April 29, 1952 C. E. SIMPSON 2,594,359

FIRING MECHANISM FOR AUTOMATIC FIREARMS WITH NONAXIAL RECTILINEAR BREECHLOCK MOTION

Original Filed June 7, 1946 2 SHEETS—SHEET 1

Fig_1_

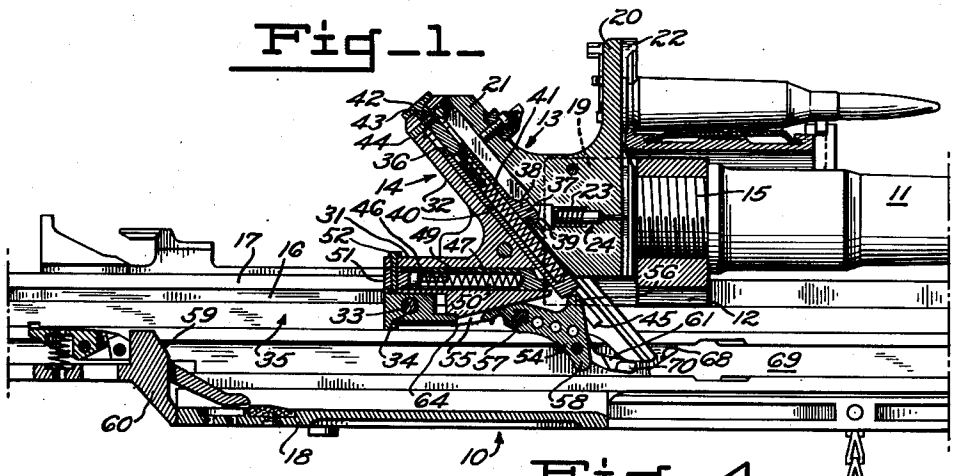


Fig_2_

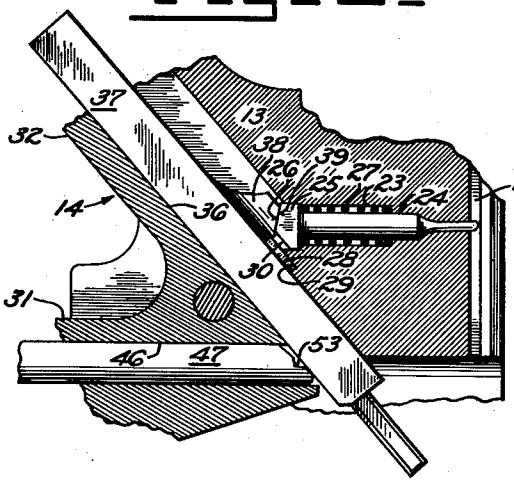


Fig_3_

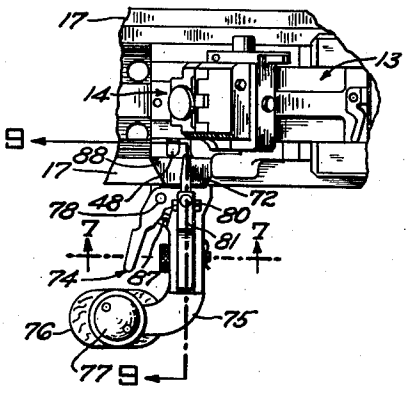


Fig_4_

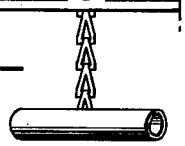


Fig_5_

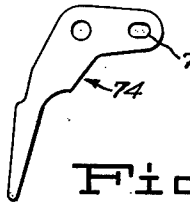


Fig_6_

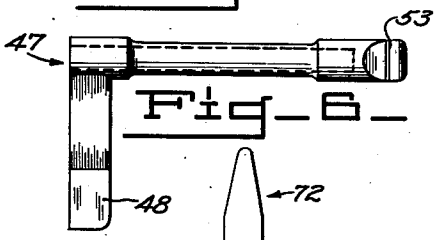
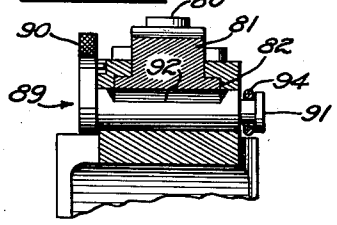


Fig_7_



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Fig. 8.

