] of the latch extends under the trigger as shown in Fig. 37, being thus held in place and prevented from moving upward. The said spring pressed plunger 131 normally serves to press the latch 124 forward to its operative position to hold the magazine. When it is desired to release the magazine the finger piece 128 is pressed rearward in opposition to the spring pressed plunger 131, thus withdrawing the tooth 125 from the notch 127.

Assuming the parts to be in the position shown in Fig. 2, it will be apparent that, when firing occurs and the barrel, barrel extension and breech bolt move as already described, the extractor 78 on the breech bolt will draw the empty shell out of the firing chamber and carry it rearward to a position opposite the ejection openings 27 and 19. For ejecting the shell through the said openings there is provided an ejector 132 which is shown in detail in Fig. 59 and which is shown in operative relation with the breech bolt in Fig. 60. The ejector is mounted in a slot 133 in the barrel extension being pivotally held by means of a vertical pin extending through a hole 134. The breech bolt is provided with a cam surface 135 which engages the tail 136 of the ejector to force it in the clockwise direction as the breech bolt nears its rearmost position. When the ejector is thus turned its front end portion lies in the path of the empty shell on the left side thereof, the right side of the shell being engaged by the before mentioned extractor 78. The ejector 132 therefore serves to forcibly tilt the shell laterally, disengaging it from the extractor and forcibly snapping it outward through the ejection openings 27 and 19.

As soon as the breech bolt reaches its rear position as shown in Fig. 6 a cartridge from the magazine is forced upward by the follower into the path of return movement of the bolt. As the bolt moves forward the cartridge is pushed into the firing chamber.

Carried by the partition 116 is a vertically movable slide or stop 137 which is normally held in its lowermost position by means of a spring 138. A forward extension on the upper end of the slide or stop 137 lies adjacent the rear edge of the magazine and in the path of upward movement of a rear portion 122[b] of the follower 122. After the last cartridge has been fired the follower 122 occupies its uppermost position as shown in Fig. 6, the portion 122[b] thereof thus engaging the slide or stop 137 and forcing it upward in opposition to the spring 138. The parts are so related that when the slide reaches its upper position as shown in Fig. 6 it serves as a stop to engage a downward extending lug 139 on the breech bolt 28. Thus the breech bolt is held in its rearmost position as shown after the last cartridge has been fired. This serves as a warning to the gunner that the last cartridge has been fired and that the empty magazine should be replaced by a loaded one, and it also facilitates reloading as it avoids the necessity for manually operating the breech bolt to insert the first cartridge into the firing chamber. After the loaded magazine has been put in place the slide or stop 137 can be released and permitted to return to its inoperative position by simply drawing the breech bolt back slightly to relieve the pressure on the stop. Then the breech bolt can be released and permitted to move forward in the usual way, carrying with it a cartridge from the newly inserted loaded magazine and inserting it into the firing chamber.

A suitable means is provided for holding the cartridges toward the front of the magazine in order to provide sufficient space at the rear for the said forward extension on the slide or stop 137. When the magazine is formed of sheet metal I prefer to locate the seam 140 thereof at the rear and projecting inward from the main rear wall. The details of the seam 140 are shown in Fig. 54 but in the other figures the several thicknesses of the sheet metal are omitted for the sake of simplicity. It will be observed that the seam serves as the required means for holding the cartridges forward. Fig. 2 shows that the seam holds the cartridges out of engagement with the slide or stop 137. The location of the seam 140 at the inside, as shown, has the further advantage of providing a flat rear wall for the magazine. The seam 140 has the still further advantage that it provides sufficient metal to permit the formation of a satisfactory retaining notch 127.

What I claim is:

1. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable unitary breech bolt normally in locked engagement with the barrel extension and having its parts rigidly maintained in fixed relation with each other, and means operatively dependent on the rearward movement of the barrel extension and breech bolt for causing at least a portion of the said breech bolt to bodily move transversely with respect to the barrel extension so as to effect disengagement of the former from the latter, and means dependent upon the rearward movement of the

barrel extension for causing additional rearward movement of the bolt separately from the barrel extension.

2. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable unitary breech bolt normally in locked engagement with the barrel extension and having its parts rigidly maintained in fixed relation with each other, means operatively dependent on the rearward movement of the barrel extension and breech bolt for moving the said breech bolt as an entirety angularly about a transverse axis so as to effect disengagement of the bolt from the barrel extension, and means dependent upon the rearward movement of the barrel extension for causing additional rearward movement of the bolt separately from the barrel extension.

3. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, the said barrel extension including two longitudinally extending parallel spaced guide rails and a transverse portion connecting the rails at the rear and forming a forward facing shoulder between them, a unitary breech bolt slidably engaging the said rails and having its parts rigidly maintained in fixed relation with each other, the said breech bolt having a downward projecting rearward facing lug located between the rails and normally engaging the said forward facing shoulder to hold the bolt in fixed relation with the barrel extension, and means operatively dependent on the rearward movement of the barrel extension and breech bolt for moving the said bolt as an entirety angularly upward about a transverse axis at the front thereof so as to effect disengagement of the lug from the shoulder and thereby permit separate rearward movement of the bolt.

4. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, a member connected with the receiver for pivotal movement about a fixed transverse axis and serving during rearward movement of the barrel extension and breech bolt to engage and bodily move at least a part of the said breech bolt transversely with respect to the barrel extension so as to effect disengagement of the bolt from the extension and thereby permit separate rearward movement of the bolt.

5. A firearm as set forth in claim 4, wherein the breech bolt is unitary and has its parts rigidly maintained in fixed relation with each other.

6. A firearm as set forth in claim 4, wherein the breech bolt is unitary and has its parts rigidly maintained in fixed relation with each other, and wherein the said breech bolt is angularly moved by the said pivoted member about a transverse axis near its front end.

7. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, a member pivotally connected with the receiver for causing at least a portion of the breech bolt to move diagonally with respect to the direction of movement of the barrel extension to effect disengagement of the former from the latter, and a cam cooperating with the said pivotally connected member to control the said diagonal movement.

8. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, a member pivotally connected with the receiver for causing at least a portion of the breech bolt to move during recoil diagonally in one direction with respect to the direction of movement of the barrel extension to effect disengagement of the former from the latter, and a cam carried by the receiver and serving during counter-recoil to move the said portion of the breech bolt diagonally in the opposite direction to effect reengagement with the barrel extension.

9. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, a cover removably connected with the receiver and partly enclosing the path of movement of the breech bolt, and means including a cam carried by the cover for causing at least a portion of the breech bolt to move during recoil diagonally in one direction with respect to the direction of movement of the barrel extension to effect disengagement of the former from the latter and to move during counter-recoil diagonally in the opposite direction to effect reengagement.

10. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, a member pivotally connected with the receiver for causing at least a portion of the breech bolt to move diagonally with respect to the direction of movement of the barrel extension to effect disengagement of the former from the latter, a cover removably connected with the receiver and partly enclosing the path of movement of the breech bolt, and a cam

carried by the cover and cooperating with the said pivotally connected member to control the said diagonal movement.

11. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, and a breech bolt operating means actuated by the barrel extension during recoil movement and serving first to move at least a portion of the breech bolt transversely with respect to the barrel extension to effect disengagement of the former from the latter and then to move the said bolt rearward separately from the barrel extension.

12. A firearm as set forth in claim 11, wherein the breech bolt is unitary and has its parts rigidly maintained in fixed relation with each other.

13. A firearm as set forth in claim 11, wherein the breech bolt is unitary and has its parts rigidly maintained in fixed relation with each other, and wherein the said breech bolt is angularly moved about a transverse axis near its front end.

14. A firearm as set forth in claim 11, wherein the breech bolt operating means is a single unitary element.

15. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, and an accelerator having engagement with the receiver and with the breech bolt and pivotally connected to one of them for movement about a transverse axis, the said accelerator being engaged and relatively moved by the barrel extension during recoil movement and thereby serving first to move at least a portion of the breech bolt transversely with respect to the barrel extension to effect disengagement of the former from the latter and then to move the said bolt rearward separately from the barrel extension.

16. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, and an accelerator pivoted to the receiver for movement about a fixed transverse axis and actuated by the barrel extension during recoil movement, the said accelerator serving upon recoil first to move at least a portion of the breech bolt transversely with respect to the barrel extension to effect disengagement of the former from the latter and then to move the said bolt rearward separately from the barrel extension.

17. A firearm as set forth in claim 16, wherein the breech bolt is unitary and has its parts rigidly maintained in fixed relation with each other, and wherein the said breech bolt is angularly moved by the said accelerator about a transverse axis near its front end.

18. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, and an accelerator pivoted to the receiver for movement about a fixed transverse axis and having a convex forward facing surface in the path of rearward movement of a rearward facing surface of the barrel extension, the said accelerator serving upon being engaged and actuated by the barrel extension first to move at least a portion of the breech bolt transversely with respect to the barrel extension to effect disengagement of the former from the latter and then to move the said bolt rearward separately from the barrel extension.

19. A firearm as set forth in claim 18, wherein the accelerator has a tooth additional to the main body portion thereof and wherein the barrel extension has a lug adapted to engage the accelerator tooth to return the accelerator in the forward direction when the barrel extension moves in the forward direction.

20. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, a breech bolt operating means actuated by the barrel extension during recoil movement and serving first to move at least a portion of the breech bolt transversely with respect to the barrel extension to effect disengagement of the former from the latter and then to move the said bolt rearward separately from the barrel extension and separately from the said operating means, and an abutment on the breech bolt serving during a part of the separate movement thereof to engage the said operating means and thereby hold the barrel extension in its rearmost position.

21. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, an accelerator pivoted to the receiver for movement about a fixed transverse axis and actuated by the barrel extension during recoil movement, the said accelerator serving upon recoil first to move at least a portion of the breech bolt transversely with respect to the barrel extension to effect

disengagement of the former from the latter and then to move the said bolt rearward separately from the barrel extension, abutment means on the breech bolt engaging the accelerator to hold it to its rearmost position during the separate rearward and forward movements of the bolt, and a stop on the barrel extension engaging the accelerator to hold the barrel extension in its rearmost position while the accelerator is in its rearmost position.

22. A firearm as set forth in claim 21, wherein the breech bolt has its parts rigidly maintained in fixed relation with each other and is angularly movable as an entirety by the accelerator about a transverse axis near the front end, and wherein the abutment means on the breech bolt engaging the accelerator has an inclined accelerator engaging surface which upon angular movement of the bolt assumes a position parallel with the direction of the separate rearward movement of the bolt.

23. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, a breech bolt operating means actuated by the barrel extension during recoil movement and serving first to move at least a portion of the breech bolt transversely with respect to the barrel extension to effect disengagement of the former from the latter and then to move the said bolt rearward separately from the barrel extension and separately from the said operating means, an abutment on the breech bolt serving during a part of the separate movement thereof to engage the said operating means and thereby hold the barrel extension in its rearmost position, and a latch additional to the breech bolt operating means and serving to prevent movement of the barrel extension to its extreme forward position prior to the return of the breech bolt to locked engagement therewith.

24. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt, releasable means normally locking the breech bolt to the barrel extension, means operative upon recoil to unlock the breech bolt from the barrel extension and permit it to move rearward separately thereof, a spring for returning the breech bolt to its normal locked position, a movable latch separate from the said breech bolt locking means and located at one side of the breech bolt, the said latch serving to prevent movement of the barrel extension to its extreme forward position while the breech bolt is unlocked therefrom, and a lug projecting laterally from the breech bolt for engaging the latch to release it when the breech bolt approaches its position of engagement with the barrel extension.

25. In a firearm of the class described, the combination of a receiver, a barrel and barrel extension movable upon recoil rearward relatively to the receiver, a rearward movable breech bolt normally in locked engagement with the barrel extension, means operative upon recoil to disengage the breech bolt from the barrel extension so as to permit it to move rearward separately therefrom, means operative after disengagement of the bolt from the barrel extension for guiding it as an entirety for rectilinear movement, a tube connected with the receiver at the rear and positioned at an angle to the direction of bolt movement, a reaction spring in the tube, and a strut pivotally connected with the rectilinearly movable breech bolt and extending into the tube to be operatively associated with the spring, the said strut by reason of the angular position of the tube frictionally engaging the tube during recoil to assist in retarding the recoil movement of the bolt.

