Dec. 17, 1946. D. M. WILLIAMS 2,412,663

CARTRIDGE-EXTRACTING MECHANISM FOR FIREARMS

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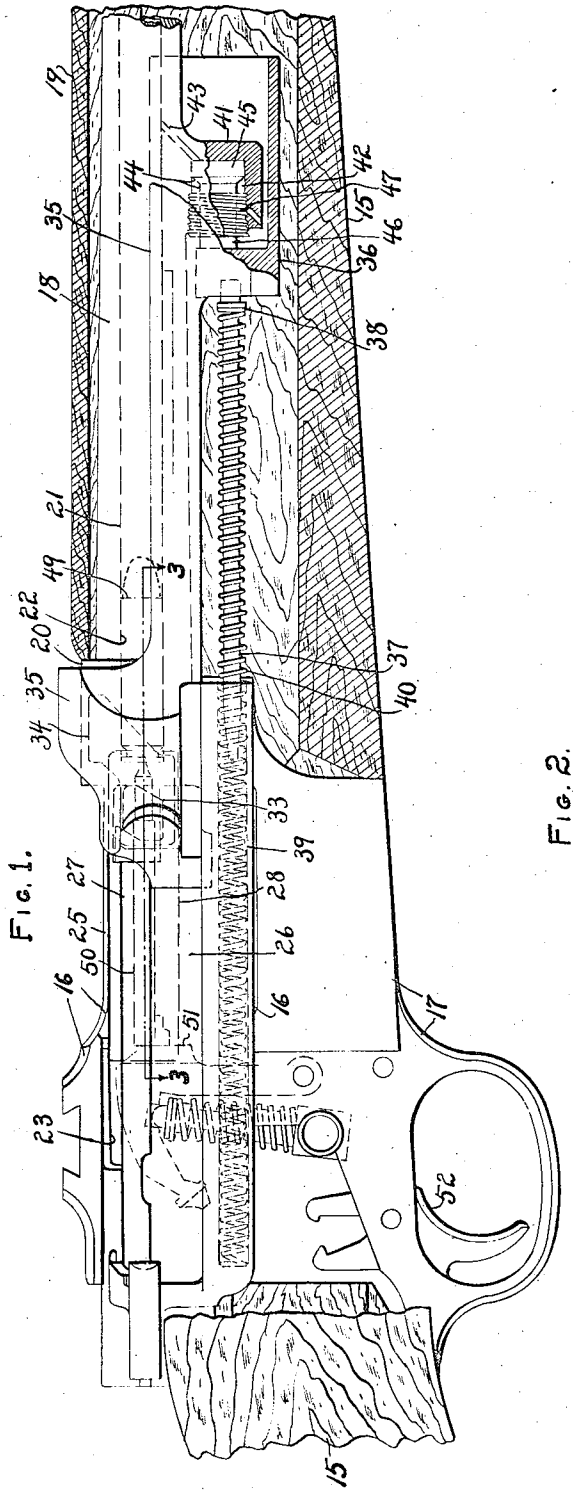


Fig. 1.

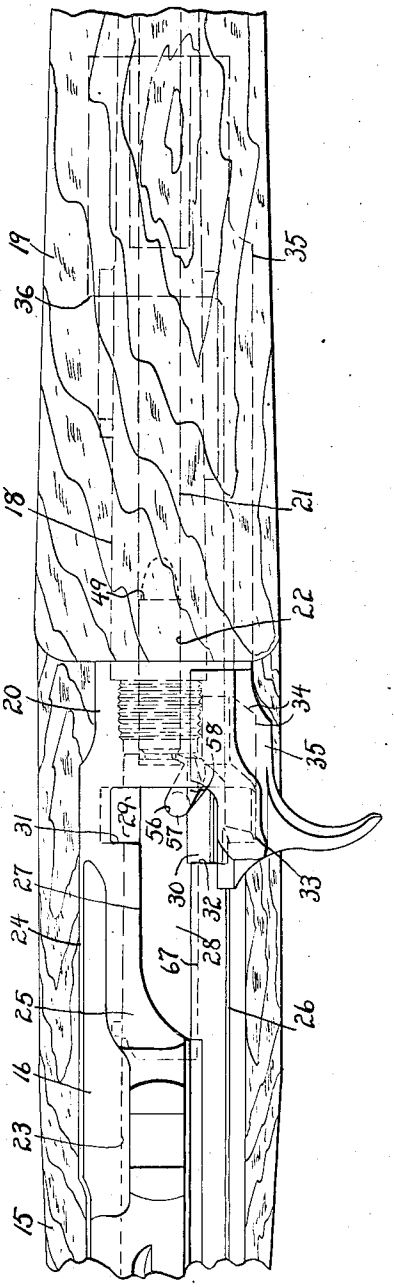


Fig. 2.