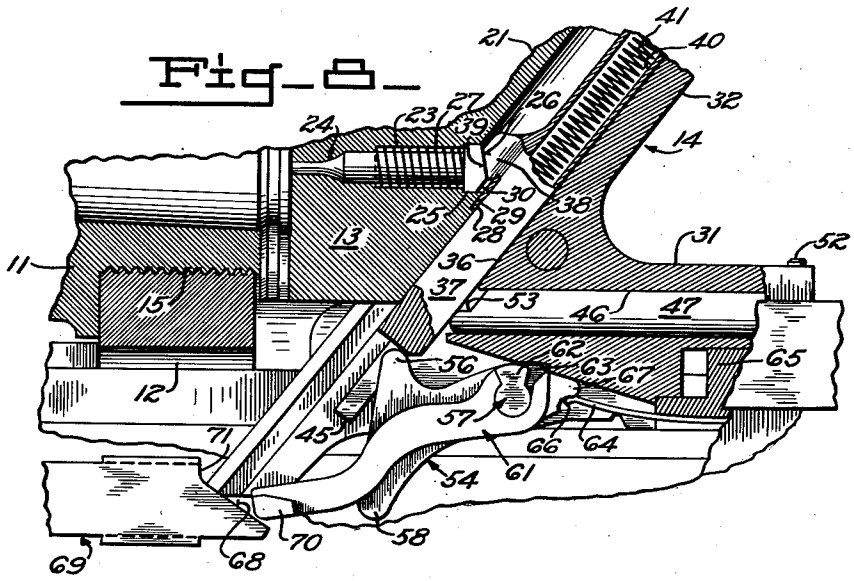
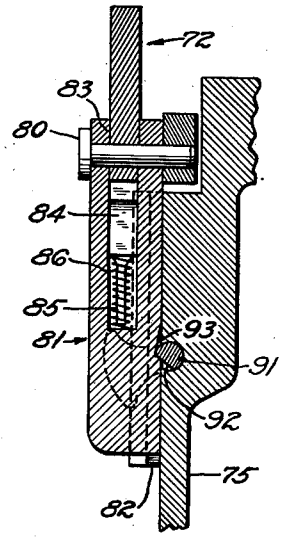


Fig. 9.



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UNITED STATES PATENT OFFICE

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FIRING MECHANISM FOR AUTOMATIC FIREARMS WITH NONAXIAL RECTILINEAR BREECHBLOCK MOTION

Clarence E. Simpson, Springfield, Mass., assignor to the United States of America as represented by the Secretary of War

Original application June 7, 1946, Serial No. 675,124. Divided and this application March 19, 1948, Serial No. 15,945

5 Claims. (Cl. 89—167)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a firing mechanism for firearms of the automatic type wherein the breech block is slidably carried by a breech block carrier for movement in a horizontal and vertical plane.

This application is a division of my copending application for Firearms, Serial No. 675,124 filed June 7, 1946 and now matured into Patent No. 2,555,379.

It is an object of this invention to provide a firing mechanism for a firearm of the automatic type wherein the breech block of such firearm is slidably mounted on a breech block carrier.

Another object of this invention is to provide a firing mechanism for an automatic firearm wherein the recoiling movement of the breech members is utilized to cock such firing mechanism.

A specific object of this invention is to provide a firing mechanism for a firearm of the type disclosed in my copending application Serial No. 675,124 filed June 7, 1946, for Firearms and now matured into Patent No. 2,555,379.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings in which:

Fig. 1 is a fragmentary longitudinal sectional view of the firearm embodying this invention.

Fig. 2 is a fragmentary, enlarged, detail, sectional view showing the main elements of the firing mechanism.

Fig. 3 is a fragmentary plan view of Fig. 1. illustrating the sear release mechanism.

Fig. 4 is an enlarged detail view of the trigger.

Fig. 5 is an enlarged detail view of the sear.

Fig. 6 is an enlarged detail view of the sear release member.

Fig. 7 is a cross-sectional view taken along the line 7—7 of Fig. 3.

Fig. 8 is a fragmentary longitudinal sectional view of the main breech elements of the firearm showing the cocking lever on the left hand side thereof.

Fig. 9 is a horizontal sectional view taken along the line 9—9 of Fig. 3.

