L. N. DIEHM.

AUTOMATIC FIREARM.

APPLICATION FILED AUG. 6, 1915.

1,226,478.

Patented May 15, 1917.

2 SHEETS—SHEET 1.

Fig. 1.

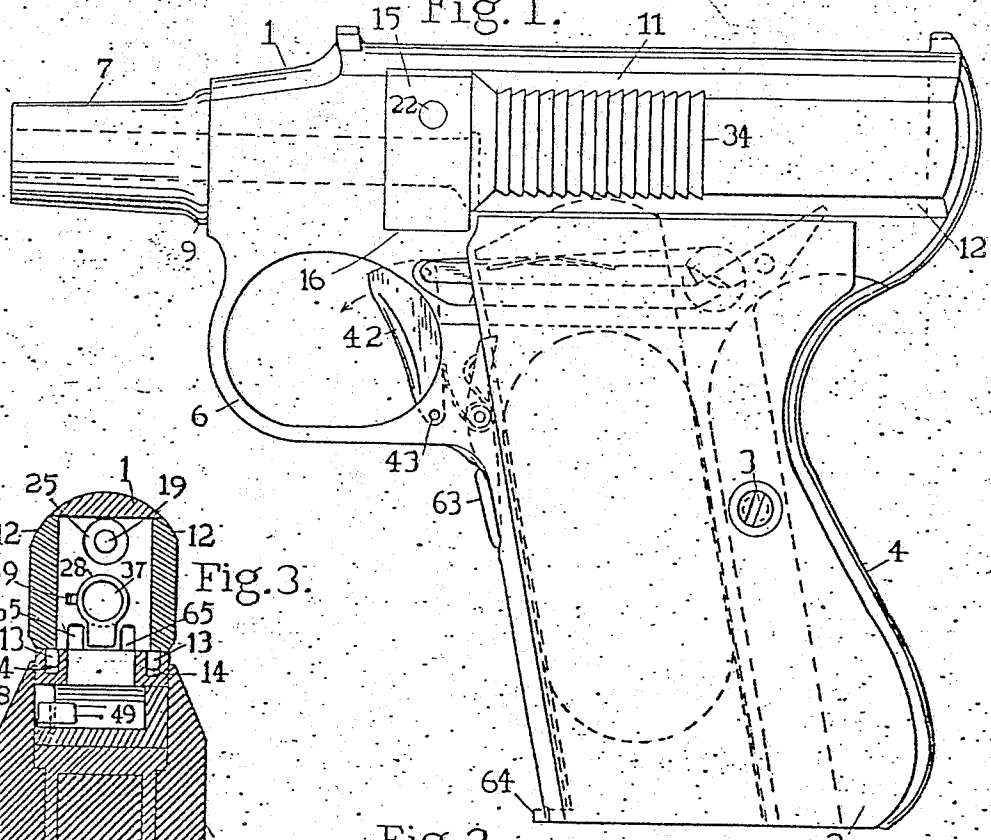
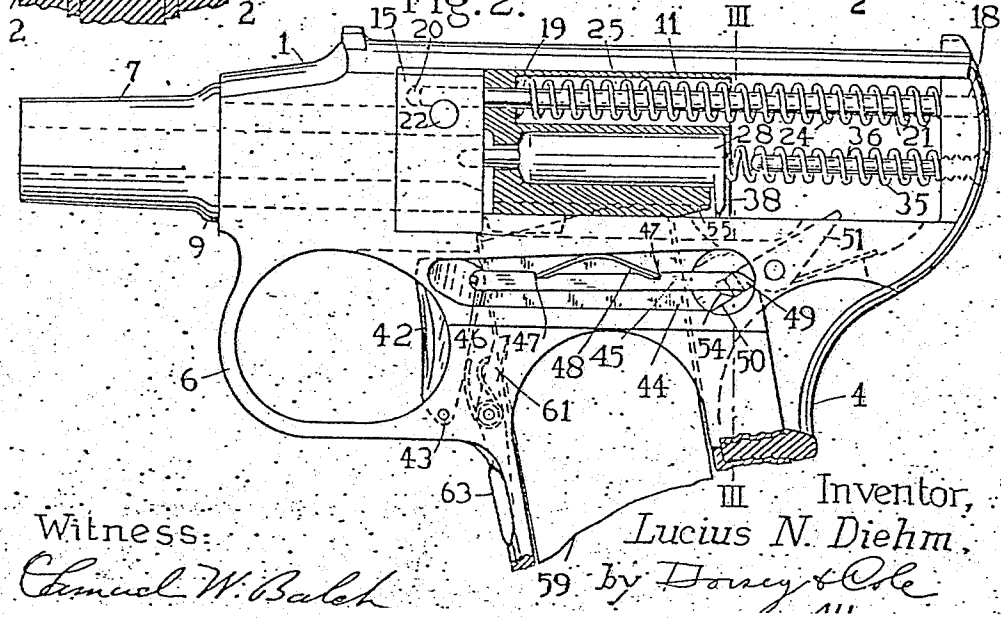


Fig. 3.