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Fig. 3.

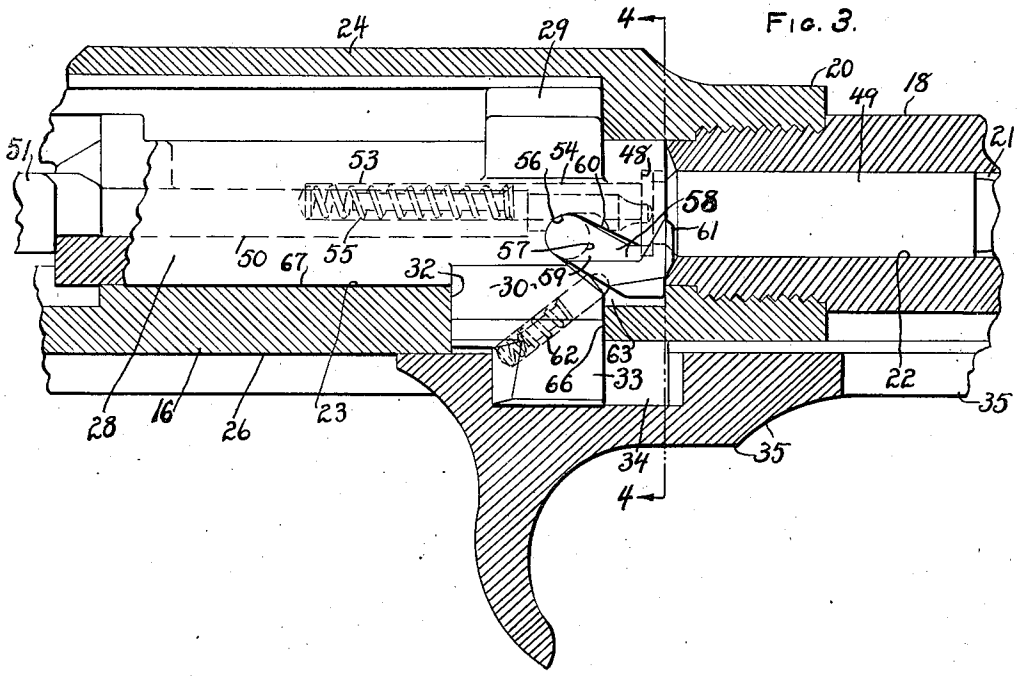
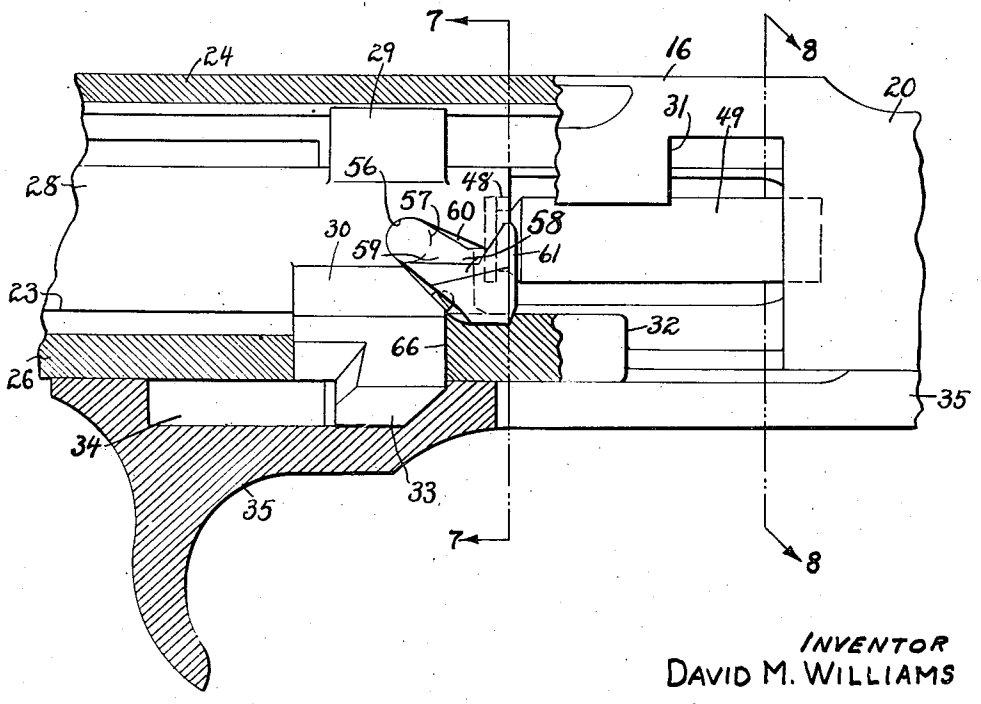


