

March 29, 1932.

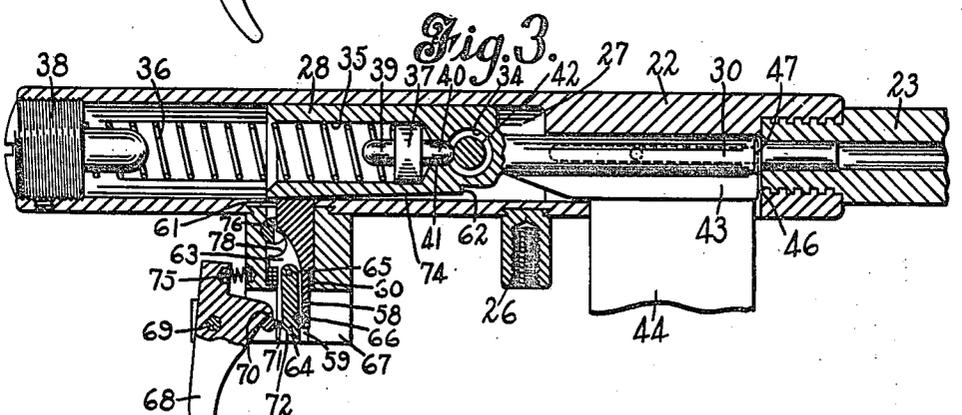
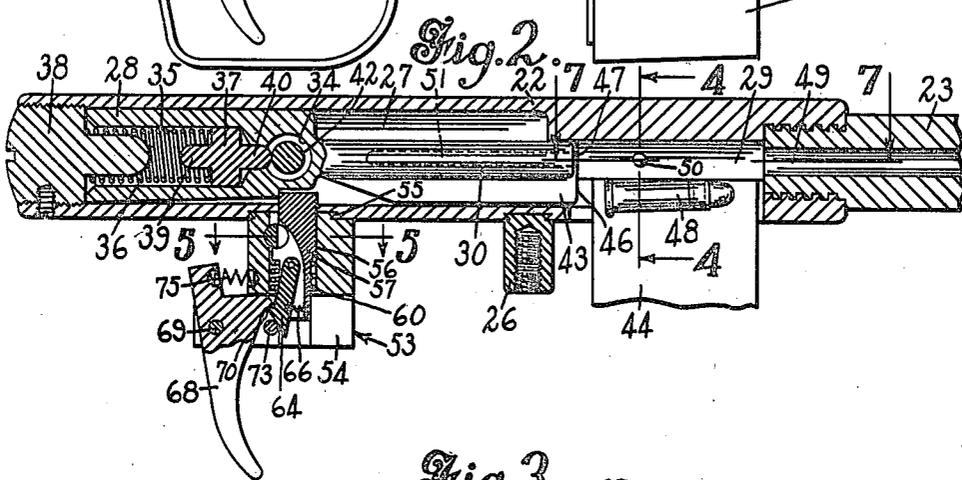
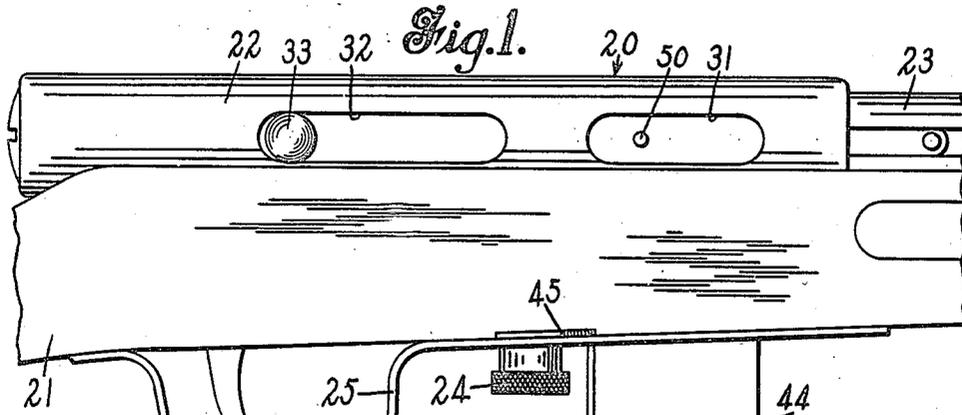
C. E. EKDAHL