26. In a firearm of the class described, the combination of a barrel and barrel extension movable rearward upon recoil, a rearward movable breech bolt, releasable means normally locking the breech bolt to the barrel extension, a spring actuated firing pin mounted in the breech bolt, firing mechanism including a trigger for releasing the firing pin, means operable upon recoil for unlocking the breech bolt from the barrel extension to permit it to move rearward independently thereof, and a manually operable safety lever pivoted for movement about a transverse axis and having two arms extending in different directions and respectively serving when the lever is in its safety position to prevent rearward movement of the barrel and barrel extension and to prevent operation of the firing mechanism.

27. In a firearm of the class described, the combination of a barrel and barrel extension movable rearward upon recoil, a rearward movable breech bolt, releasable means normally locking the breech bolt to the barrel extension, a spring actuated firing pin mounted in the breech bolt, firing mechanism including a trigger for releasing the firing pin, means operable upon recoil for unlocking the breech bolt from the barrel extension to permit it to move rearward independently thereof, and a manually operable safety lever pivoted for movement about a transverse axis and having two arms extending in different directions and respectively serving when the lever is in its safety position to engage the breech bolt to prevent rearward movement of the said bolt or of the barrel and barrel extension and to engage the trig-

ger to prevent operation of the firing mechanism.

28. In a firearm of the class described, the combination of a barrel and barrel extension movable rearward upon recoil, a rearward movable breech bolt, releasable means normally locking the breech bolt to the barrel extension, means operative upon recoil to unlock the breech bolt from the barrel extension and permit it to move rearward independently thereof, a spring for returning the breech bolt to its normal locked position, a removable magazine having a follower for moving cartridges successively into the path of return movement of the bolt, a stop mounted independently of the magazine and adapted to be engaged by the follower and moved upward into the path of return movement of the bolt after the last cartridge has been removed from the magazine, the said stop thus serving to hold the breech bolt in its rearward position, and means in the magazine at the rear thereof for holding the cartridges forward and thus preventing their engagement with the said stop.

29. In a firearm of the class described, the combination of a barrel and barrel extension movable rearward upon recoil, a rearward movable breech bolt, releasable means normally locking the breech bolt to the barrel extension, means operative upon recoil to unlock the breech bolt from the barrel extension and permit it to move rearward independently thereof, a spring for returning the breech bolt to its normal locked position, a removable sheet metal magazine having a follower for moving cartridges successively into the path of return movement of the bolt, the said magazine having a seam at the rear thereof for holding the cartridges forward, and a stop mounted independently of the magazine and adapted to be engaged by the follower and moved upward into the path of return movement of the bolt after the last cartridge has been removed from the magazine, the said stop being at the rear of the path of movement of the cartridges as guided by the said seam and the said stop when in its upper position serving to hold the breech bolt in its rearward position.

30. In a firearm of the class described, the combination of a receiver having a longitudinally extending opening in the bottom of the main body portion thereof, a barrel and barrel extension carried by the receiver and movable upon recoil rearward relatively thereto, a rearward movable breech bolt, releasable means normally locking the breech bolt to the barrel extension, means operative upon recoil to unlock the breech bolt from the barrel extension and permit it to move rearward independently thereof, a spring for returning the breech bolt to its normal locked position, a removable magazine normally positioned in the forward part of the said receiver opening and having a follower for moving cartridges successively into the path of return movement of the bolt, a transverse partition structurally separate from the receiver and positioned in the said bottom opening thereof at the rear of the magazine, and a stop mounted on the partition and adapted to be engaged by the follower and moved upward into the path of return movement of the bolt after the last cartridge has been removed from the magazine, the said stop thus serving to hold the breech bolt in its rearward position.

In testimony whereof I have hereunto set my hand this 10th day of March, 1928.

JONATHAN EDMUND BROWNING.