In a firearm of the type described and fully disclosed in the above-mentioned copending application there is utilized a breech mechanism of

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novel construction which must necessarily employ a firing mechanism of substantially radical construction from those hitherto used in the art for discharge of a cartridge.

Briefly such firearm comprises essentially a receiver 10, a barrel 11, a barrel extension 12, a breech block 13 and a breech block carrier 14. Receiver 10 comprises two oppositely disposed parallel side plates 17. Such side plates are separated by front and rear spacers (not shown). A bottom plate 18 is provided underneath the side plates 17 and is disposed towards the rear of receiver 10. Extension 12 is secured to barrel 11 preferably by threads 15 and such extension 12 is slidably mounted in receiver 10 for longitudinal movement by guide ribs (not shown) which engage corresponding ways 16 provided in each side plate of receiver 10. The forward end of barrel 11 is supported by a front barrel bearing support (not shown) so that such barrel is horizontally disposed for longitudinal reciprocating movement.

Barrel extension 12 is a substantially rectangular member and is provided with a vertically disposed slot 19 at the rear end thereof which is shaped to receive breech block 13 as will be later described. Suitable locking lugs (not shown) are provided in such slot. Breech block 13 is likewise slidably mounted in receiver 10 for longitudinal reciprocating movement and such breech block is provided with suitable ribs (not shown) for engagement with ways 16. Breech block 13 comprises a substantially V-shaped member having a vertical arm 20 and an upwardly and rearwardly sloping arm 21. A cartridge feeding T-slot 22 is provided on the forward vertical face on arm 20 as shown in Fig. 1. On the rear face of the rearwardly sloped arm 21 of breech block 13 there is provided a T-shaped rib (not shown) which slidably connects breech block 13 to breech block carrier 14 as will be later described. A plurality of locking lugs (not shown) engage the corresponding lugs on the barrel extension 12 to lock such breech block thereto. Near the bottom of breech block 13 there is provided a rearwardly opening counterbored horizontal hole 23 of suitable shape to receive a firing pin 24.

Firing pin 24 (Figs. 1, 2 and 8) is provided with an integral head 25, the rear end surface of which is sloped as shown at 26 for a purpose to be described. A spring 27 surrounds the body portion of firing pin 24 and abuts head 25 and the bottom of the counterbored portion of hole 23 to bias

firing pin 24 rearwardly thus retracting the forward end of such firing pin from the face of cartridge feeding T-slot 22. A longitudinal slot (not shown) is provided in head 25 of firing pin 24 which is engaged by a transverse pin provided in breech block 13 (not shown) so that the sloped end 26 of firing pin 24 is maintained in the position shown in Fig. 2. Firing pin 24 is retained within hole 23 by a plate 28 which is inserted in a corresponding transverse slot 29 in the rear of breech block 13. Such plate and slot are preferably of dovetailed construction. A sloped rear corner 30 is provided on firing pin 24 which strikes against plate 28 thereby limiting the rearward travel of such firing pin.

Breech block carrier 14 is likewise slidably mounted in receiver 10 in a manner similar to that of breech block 13. Such carrier comprises a horizontal arm 31 and an integral upwardly inclined arm 32 as shown in Figs. 1 and 2. A transverse hole 33 is provided in the lower rear corner of carrier 14 as shown in Fig. 1 in which is inserted a pin 34 to connect such carrier with a carrier slide 35. On the forward face of inclined arm 32 of carrier 14 there is provided a suitable T-slot (not shown) which is engaged by the corresponding rib provided on breech block 13 to slidably secure such block to carrier 14. A longitudinal rectangular recess 36 is provided on the front face of inclined arm 32 of carrier 14 to slidably mount a hammer 37. Hammer 37 is a substantially rectangular member provided with an integral lug 38 on the upper surface thereof as shown in Figs. 1, 2 and 8. Lug 38 has a sloped forwardly facing surface 39 which mates with sloped surface 26 on the end of firing pin 24 when such hammer rests within recess 36. A rearwardly opening hole 40 provided in hammer 37 along the longitudinal axis thereof houses a helical hammer spring 41. Such spring is retained within hole 40 by a headed rod-like member 42. The head portion of head member 42 rests on top of inclined arm 32 to seal the end of a hole 43 which communicates with the rectangular recess 36. Member 42 in turn is retained within hole 43 by a pin 44 inserted in a suitable transverse hole near the top of arm 32.