1,851,696

FIREARM

Filed May 15, 1931

2 Sheets-Sheet 1



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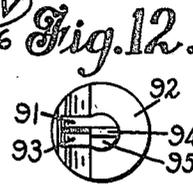
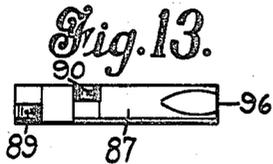
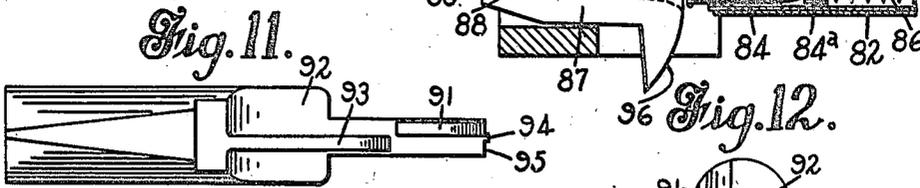
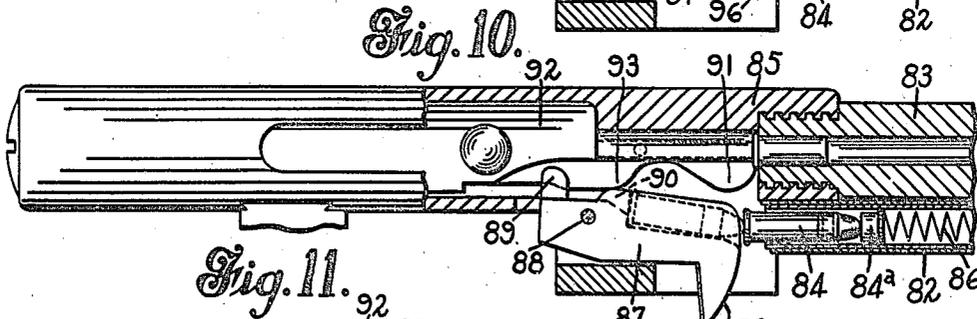
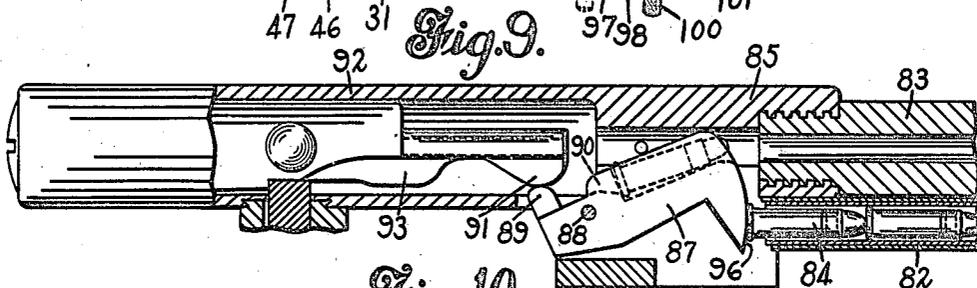
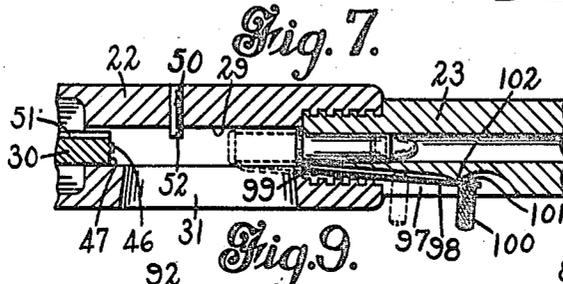
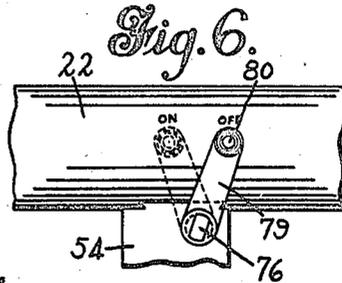
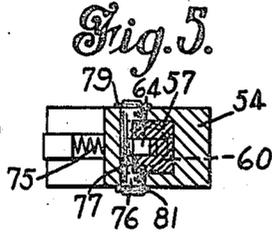
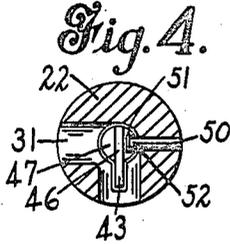
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FIREARM

Filed May 15, 1931

2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

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## FIREARM

Application filed May 15, 1931. Serial No. 537,664.