Fig. 2.



Witness:
Emmet W. Balch

Inventor,
Lucius N. Diehm.
by Dorsey & Cole
Att'ys

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42. FIREARMS,

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2 SHEETS—SHEET 2.

Fig. 4.

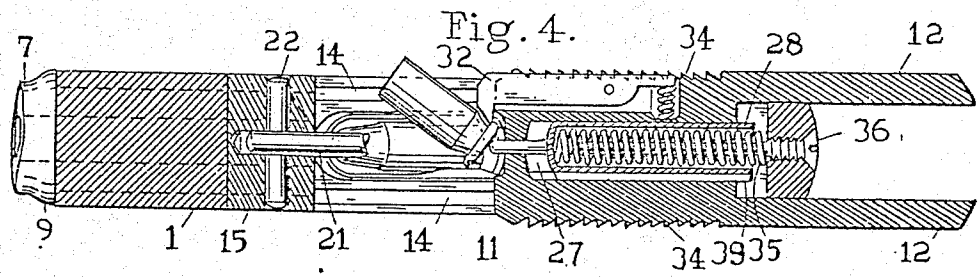


Fig. 5.

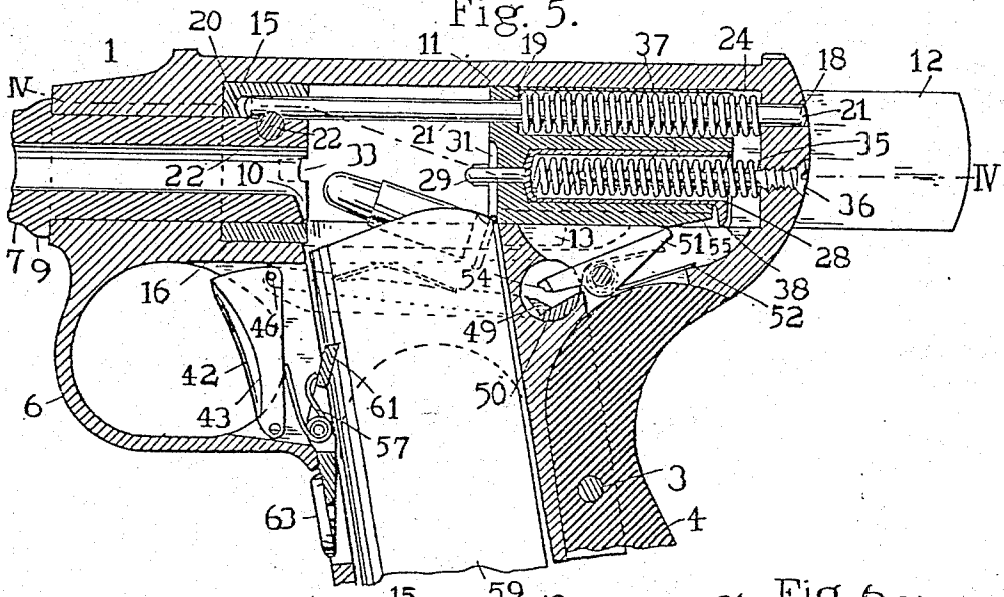
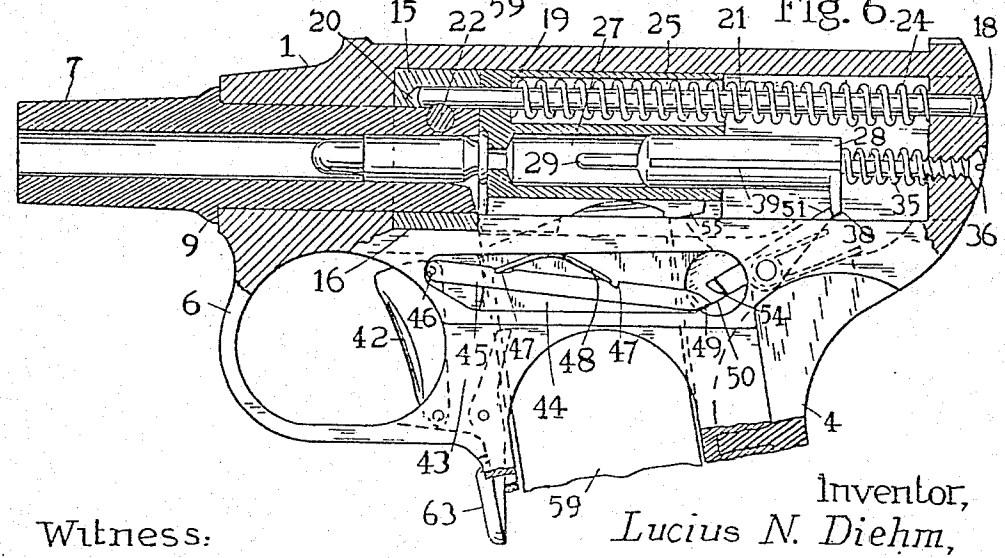