The lower end of hammer 37 is bifurcated as shown at 45 in Figs. 1 and 8. It should be mentioned here that hammer 37 is substantially shorter than the rectangular recess 36 to permit considerable longitudinal movement of such hammer within recess 36 in order that hammer 37 can obtain sufficient momentum to strike firing pin 24 a smart blow.

A horizontal longitudinally-extending hole 46 is provided in the horizontal arm 31 of breech block carrier 14 to house a substantially cylindrical sear 47. A tang 48 is provided on the rear end of sear 47 disposed at right angles to the axis of the cylindrical body of such sear. Tang 48 projects outwardly somewhat beyond the side of carrier 14 through a suitable horizontally disposed slot in such carrier. Sear 47 is arranged to be biased forwardly by a spring 49 which is retained within a rearwardly opening bore 50 of sear 47.

A plug 51 placed in the end of bore 50 secures spring 49 and sear 47 in hole 46, such plug being in turn secured to carrier 14 by a vertically disposed pin 52. A notch 53 is provided on the forward end of sear 47 so that the end of hammer 37 can be engaged by such end of the sear and retained thereon until released.

The hammer 37 is cocked by a cocking member 54 comprising a substantially triangular member and is inserted in a slot 55 provided on the underside of carrier 14. The cocking member 54 is pivotally mounted within slot 55 on a transverse pin 57, such transverse pin however is of rectangular configuration where such pin passes through cocking member 54. A rectangular hole is of course provided in cocking member 54 to accommodate such rectangular portion of pin 57. One of the apexes 56 of cocking member 54 passes between the bifurcated end 45 of hammer 37 to force such hammer upwardly when the lower apex 58 of cocking member 54 strikes the sloped surface 59 on an upstanding lug 60 provided on bottom plate 18 as carrier 14 moves rearwardly.

There is pivotally secured to the left end of pin 57, as shown in Fig. 8, a firing pin retracting lever 61. Lever 61 is secured to pin 57 in such fashion so as to permit limited pivotal movement of such lever about pin 57. An integral lug 62 is provided on the end of pin 57 which rests within a substantially V-shaped recess 63 provided on the end of lever 61. A leaf spring 64 is secured within a suitable recess in the underside of a cross member 65 of carrier slide 35. Leaf spring 64 extends forwardly and is provided with a rounded end 66 as shown in Fig. 8. Such rounded end contacts a projection 67 formed by notching the rear corner of cocking member 54. Spring 64 is provided to bias cocking member 54 upwardly and hence lever 61 downwardly into the path of a sloped end 68 of a reciprocable operating slide 69. The forward end of lever 61 is provided with a transversely outwardly projecting lug 70 to engage the rear end of operating slide 69.

Operating slide 69 is provided to manually charge or load the firearm. Such slide likewise provides means for retracting the firing pin as will be presently described. This is quite necessary in the event a misfire should occur. As will be brought out later, if the action were retracted without retraction of the firing pin, the breech block 13 would slide down the breech block carrier 14 and thus break the tip of the firing pin.

When operating slide 69 is retracted, the sloped end 68 thereof strikes the lower corner of lug 70 of firing pin retracting lever 61. Upon striking the end of such lug, cocking member 54 is forced upwardly a slight amount which likewise forces hammer 37 upwardly. This upward movement of the hammer lifts lug 38 from the head 25 of firing pin 24. Firing pin 24 is then retracted by the bias of spring 27 until the slope corner 26 provided on the underside of head 25 strikes plate 28. The forward end of firing pin 24 will then be sufficiently retracted from the face of breech block 13 so that there will be no interference with the cartridge in the T-slot 22 of such block. As the sloped surface 68 on the end of operating slide 69 strikes lug 70, lever 61 is raised upwardly along such sloped surface until the extreme rear end of lug 70 strikes a shoulder 71 provided on operating slide 69. Upon striking shoulder 71, the lever 61 is prevented from rotating further and hence carrier slide 35, carrier 14 and breech block 13 will be moved rearwardly by operating slide 69.

As the recoil stroke is completed, cocking member 54 rides up cam surface 59 of lug 60 and hammer 37 is raised upwardly sufficiently to permit sear 47 under the bias of spring 49 to slide under the bottom end of hammer 37 thus retaining such hammer in the cocked position.