My invention relates to a firearm and more especially to an automatic firearm in which energy incident to the firing of one cartridge is utilized for ejecting the empty cartridge case, reloading and firing a subsequent cartridge.

The general object of the invention is to produce a firearm of the above type in which there are relatively few moving parts and in which the functions of loading, firing and ejecting the cartridges may be efficiently carried out without danger of malfunctions or jams.

In automatic firearms, especially those of the blow-back type, more or less gas leaks from the chamber into the action with the result, especially in .22 caliber weapons, that the extractors, the ejectors, firing pins and other moving parts become gummed or otherwise dirty and fail to function after a relatively small number of cartridges have been fired.

A feature of the present invention resides in a form of firearm in which the extractors, firing pins and other moving parts especially at the forward end of the breech bolt, have been eliminated with the result that a weapon made in accordance with the invention may be fired indefinitely without cleaning.

A further feature of the invention resides in a novel form of trigger mechanism whereby the operation of the firing mechanism may be controlled.

Another feature of the invention resides in an arrangement for supporting the cartridge case during the ejection thereof.

A still further feature of the invention resides in a relatively simple form of safety whereby the mechanism may be locked against operation.

Still another feature of the invention resides in a simple form of extractor which, although normally stationary, may be utilized for extracting a cartridge in case of a misfire or the like.

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

In the drawings:

Fig. 1 is a side elevational view of a firearm according to my invention, the ends thereof being broken away;

Fig. 2 is a cross-sectional view of the breech mechanism of the firearm shown in Fig. 1;

Fig. 3 is a view similar to Fig. 2 but showing the parts in a different position;

Fig. 4 is a cross-sectional view along line 4—4 of Fig. 2;

Fig. 5 is a cross-sectional view along line 5—5 of Fig. 2;

Fig. 6 is a fragmentary view showing a part of the safety lock;

Fig. 7 is a cross-sectional view taken along line 7—7 of Fig. 2;

Fig. 8 is a view showing a modified form of a part of the operating mechanism;

Fig. 9 is a view similar to Fig. 2, but showing the invention applied to a different type of weapon;

Fig. 10 is a view similar to Fig. 9 but showing the mechanism in a different position;

Fig. 11 is a view showing the underside of the breech block used in that form of the invention shown in Figs. 9 and 10;

Fig. 12 is an end view taken from the left end of the breech block shown in Fig. 11, and

Fig. 13 is a plan view of the cartridge carrier shown in Figs. 9 and 10.

Referring to the drawings in which I have illustrated my invention by showing some preferred embodiments of the same, and especially to Figs. 1 to 8 inclusive, the reference numeral 20 indicates in general the improved firearm, which in this instance takes the form of an autoloading rifle of the blow-back type. Rifle 20 is provided with a stock 21, a receiver 22 and a barrel 23, the receiver and barrel being detachably secured to stock 21 by means of takedown screw 24 which passes through

trigger guard 25 and stock 21 into escutcheon 26, dovetailed in the underside of receiver 22. The receiver 22, in this instance, is generally tubular in form and is provided at its rear end with an enlarged bore 27 for the reception of breech block or bolt 28, the forward end of bore 27 being reduced as at 29 for the reception of the reduced forward end 30 of bolt 28.

At the forward end of receiver 22, opposite the bore 29 is a laterally directed ejection opening 31, while rearwardly of ejection opening 31 is an axially directed opening 32 through which an operating or cocking handle 33 extends into the bolt 28, the latter being provided with an opening 34 in which the handle 33 is received. Bolt 28 is provided with an axially directed bore 35, extending inwardly from the rear end thereof, a main or action spring 36 being mounted in the bore 35 and having one end bearing against a plug 37 seated at the inner end of bore 35, the outer end of spring 36 being seated against a plug 38, mounted in the threaded end of receiver 22. Plug 37 is provided at its ends with stems 39 and 40, the former entering the adjacent end of spring 36 while the stem 40 passes through opening 41 in bolt 28 into opening 34 and enters groove 42 in handle 33 to detachably secure the latter to the bolt.