Fig. 6.



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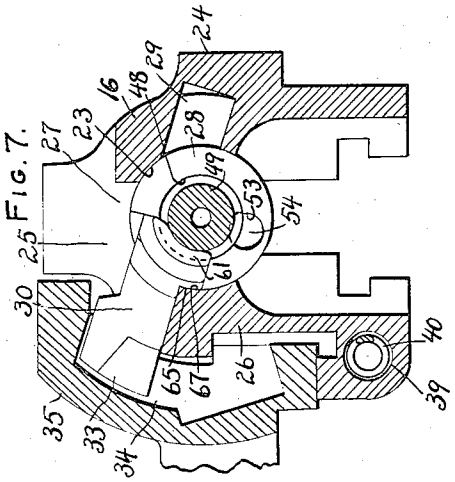


FIG. 7.

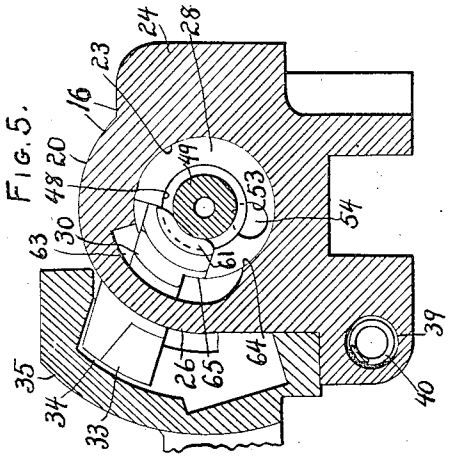


FIG. 5.

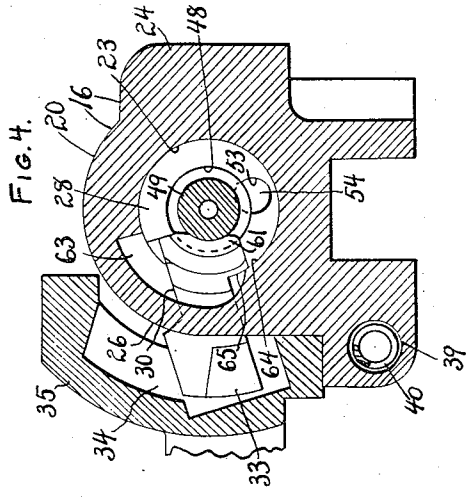


FIG. 4.

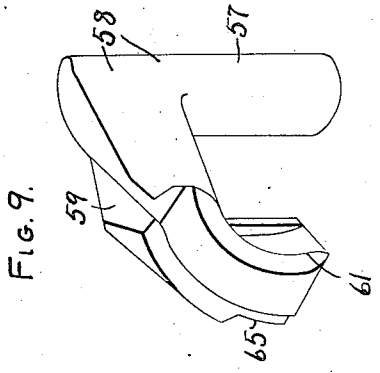


FIG. 9.

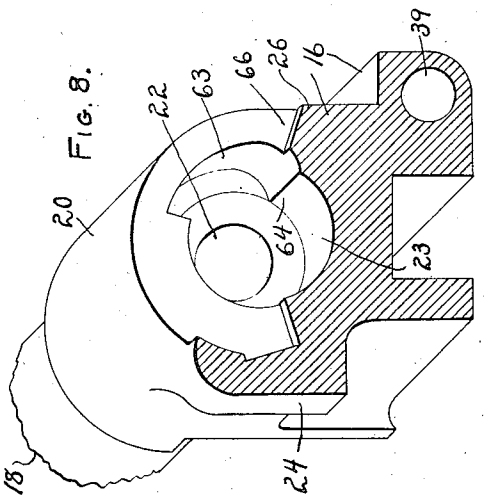


FIG. 8.