Fig. 6.



Witness:

Samuel W. Balch

Inventor,

Lucius N. Diehm,

by Dorsey & Cole

Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LUCIUS N. DIEHM, OF WEST HARTFORD, CONNECTICUT, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF TWO-THIRDS TO BERKLEY C. STONE, OF MIDDLETOWN, CONNECTICUT.

AUTOMATIC FIREARM.

1,226,478. Specification of Letters Patent. Patented May 15, 1917.

Application filed August 6, 1915. Serial No. 43,916.

To all whom it may concern:

Be it known that I, LUCIUS N. DIEHM, a citizen of the United States, and a resident of the town of West Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Automatic Firearms, of which the following is a specification.

The invention relates to a fire-arm of the general type which is automatically loaded, fired and automatically discharges its empty cartridge, and which repeats these operations until the supply of ammunition carried by it is exhausted. The invention is particularly, though not exclusively, adapted for embodiment in the form of a pistol.

The object of the invention is the production of a fire-arm having these characteristics which is simple of construction, firmly built, readily taken down and assembled and in which the liability of getting out of order is cut to a minimum.

To enable the invention to be more readily understood I have illustrated one embodiment thereof in the drawings which form a part of this application. These drawings are to be understood as purely illustrative and not intended in any way to limit the invention to the precise showing; for various modifications will occur to those skilled in the art.

In these drawings—

Figure 1 is a side elevation of a pistol embodying the invention showing certain of the parts thereof in dotted lines. These parts are illustrated in their respective positions after the trigger has been pulled, the gun being empty, but before the trigger has been entirely released.

Fig. 2 is a side view partly in elevation, but with the breech-bolt in section through its longitudinal vertical central plane, the left hand side of the grip having been removed and the handle partly broken away. This figure illustrates the parts, the gun being empty, when the trigger is pulled to its rear position and the hammer released into its firing position.

Fig. 3 is a vertical section on the line 3 3 of Fig. 2 looking toward the point of the gun.

Fig. 4 is a horizontal section on the two planes indicated by the line 4 4 of Fig. 5, illustrating the breech-bolt in or near its rear position and showing the action of the extractor, the breech-bolt being illustrated as forced rearwardly by the explosion of the cartridge.

Fig. 5 is a central longitudinal vertical section illustrating the parts after the trigger has been pulled and has been entirely released and has assumed its forward position, with the breech-bolt in or near its rear position; the handle being broken away. This figure shows the parts immediately after the empty cartridge has been extracted and as the next loaded cartridge is leaving the magazine on its way into the barrel.

Fig. 6 is a vertical longitudinal section (with some of the parts in elevation) illustrating the parts in cocked position with the loaded cartridge in the barrel ready for firing, the handle being broken away.

In the form of my invention illustrated, the receiver 1 of the gun has ordinary grip-pieces 2 2 fastened on the sides thereof in any suitable manner as by the screw pin 3, and at the rear is recessed and carries a back grip piece 4 set into the recess and suitably attached to the receiver also by the screw pin 3. These grip-pieces are preferably, though not necessarily, made of wood. The forward part of the receiver is made with the usual trigger guard 6, and carries a barrel 7 which is illustrated as cylindrical and the rear end of which fits snugly in the suitably apertured forward portion of the receiver above the trigger guard, its rear position being determined by the annular collar 9. The inner end of the bore is beveled downwardly at 10 to permit of the ready insertion of the cartridge.