Extending downwardly from the underside of the reduced portion 30 of bolt 28 is an axially directed rib 43, which is adapted to enter the upper end of magazine 44, upon the forward movement of bolt 28, under urge of spring 36. The magazine 44 may be of any well known type and is detachably held in place by means of latch 45, the magazine and latch not being shown herein in detail. The forward end 46 of rib 43 extends slightly beyond the end face 47 of bolt 28, and terminates in a vertically directed face extending in a straight line across the face 47 of the bolt.

As the rib 43 passes through the upper end of magazine 44, the end face 46 contacts with a cartridge 48, stripping the latter from the magazine 44 and forcing it into chamber 49 of barrel 23. When the cartridge 48 is seated in chamber 49, the momentum of breech block 28 drives the upper end of rib 43 into the end of the cartridge case, crushing the primer and igniting the powder, the mechanism at this time being in the position shown in Fig. 3 of the drawings. The pressure generated within the cartridge case and the barrel rapidly builds up until it is sufficient to overcome the inertia of the bolt 28 as well as the tension of spring 36, whereupon the cartridge case is forced out of the chamber 49, driving the breech block back until the base of the cartridge case comes in contact with an ejector pin 50, extending through the wall of receiver 22, whereupon the cartridge case is driven outwardly from the receiver 22

through the ejection opening 31. As shown particularly in Fig. 4 of the drawings, the reduced end portion of the bolt 28 is provided with a groove 51, which provides clearance for the exposed end 52 of ejector pin 50.

The momentum acquired by bolt 28 carries the latter back, compressing spring 36 until the bolt contacts with plug 38 whereupon it is engaged by a trigger mechanism generally designated by the reference numeral 53, to be held against further movement.

The trigger mechanism 53 comprises a frame 54, dovetailed at 55 to the underside of receiver 22, frame 54 being provided at its upper end with a generally rectangular opening 56, in which a vertically slidable sear 57 is mounted. Sear 57 is provided on its lower end with a generally cylindrical stem 58, received in the generally cylindrical opening 59, in frame 54. Surrounding stem 58 and positioned between the lower end of the rectangular portion of the sear 57 and the bottom of the rectangular opening of frame 54, is a compression spring 60 which urges the sear 57 upwardly into contact with the bolt 28, the upper rear end or nose 61 of sear 57 entering a sear notch 62 on the lower face of bolt 28 to hold the bolt against forward movement, as shown in Fig. 2. Mounted in an axially directed slot 63 in sear 57 is a disconnecter 64 pivotally supported on a pin 65 at its upper end, and urged rearwardly at its lower end by means of spring 66. The lower end of frame 54 is slotted at 67, for the reception of a trigger 68, pivotally mounted on a trigger pin 69 and having a shoulder 70 which may contact with a notch 71 on disconnecter 64 to move the sear 57 downwardly to disengage it from the sear notch 62 in bolt 28. As the sear 57 is moved downwardly by trigger 68, a cam face 72 on the lower end of disconnecter 64 strikes a pin 73, extending transversely across the slot 67 to swing the disconnecter 64 out of contact with the trigger. Upon movement of the sear 57 a sufficient distance to release the bolt 28, the upper end of the sear 57 is engaged by a sloping surface 74 on the underside of bolt 28 and forced downwardly a sufficient distance to cam the disconnecter 64 out of contact with the trigger 68, the shoulder 70 on trigger 68 contacting with pin 73 which acts as a stop for the trigger.

During the rearward motion of the bolt 28, the sear 57 is forced upwardly by sear spring 60, the pressure exerted by the shooter's finger on the trigger 68 maintaining the shoulder 70 against pin 73, the shoulder and pin forming a substantially unbroken surface over which the disconnecter passes during the upward travel of the sear. If desired, the shoulder on the trigger may have an under-surface shaped to embrace the cylindrical surface of the pin 73. When the bolt is fully

back, the nose 61 of sear 57 passes into sear notch 62 of bolt 28, holding the bolt against further movement, the spring 66 forcing the disconnecter 64 back into its normal position.

5 When the shooter releases the trigger 68, trigger spring 75 brings the trigger back into firing position, the end of the trigger riding upwardly over the disconnecter owing to the fact that spring 75 is more powerful than  
10 spring 66. The mechanism is now restored to the position shown in Fig. 2 of the drawings, ready to load and fire another cartridge upon the pulling of the trigger.