To release sear 47, a sear release mechanism is utilized comprising a wedge-shaped sear release member 72 (Figs. 3 and 6) which has a

T-shaped base 73, and a trigger 74, is mounted on a bracket 75 on the right side of the firearm as shown in Fig. 3. Bracket 75 is suitably secured to right side plate 17 slightly ahead of sear tang 48 as shown in Fig. 3. A grip 76 is vertically mounted in bracket 75 as by a bolt 77. Trigger 74 comprises a substantially L-shaped member as best shown in Fig. 4 and is pivotally mounted on bracket 75 by a vertical pin 78. The forwardly projecting leg of trigger 74 is provided with an elongated hole 79 which is engaged by a vertical pin 80 in a sear release housing 81 as shown in Figs. 3 and 9. Pin 80 also passes through wedge shaped sear release member 72 thereby pivotally securing such member to housing 81.

Housing 81 is a substantially rectangular member and is mounted in a T-shaped slot 82 provided on top of bracket 75. The forward end of housing 81 is bifurcated as shown at 83 to receive a sear release plunger 84. Sear release plunger 84 is a T-shaped member provided with a cylindrical stem portion 85 (Fig. 9). A spring 86 surrounds stem portion 85 to bias plunger 84 against T-shaped base 73 of sear release member 72. A spring-biased plunger 87 (Fig. 3) is inserted within a suitable hole in bracket 75 and engages the front surface of trigger 74 in such fashion that trigger 74 will be biased in a clockwise direction about pin 78.

The trigger mechanism illustrated in the appended drawings is utilized for semi-automatic fire. When the action is in the breeched or closed position shown in Fig. 1, sear 47 is released by pressing against trigger 74. Sear release member 72 which is pivotally secured to housing 81 is forced transversely across a tapered transverse slot 88 on the top edge of side plate 17. The wedge-shaped nose of sear release member 72 then wedges between sear tang 48 and breech block carrier 14 and actuates sear 47 rearwardly thereby effecting release of firing pin 24. The rearward movement of carrier 14 then rotates release member 72 rearwardly against the rear surface of tapered slot 88 whereupon such carrier and in fact the whole breech mechanism slides past such release member.

When barrel extension 12 has recoiled past the sear release member 72, plunger 84 biases such member forwardly into the path of counter-recoil movement of barrel extension 12. It should be mentioned here that the T-shaped head of plunger 84 contacts some portion of base 73 of release member 72 at all times. Thus regardless of what position the release member 72 may assume, such plunger will force member 72 to the position shown in Fig. 3 when the trigger is released as will be presently described. As the barrel extension 12 moves forwardly on the counter-recoil stroke, such extension strikes sear release member 72 rotating such release member forwardly until it strikes the forward sloped surface of tapered slot 88, whereupon the breech mechanism will slide freely past sear release member 72. As the sear release member 72 has been thrust to one side, as just described, the weapon can not be fired automatically, the sear release member having been disconnected from sear 47.

To again fire the weapon trigger 74 is released whereupon housing 81 is forced away from the gun through the connection of such housing to trigger 74 by the bias of plunger 84. Sear release member 72 is then returned to the position shown in Fig. 3 ready to effect release of sear 47 when trigger 74 is again actuated. It should be understood that such mechanism can be readily modified to permit automatic fire if desired.

A safety 89 comprising a knob portion 90 and a cylindrical stem portion 91 is mounted underneath housing 81 as shown in Fig. 7, so that the stem portion thereof can engage housing 81 in such fashion as to block the forward movement of such housing. A flattened portion 92 is provided in the center of stem portion 91. In the position shown in Fig. 7, safety 89 is in the inoperative position. When such safety is rotated in a clockwise direction as shown in Fig. 9, the flattened portion 92 is rotated into a transverse notch 93 provided on the bottom of housing 81 thereby effectively blocking any movement of such housing. Safety 89 is retained on bracket 75 by a spring clip 94 which surrounds the projecting end of stem portion 91. Such spring clip likewise allows slight lateral movement of safety 89 which therefore permits use of a suitable detent (not shown) to yieldingly secure such safety in either the "safe" or "fire" position.

For a more detailed and complete description of the firearm embodying this invention, reference may be had to my copending application Serial No. 675,124 filed June 7, 1946, for Firearm and now matured into Patent No. 2,555,379.