The upper part of the receiver has a chamber with both sides open in which is carried a one piece breech-bolt 11 which is made at the rear with two wings 12 12 which in the forward position of the breech-bolt are flush with the upper rear portion of the receiver. The breech-bolt carries on its forward end, on its under side, lugs 13, 13, the latter traveling in guides 14 14 in the walls of the receiver chamber, to assure the proper reciprocal travel of the breech-bolt during the firing, extracting and re-charging of the gun.

A locking block 15 is mounted in the forward end of the receiver chamber and serves as a means of assembling the barrel and the breech-bolt, the forward end of the receiver chamber being recessed as at

16 for the mounting thereof. The locking block is suitably apertured to receive the breech end of the barrel which extends through the same so that the end thereof is flush with the rear end of the locking block when the parts are assembled.

The receiver, breech-bolt and locking block are each provided with horizontal apertures 18, 19 and 20 respectively all in alinement, the lower line of which is in alinement with the top of the aperture in the locking block in which the end of the barrel fits. A guide pin 21 extends through the apertures 18 and 19 and into the aperture 20. A hole for a locking pin 22 extends horizontally and at right angles to the gun through the locking block, the upper portion of the barrel and the lower portion of the guide pin, so that when the locking pin 22 is placed therein these three parts are held firmly together.

The guide pin 21 extends centrally through a helical return spring 24 one end of which abuts against the rear wall of the receiver chamber and the other end of which extends into a pocket 25 in the breech-bolt and abuts against the end of the pocket. Beneath this pocket the breech-bolt is provided with a hammer-chamber 27, in line with the bore of the barrel, within which reciprocates a plunger hammer 28, the forward end of the chamber being drilled through so that the firing pin 29 carried by the forward end of the hammer can extend through the breech-bolt and strike the cartridge. The forward face of the breech-bolt is cut away as at 31 to accommodate the rim of the cartridge.

On one side of the breech-bolt is suitably pivoted in the horizontal plane of the hammer a spring actuated extractor dog 32 the nose of which extends through cut away portions 33 in the locking block and barrel, slightly over the cut away portion 31 in the breech-bolt to grasp the rim of the cartridge in a manner well known in the art. The sides of the breech-bolt are suitably corrugated as at 34 34 for manual manipulation.

The main or firing spring of the gun is shown in the form of a helical spring 35. This is kept in position by a guide pin 36, which is screwed into the upper rear portion of the receiver, and a pocket 37 in the hammer, the spring abutting against the rear wall of the receiver chamber and the forward end of the hammer pocket. The cocking lug 38 is carried by the rear lower portion of the hammer; and the hammer is prevented from turning in its cylinder by a feather 39 which slides backward and forward in the hammer cylinder properly grooved therefor.

A trigger 42 is pivoted at the bottom in a slot 43 in the receiver immediately at the rear of the lower portion of the trigger guard. One side of the receiver is hollowed out above the grip portion as at 44 and forms a bed in which a trigger-bar 45 operates. The forward end of the trigger-bar carries a pin 46 which extends through the upper rear portion of the trigger and cooperates with the forward end of the trigger-bar and the forward end of the hollowed out portion 44 to form a stop to prevent the trigger from being forced forward beyond its normal position. Notches 47 47 on top of the trigger-bar serve as seats for a leaf spring 48, the upper portion of which abuts against the upper face of the hollowed out portion 44 so that the spring exerts a downward pressure on the trigger-bar. The rear end of the trigger-bar carries on its inner face a dog or pin 49 which normally rests on the inclined face of a hardened steel cam 50 conveniently set into the receiver.

A sear 51 is pivoted in the receiver at the rear of the cam and is under pressure of a coiled spring 52 (counter clockwise as viewed in Fig. 5), the sear being hollowed out to accommodate the spring, and the lower portion of the sear abutting against the cam as a stop. A cam or lug 54 projects outwardly from the forward end of the sear and coöperates with the dog 49 on the end of the trigger-bar in firing the gun. The rear end of the sear normally extends slightly into the receiver chamber and coöperates with the cocking lug 38 on the hammer in cocking the gun, the lower face of the solid portion of the breech-bolt being beveled upwardly as at 55 so that engagement with the cocking lug can be made when the breech-bolt is carried back.