15 In order that the rifle may be carried safely in this position, a safety lock is provided, in this instance taking the form of a rod 76, extending transversely of and rotatably mounted in frame 54. Rod 76 is milled  
20 away at 77 to provide clearance for the upper end of sear 57 during the firing of the rifle, sear 57 being provided with a semi-cylindrical groove or notch 78 into which the non-milled central portion of the rod 76  
25 may be rotated to hold the sear against movement, the notch 78 being opposite the rod when the sear nose is engaged in sear notch 62. Riveted or otherwise secured to one of  
30 the ends of rod 76 at the outside of receiver 22 is an arm 79 by means of which rod 76 may be rotated, safety arm 79 being provided for convenience of operation with a button or  
finger piece 80. A washer 81 is secured to the opposite end of rod 76 to secure the latter  
35 within the frame 54.

40 In Figs. 9 to 13 inclusive I have shown a different form the invention may take, in this instance the box magazine of Figs. 1 to 3 inclusive being replaced by a tubular magazine 82 of any well-known type, tubular  
45 magazine 82 extending beneath barrel 83. The cartridges 84 are forced toward the receiver 85 by magazine plug or follower 84<sup>a</sup>, actuated by magazine spring 86 and are received one at a time on carrier 87, pivotally  
50 mounted at 88. Carrier 87 is provided at its upper end with operating fingers 89 and 90, the former contacting with a camming lug 91, on the underside of bolt 92 during the rearward motion of the latter to swing the  
55 carrier into the position shown in Fig. 9 of the drawings, while finger 90 contacts with the camming lug 93 upon the forward motion of the bolt to swing the carrier back into the position shown in Fig. 10.

60 During the forward movement of the bolt 92, the cam lug 91 engages a cartridge supported on the carrier 87 and forces it into the barrel, the continued forward motion of the bolt driving a rib 94 on the end face 95 of the  
65 bolt into the end of the cartridge in the chamber firing the same. Carrier 87 is frictionally held against movement by the engagement of either the plug 84<sup>a</sup> or the cartridge 84 with the end 96, which is formed concentric with the pivotal support 88.

In case of a misfire, due to an improperly loaded cartridge or the like, the bolt 28 will not be driven back but will rest in the position shown in Fig. 3 of the drawings. It will then be necessary for the shooter to grasp the  
70 handle 33 and to move the breech bolt back into the position shown in Fig. 2 before the gun may again be fired. However, since the elimination of extractors of the bolt or other moving parts of the action is a feature of the  
75 invention, it will be apparent that the cartridge will remain in the chamber 49. To meet an emergency of this character, the barrel 23 is provided at its breech end with a slot 97 in which a normally stationary and  
80 inoperative extractor 98 is positioned, extractor 98 being preferably made out of a strip of steel and having an inwardly bent end 99 which may engage under the rim of the cartridge, there being a handle 100 on the opposite  
85 end of the extractor, handle 100 having an inner end 101 which passes through an opening in the end of the strip 98 and is upset to form an abutment which engages a projection 102 in the bottom of slot 97 to hold the  
90 extractor normally against movement. After the bolt has been moved back into the position shown in Fig. 2 of the drawings, the shooter may grasp the handle 100 of the extractor and force the same towards the rear into the  
95 dotted line position shown in Fig. 7, bringing the cartridge into the receiver whereupon the cartridge may be disposed of through the ejection opening 31. It will be noted that the end of receiver 22 passes over the slot 97, the  
100 receiver acting to hold the extractor 98 within the slot 97, and during extraction of a cartridge, holding the end 99 in tight contact with the cartridge case.

105 In order that the rifle may be suitable for use with cartridges developing different chamber pressures, more than one plug 37 may be provided, for example, the plug 37 shown in Figs. 2 and 3 of the drawings being  
110 suitable for use with cartridges developing low chamber pressures while the plug 103, shown in Fig. 8 of the drawings, is adapted for use with cartridges developing higher pressures. Plug 103 not only increases the weight of the breech bolt but being of greater  
115 length than plug 37 brings about an initial compression of the spring 36.