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CARTRIDGE-EXTRACTING MECHANISM FOR FIREARMS

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Application November 2, 1944, Serial No. 561,528

3 Claims. (Cl. 42—25)

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The present invention relates to improvements in cartridge-extracting mechanisms for firearms, i. e., mechanisms whereby cartridges are extracted from the cartridge-chamber of a firearm for being ejected prior to the insertion of a fresh cartridge into the said cartridge-chamber.

One of the main objects of the present invention is to provide a superior cartridge-extracting mechanism for firearms which is characterized by a construction and arrangement of parts whereby the cartridge-extractor is positively locked or held in engagement with a cartridge.

Another object of the present invention is to provide a superior mechanism of the character referred to and having a construction and arrangement of parts whereby the cartridge-extractor is positively held in engagement with a cartridge when the breech-bolt is in its breech-closing position, to thereby avoid the inadvertent retirement or displacement of the cartridge-extractor in the event that a faulty cartridge-case should burst and thus permit the emission of hot high-pressure gases.

A further object of the present invention is to provide a superior cartridge-extracting mechanism for firearms which will firmly hold the cartridge-extractor in engagement with the cartridge when the breech-bolt carrying the said cartridge-extractor is retired rearwardly into a position to permit the ejection of the said cartridge, to thereby insure proper ejection of the previously-extracted cartridge.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art and which are not claimed in any separate application.

In the accompanying drawings, in which certain modes of carrying out the present invention are shown for illustrative purposes:

Fig. 1 is a broken view of the central portion of a firearm embodying the present invention and showing the same partly in side elevation and partly in vertical central-longitudinal section, with the parts in the positions which they assume at the instant of the discharge of the firearm;

Fig. 2 is a top or plan view thereof;

Fig. 3 is a broken horizontal sectional view taken on the line 3—3 of Fig. 1, but on a larger scale;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a view corresponding to Fig. 4 but

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showing the breech-bolt turned into its unlocked position;

Fig. 6 is a view similar to Fig. 3 but showing the breech-bolt and associated elements partly retired just prior to the ejection of the cartridge;

Fig. 7 is a transverse sectional view taken on the line 7—7 of Fig. 6;

Fig. 8 is a perspective sectional view taken on the line 8—8 of Fig. 6; and

Fig. 9 is a perspective view of the cartridge-extractor, detached.

The particular firearm herein chosen for purposes of illustrating a preferred embodiment of the present invention is of the self-loading type, and includes a stock 15, a receiver 16, a trigger-plate unit 17, a barrel 18 and a barrel-cover or hand-guard 19. The receiver 16, trigger-plate unit 17 and barrel 18 are preferably formed of high-grade steel, while the stock 15 and barrel-cover 19 are preferably formed of wood or other suitable heat-insulating and shock-absorbing material.

The barrel 18 is rigidly attached to the band-like forward-end 20 of the receiver 16 and has the usual axial bore 21 extending therethrough and enlarged at its rear-end to provide a cartridge-chamber 22 in the usual manner of firearm-barrels.

The upper-portion of the receiver 16 is formed in its interior with a longitudinally-extending bolt-receiving passage 23 laterally bounded by a left side-wall 24, a top-wall 25 and a right side-wall 26. A portion of the right side-wall 26 and an adjacent portion of the top-wall 25 are cut away just to the rear of the band-like forward-end 20 of the receiver, to provide an ejection-opening 27 through which empty cartridge-cases may be ejected in a manner as will hereinafter appear.

Movably mounted in the bolt-receiving passage 23, with capacity for both longitudinal reciprocation and lateral oscillating movement, is a breech-bolt 28 which is of substantially-cylindrical form. Adjacent its forward-end, the breech-bolt 28 is formed with two laterally-extending locking-lugs 29 and 30. The said locking-lugs 29 and 30 are adapted to have their respective rear-faces engaged with forwardly-locking-abutments 31 and 32 respectively. The said locking-abutments 31 and 32 are respectively formed in the left side-wall 24 and the right side-wall 26 of the receiver 16.