The trigger is maintained under forward spring pressure by a bent spring 57, which in addition to this function serves also as a latch spring to hold a magazine 59 of the ordinary coil spring type in place in the grip portion of the receiver. A magazine latch is pivoted in the rear of the slot 43 and is formed at the top with tooth 61, the magazine being notched for engagement therewith. The bottom of the latch extends through an aperture in the receiver and is formed in the shape of a button 63. One end of the above mentioned spring 57 exerts pressure on the trigger and the other end of the said spring on the latch tooth 61. The latch is of such construction that when its button 63 is pressed its tooth 61 is withdrawn from engagement with the magazine so that the latter may be drawn downward out of the receiver for recharging or otherwise, a projecting lip 64 on the forward lower portion of the magazine being provided as a convenient means for withdrawing the magazine from the re-

ceiver. The rear of the side walls of the upper portion of the magazine extend into grooves 65 65 in the lower face of the solid portion of the breech-bolt so that the cartridge is properly guided on its way into the barrel.

In discussing the operation of the gun assume that the gun is cocked and loaded as illustrated in Fig. 6 where an ordinary standard cartridge is shown in position in the barrel. When the trigger is pulled the trigger-bar 45 is carried rearwardly; and the dog 49 on the inner rear face thereof rides up the cam 50, engages the lower part of the sear lug 54, thereby rocks the sear slightly on its pivot withdrawing the upper end of the sear out of engagement with the cocking lug 38 on the hammer. The hammer thus released under pressure of the main spring 35 plunges forward in its cylinder 27 and its firing pin 29 strikes and explodes the cartridge.

As soon as the trigger-bar dog 49 has passed to the rear of the sear lug 54 and the hammer has started its forward travel the sear resumes its normal position, illustrated in Fig. 2; and as the trigger is released the trigger-bar dog 49 rides over the top of the sear lug 54 (see Fig. 1) and the trigger-bar under influence of its spring 48, when the trigger is entirely released, drops back into its normal position shown in Fig. 6. This action obviates the accidental firing of the gun on the forward motion of the trigger as might be the case if the dog 49 traveled back on the cam 50 and tilted the sear.

When the gun has been fired as above described the rearward force of the explosion thrusts the breech-bolt back in the receiver chamber as illustrated in Fig. 5 carrying with it the hammer and compressing both the main spring 35 and the return spring 24, the cocking lug on the hammer passing to the rear of the sear which is temporarily tilted down thereby. The rearward thrust of the breech-bolt at once results in extracting the empty shell of the cartridge as illustrated in Fig. 4, where it is seen that one side of the rim of the shell is caught by extractor dog 32 and under pressure of the firing pin 29 the shell is being thrown sidewise through one side of the receiver chamber. Furthermore the next cartridge in the magazine jumps into place for reloading in the well known manner as illustrated in Fig. 5 and on the forward travel of the breech-bolt is thrust home into the barrel.

As soon as the breech-bolt reaches its rear position as above described, it is instantly thrust forward into its normal position by the pressure chiefly of the return spring 24 as can readily be understood by comparing Fig. 5 with Fig. 6. On this forward travel of the breech-bolt the upper end of the sear under pressure of its spring 51 slides up the incline 55 on the bottom of the breech-bolt and engages with the cocking lug 38 on the hammer to cock the gun. When the breech-bolt has completed its forward travel the parts are therefore again in the position illustrated in Fig. 6 and the gun is ready for firing with the same train of operation as just described.

It is obvious that the gun can be cocked manually by drawing the breech-bolt backward into the position of Fig. 5, or until the cocking lug has passed the upper part of the sear, and allowing the breech-bolt to again assume the position of Fig. 6.

When it is desired to remove the magazine for recharging or otherwise backward pressure is exerted on the button 63 of the magazine latch until the tooth 61 of the latter is withdrawn from engagement with the magazine which can then be withdrawn from the receiver by the aid of the lip 64. The magazine can be put back by simply pushing it back into position when the latch tooth 61 under pressure of the spring 57 again locks it in place.

One of the advantageous features of the invention is the ease with which the gun can be taken down and assembled. To take down the gun the grip on the side of the trigger-bar 45 is removed by taking out the screw pin 3, thereby giving access to the trigger-bar which can readily be lifted out. The locking pin 22 is then removed, the guide pin 21 shaken out and withdrawn through the aperture 18, and the main spring guide pin 35 unscrewed and removed. The barrel 7 is then pulled out from the locking block 15 and the forward end of the receiver, and the locking block slid sidewise out of the receiver. This permits the breech-bolt to be carried forward until its guiding lugs 13 13 pass out of the guides 14 14 into the recess 16 so that the forward end of the breech-bolt can thus be carried sidewise through either open side of the receiver chamber and the breech-bolt withdrawn therefrom. The return spring 24 and the hammer can then be readily withdrawn from the breech-bolt, and the main spring removed from the hammer. When the breech-bolt has been removed the sear is exposed and, if desired, can be taken out through the receiver chamber.