120 It will be noted that the forward end of rib 43 and the rib extending across the end face of bolt 28 form an unbroken straight line, it thus being possible to feed a cartridge from the magazine 44 into the chamber 49 without jamming, the base of the cartridge riding freely upwardly over the forward end of the rib 43 and across the breech block.  
125 The rib at the forward end of the breech block, upon being driven into the base of the cartridge, forms a groove therein, the cartridge case embracing the rib during the rearward motion of the breech block and thus  
130

being held in position to be ejected from the receiver.

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

What I claim is:

1. In a firearm provided with a barrel having a chamber, and a magazine, the combination of a breech bolt mounted for movement towards and away from the chamber, said bolt having a rigid projection on the forward end thereof adapted to engage and fire a cartridge in the chamber, said projection extending outwardly into position to engage and feed a cartridge from the magazine into the chamber.

2. In an automatic firearm, a barrel, a breech bolt mounted for movement towards and away from the barrel, a magazine mounted below the path of movement of the breech bolt, said breech bolt having a vertically directed cartridge firing rib on the forward end thereof, said rib extending downwardly into position to engage and feed a cartridge from the magazine into the barrel.

3. In a firearm, a barrel provided with a chamber adapted to receive a cartridge, a breech bolt, a spring for driving the breech bolt towards the chamber, and a fixed rib extending diametrically across the forward face of the breech bolt adapted to engage and fire a cartridge in the chamber.

4. In a firearm, a barrel provided with a chamber adapted to receive a cartridge, a breech bolt, a spring for driving the breech bolt toward the chamber, and a rib fixed to the breech bolt at the forward end thereof, said rib extending vertically across the front face of the breech bolt adapted to engage and fire a cartridge in the chamber.

5. In a firearm provided with a barrel having a chamber and a magazine, the combination of a breech bolt mounted for movement towards and away from the chamber, said breech bolt being provided with a downwardly and forwardly extending rib, said rib extending beyond the end of the breech bolt and diametrically across the end face thereof, said rib at its lower end being adapted to enter the magazine and to feed a cartridge therefrom into the chamber and at its upper end to engage and fire the cartridge when received in the chamber.

6. In a firearm, a barrel having an axially directed slot in the breech end thereof, an extractor mounted for movement in said slot, said extractor having an abutment, and means positioned in said slot and engaged by said abutment for holding the extractor against movement.

7. In a firearm, a barrel having an axially

directed slot at the breech end thereof, an extractor mounted for movement in the slot, an operating handle mounted on said extractor and having a part thereof extending into said slot, and means in said slot engaged by said part of the handle for holding the extractor against movement.

8. In a firearm provided with a cartridge firing element, the combination of a sear for holding the element in firing position, trigger means for moving said sear into position to release said element, and means on said element for moving the sear into position wherein it is disengaged from operation by the trigger means.

9. In a firearm, a firing element, a sear for holding the element in cartridge firing position, a trigger, means for connecting said trigger to said sear for movement thereby to disengage the sear from the element, means for disconnecting the trigger from the sear, and means on said element for moving the sear into trigger disconnecting position.

10. In a firearm, a breech bolt, an operating handle extending into an opening in said breech bolt, a bore extending inwardly from one end of the breech bolt, an actuating spring mounted in said bore, and a plunger on the inner end of said spring, said handle being provided with a groove and said plunger entering said groove to secure the handle within the breech bolt.

11. In a firearm of the automatic type, a vertically sliding sear, a pivoted hook on said sear, a trigger normally engaging said hook to actuate said sear, and means for moving said hook out of engagement with the trigger upon downward movement of the sear beyond a predetermined amount.

12. In a firearm of the automatic type, a vertically sliding sear, a pivoted hook on said sear, a trigger normally engaging said hook for actuation of the sear, and common means for limiting the movement of said trigger and disengaging the hook therefrom upon downward movement of the sear.

13. In a firearm of the automatic type, a vertically sliding sear, means constantly urging said sear in one direction, a pivoted hook on said sear, a trigger normally engaging said hook and adapted to move the sear in an opposite direction, and means for disengaging said hook from said trigger upon downward movement of the sear beyond a predetermined amount, said means holding the hook out of engagement with the trigger upon upward movement of the sear.

In witness whereof, I have hereunto set my hand this 13th day of May, 1931.

CARL E. EKDAHL.