The right-locking-lug 30 before referred to, of the breech-bolt 28, is extended substantially

radially outwardly to provide an operating-lug 33 which extends into a cam-recess 34 formed in the inner-face of the rear-portion of an action-slide 35. The said action-slide is mounted for longitudinal reciprocation along the right side of the firearm-structure. The operating-lug 33 of the breech-bolt 28 and the cam-recess 34 in the action-slide 35 generally correspond to the similar parts in the well-known Garand military rifle and function in a manner as will more fully hereinafter appear, to unlock and retire the breech-bolt 28 and to advance and lock the same.

In the particular firearm illustrated, the forward-end of the action-slide 35 is formed with a crosshead 36 positioned for reciprocation mainly beneath the barrel 18. Thrusting forwardly against the rear-portion of the crosshead 36 of the action-slide 35 is the forward-end of a breech-closing plunger 37 which is formed adjacent its forward-end with a spring-seat 38. The rear-portion of the breech-closing plunger 37 is adapted to reciprocate in a longitudinal pocket 39 formed in and opening forwardly through the front-end of the right side-wall 26 of the receiver 16. Encircling the rear-portion of the breech-closing plunger 37 and thrusting forwardly against the spring-seat 38 thereof, is a helical breech-closing spring 40 having its rear-portion extended into the pocket 39 which also receives the rear-portion of the said plunger 37.

As thus constructed and arranged, the breech-closing spring 40 (acting through the breech-closing plunger 37) exerts a constant-but-yielding effort to hold the action-slide 35 at the limit of its forward movement and hence also serves to normally hold the breech-bolt 28 in its forward or breech-closing position.

To effect the automatic lateral turning movement and rearward movement of the breech-bolt 28, the barrel 18 is formed at a point a short distance forwardly of the front-end of the receiver 16 with an integral downwardly-extending cylinder-lug 41. The said cylinder-lug is formed with a rearwardly-opening piston-chamber 42 extending in substantial parallelism with the axis of the barrel 18. In its forward-portion, the cylinder-lug 41 is formed with an inclined gas-passage 43 (Fig. 1) leading forwardly and upwardly from the front-end of the said piston-chamber 42 into communication with the bore 21 of the barrel 18.

Mounted for reciprocation in the piston-chamber 42 of the cylinder-lug 41 is a piston 44 provided at its forward-end with a head 45 and at its rear-end with a stem 46 integral with and rearwardly projecting from the said head 45. The stem 46 just referred to extends through an externally-threaded ring-like stop-member 47 threaded into the internally-threaded rear-end of the piston-chamber 42.

The rear-end of the stem 46 of the piston 44 is normally engaged by a forwardly-facing portion of the cross-head 36 of the action-slide 35, while the forward-face of the head 45 of the said piston is normally engaged with the rear-face of the front-wall of the said piston-chamber 42, as is illustrated in Fig. 1.

Returning now to the breech-bolt 28, it will be noted by reference to Figs. 3, 6 and 7 in particular, that the said breech-bolt is formed in its forward-face with a forwardly-opening central recess 48 adapted to successively receive the head-ends of cartridge-casings such, for instance, as the cartridge-casing 49 shown in the drawings.

Extending axially through the breech-bolt 28 is a firing-plunger 50 which is adapted to be driven forwardly in any suitable manner to discharge the firearm such, for instance, as by the impact of a pivotal hammer 51. The said hammer is mounted in the trigger-plate unit 17 before referred to, and may be controlled in any suitable manner such, for instance, as by a trigger 52 also forming a feature of the trigger-plate unit 17.

Eccentrically with respect to but parallel with the firing-plunger 50, the breech-bolt 28 is formed with a forwardly-opening pocket 53 in which reciprocates a plunger-like cartridge-ejector 54 which is pressed forwardly by a helical ejector-spring 55 located in the rear-portion of the pocket 53. The forward-end of the cartridge-ejector 54 is adapted to extend into the recess 48 in the forward-end of the breech-bolt 28 adjacent the periphery of the said recess for purposes of ejecting a cartridge in a manner as will more fully hereinafter appear.