Obviously it makes no difference whether the barrel and the breech-bolt are removed before the grip and trigger bar or afterward.

To reassemble the gun the sear, if removed, is readily put back in place. The return spring 24 is inserted into its pocket in the breech-bolt; the hammer with its spring inserted therein is placed in its forward position in its chamber in the breech-bolt, and the breech-bolt is then ready for

insertion into the open side of the receiver chamber. This is done cotemporaneously with inserting the guide pin 21 and the main spring guide pin 36 through their respective apertures in the rear of the receiver so that the same are "threaded" into their respective springs. The main spring guide pin is then screwed home. This permits the breech-bolt with the parts mentioned which it carries to be placed in proper alinement in the receiver chamber, after which it is pulled backward therein and the locking block 15 slid into position. The barrel can then be inserted through the cylindrical openings 8 and 17 in the receiver and locking block respectively, care being taken to insert the barrel in such a position that the locking pin 22 can cooperate therewith as heretofore described in locking it in place. The guide pin 21 is then slid into place care being taken in positioning the same so that the locking pin 22 can also coöperate therewith as heretofore described. The locking pin is next inserted and reassembling of the above parts thus completed. The trigger is pushed back slightly and the trigger-bar put in place, the grip screwed on, and the gun is ready for use.

The foregoing detailed description has been given for clearness of understanding and no undue limitation should be deduced therefrom but the appended claims should be construed as broadly as permissible in view of the prior art.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In an automatic fire arm the combination of a trigger, a trigger-bar, a cam, and a sear, one end of the trigger-bar being pivotally connected with the trigger, the other end of the trigger-bar being provided with a dog for operating the sear, the sear being provided with a lug for engagement therewith, the cam being so positioned in respect to the trigger-bar that the dog on the trigger-bar in operation first engages the lug on the sear beneath the same and then passes over the said lug in returning to its normal position, substantially as described.

2. In an automatic fire arm the combination of a receiver, a trigger pivoted at the bottom thereto, a spring pressed trigger-bar pivotally connected with the upper portion of the trigger, a cam, and a sear, the trigger-bar being provided with a dog for operating the sear, the sear being provided with a lug for engagement therewith, the cam being so positioned in respect to the trigger-bar that the dog on the trigger-bar in operation first engages the lug on the sear beneath the same and then passes over the said lug in returning to its normal position, substantially as described.

3. In an automatic fire arm the combination of a receiver, a trigger pivoted at the bottom thereto, a spring pressed trigger-bar pivotally connected with the upper portion of the trigger and coöperating with the receiver to form a stop for the trigger, a cam and a sear, the trigger-bar being provided with a dog for operating the sear, the sear being provided with a lug for engagement therewith, the cam being so positioned in respect to the trigger-bar that the dog on the trigger-bar in operation first engages the lug on the sear beneath the same and then passes over the said lug in returning to its normal position, substantially as described.

4. In an automatic fire arm the combination of a receiver provided with an open sided chamber at the top thereof, a breech-bolt of unitary construction adapted for reciprocal movement in said chamber, a locking block removably secured in said chamber, and means coöperating therewith for maintaining the breech-bolt in said chamber, substantially as described.

5. In an automatic fire arm the combination of a receiver provided with an open sided chamber at the top thereof, a breech-bolt of unitary construction adapted for reciprocal movement in the said chamber, a locking block removably secured in the said chamber, a guide pin and a locking pin, the locking block, guide pin, and locking pin cooperating to maintain the breech-bolt in said chamber, substantially as described.

6. In an automatic fire arm the combination of a receiver provided with an open sided chamber at the top thereof, a breech-bolt of unitary construction adapted for reciprocal movement in the said chamber, a guide pin and a locking pin, the locking block, guide pin, and locking pin coöperating to removably secure the barrel in the said receiver and the breech-bolt in the said chamber, substantially as described.

7. In an automatic fire arm the combination of a receiver having an open sided chamber at the top thereof, a breech-bolt adapted for reciprocal motion therein and being provided with guiding lugs, guiding channels in the receiver for said lugs, and a locking block, whereby the breech-bolt is maintained in the said chamber, substantially as described.

Signed at Hartford, Connecticut, this 2nd day of August, 1915.

LUCIUS N. DIEHM.

Witnesses:
H. M. BLAKESLEY,
FLORENCE V. JEFSEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."