It should thus be apparent from the above description of the preferred embodiment of this invention that there is here provided a unique firing mechanism for a firearm having a breech block slidably mounted on the breech block carrier for movement in a vertical as well as a horizontal plane. Such mechanism is also of positive operation and is of sturdy construction to insure long life.

I claim:

1. In a firearm having a receiver, a barrel extension slidably mounted in said receiver for reciprocating movement, a barrel secured to said barrel extension, a breech block carrier slidably monuted in said receiver for reciprocating movement parallel to said barrel and barrel extension movement, a breech block guide surface on said carrier angularly disposed relative to the path of movement of said carrier and located rearwardly of said barrel extension, a breech block slidably mounted relative to said guide surface for reciprocal movement between two spaced positions on said guide surface, said guide surface having a longitudinal recess, a hammer slidably mounted in said recess, resilient means biasing said hammer downwardly, a sear horizontally mounted in said carrier constructed and arranged to engage the lowermost end of said hammer, means for cocking said hammer, and resilient means biasing said sear forwardly to engage said hammer when in the cocked position whereby said hammer is so held until release of said sear.

2. In a firearm having a receiver, a barrel extension slidably mounted in said receiver for reciprocating movement, a barrel secured to said barrel extension, a breech block carrier slidably mounted in said receiver for reciprocating movement parallel to said barrel movement, a breech block guide surface on said carrier angularly disposed relative to the path of movement of said carrier and located rearwardly of said barrel extension, a breech block slidably mounted relative to said guide surface for reciprocal movement between two spaced positions on said guide surface, a firing pin horizontally mounted in said breech block having a head portion provided with a sloped surface, said angularly disposed

guide surface having a longitudinal recess therein, a hammer slidably mounted in said recess, said hammer having a projection thereon constructed and arranged to strike said sloped surface of said firing pin upon release of said hammer from a cocked position.

3. In a firearm as in claim 1 wherein said cocking means comprises a substantially triangular member, said triangular cocking member being pivotally mounted underneath said carrier and so arranged whereby one of the apexes thereof contacts the bottom of said hammer, and a downwardly projecting apex arranged to strike an upright cam on the recoil movement of said breech block whereby said cocking member is rotated upwardly to cock said hammer.

4. In a firearm having a receiver, a barrel extension slidably mounted in said receiver for reciprocating movement, a barrel secured to said barrel extension, a breech block carrier slidably mounted in said receiver for reciprocating movement parallel to said barrel and barrel extension movement, a breech block guide surface on said carrier angularly disposed relative to the path of movement of said carrier and located rearwardly of said barrel extension, a breech block slidably mounted relative to said guide surface for reciprocal movement between two spaced positions on said guide surface, a firing pin in said breech block, resilient means surrounding said firing pin, a hammer mounted in said carrier constructed and arranged to strike said firing pin, a cocking member adapted to cock said hammer, an operating slide slidably mounted on said receiver, a retracting lever secured to said cocking member, and arranged for limited pivotal movement, said lever having a projecting lug on the free end thereof, and said operating slide having a cam surface on one end whereby said cam surface contacts said projecting lug on said lever when said slide is manually retracted thereby rotating said lever and cocking member to raise said hammer a limited amount

to permit said resilient means to retract said firing pin to prevent breakage of said firing pin.

5. The combination defined in claim 4 including a sear engageable with said hammer and a sear release means therefor comprising, a bracket fixedly secured to the side of the receiver, a housing slidably mounted in said bracket for transverse reciprocable movement, a T-shaped sear release member, a pivot pin vertically mounted in the front end of said housing for pivotally retaining said sear release member thereto, a trigger pivotally secured to said bracket and having a forwardly projecting arm, said arm having an elongated slot arranged to receive said pivot pin therethrough whereby pivotal movement of said trigger effects slidable movement of said housing, a spring-biased T-shaped plunger in said housing arranged to abut said T-shaped sear release member in back-to-back relationship whereby pivotal movement of said member depresses said plunger, said sear release member having a wedge-shaped front end arranged to be moved inwardly of the receiver into the path of movement of the recoiling breech block carrier and against said sear when said trigger is depressed whereby said sear is cammed rearwardly out of engagement with said hammer, means in the receiver for limiting the pivotal movement of said sear release member, and spring means for urging said trigger to its prefired position upon release thereof.

CLARENCE E. SIMPSON.

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