Adjacent its forward-end, the breech-bolt 28 is formed with a transverse substantially-diametric passage 56 in which is pivotally mounted the stem 57 of a cartridge-extractor generally designated by the reference character 58. The said cartridge-extractor also includes a head-portion 59 which is accommodated with freedom for swinging movement in a diagonal recess 60 formed in the adjacent portion of the breech-bolt 28. The end of the head-portion 59 of the cartridge-extractor 58 is formed with an extractor-hook 61 which is curved in a direction circumferentially of the breech-bolt 28 and extends laterally part way into the recess 48 in the front-end of the latter. The said extractor-hook 61 is adapted to hook over the head of and into the cannelure of a cartridge-casing, such as the cartridge-casing 49, for the purpose of drawing such cartridge-casing rearwardly out of the cartridge-chamber 22 in the barrel 18. The cartridge-extractor 58 is urged by a helical spring 62 to turn about its stem 57 in a direction required to engage its extractor-hook 61 successively with the heads of cartridge-casings.

It will be noted by reference to Fig. 8 in particular, that the bolt-receiving passage 23 in the receiver 16 is laterally enlarged at its forward-end immediately to the rear of the rear-end of the barrel 18, to form a clearance-recess 63 in which the forward-end of the cartridge-extractor 58 may fit with freedom for outward movement, to enable it to slide over the head of a cartridge-casing when the breech-bolt is in its unlocked position, as illustrated in Fig. 5. The portion 64 of the bolt-receiving passage 23 immediately below the lower boundary of the clearance-recess 63, constitutes an extractor-locking abutment with which a portion 65 (retaining-abutment) of the outer face of the forward-portion of the cartridge-extractor 58 is adapted to engage when the breech-bolt is locked in its breech-closing position, as shown in Figs. 1 to 4 inclusive.

The right side-wall 26 of the receiver 16 is formed with an upwardly-opening clearance-notch 66 accommodating the locking-lug 30 and the rear wall of which constitutes the locking-abutment 32 before referred to. Rearwardly of the locking-abutment 32 and the clearance-notch 66, the inner face of the right side-wall 26 is shaped to provide a longitudinal extractor-locking abutment 67. The said extractor-locking abutment 67 is so positioned as to be engaged by the retaining-abutment 65 of the cartridge-extractor 58 when the breech-bolt 28 is retired rearwardly,

as shown in Figs. 6 and 7, for purposes of preventing the said extractor from retiring out of engagement with the head of the cartridge-casing as the same is being ejected, in a manner as will more fully hereinafter appear.

Operation

When the breech-bolt is locked in its breech-closing position as shown in Figs. 1, 2, 3 and 4, the cartridge-extractor 58 will also be positively locked in position wherein its extractor-hook 61 is located in the cannelure of the cartridge, by the engagement of the retaining-abutment 65 with the extractor-locking abutment 64 at the lower-portion of the clearance-recess 63 in the forward-end 20 of the receiver 16.

Thus, when the firearm is discharged, should a defective cartridge be in place in the cartridge-chamber 22 and should such cartridge burst adjacent its head-portion, the cartridge-extractor 58 will be firmly backed-up and thus guarded against breakage or displacement.

When the firearm is discharged, gas-pressure from the bore 21 of the barrel 18 will pass through the gas-passage 43, with the effect of driving the piston 44 rearwardly until the rear-face of its head 45 strikes the forward-face of the ring-like stop-member 47, whereupon the rearward movement of the said piston will cease. This rearward movement of the piston as just described, while but of short length, will drive the action-slide 35 rearwardly against the tension of the breech-closing spring 40 until the said action-slide reaches the limit of its rearward travel.

As soon as the action-slide starts rearwardly under the impulse of the piston 44, as above described, the contours of the cam-recess 34 of the said action-slide will first cause the breech-bolt 28 to turn slightly in a clockwise direction (when viewed from the front), with the effect of disengaging the locking-lugs 29 and 30 of the said breech-bolt from the complemental locking-abutments 31 and 32 of the receiver 16. The turning movement of the breech-bolt as just described, will effect its rotation from the position in which it is shown in Figs. 1 to 4 inclusive into the position in which it is shown in Figs. 5 and 6, so that both the cartridge-ejector 54 and the cartridge-extractor 58 will be similarly turned with the said breech-bolt.

As the breech-bolt is turned into its unlocked position as above described, the retaining-abutment 65 of the cartridge-extractor 58 will be moved upwardly out of engagement with the extractor-locking abutment 64 of the receiver 16 and into the adjacent clearance-recess 63.

Following the unlocking of the breech-bolt as above described, the continued rearward movement of the action-slide 35 under the impulse imparted to it by the piston 44 as before described, will carry the said breech-bolt 28 rearwardly with great rapidity. Now since the cartridge-extractor 58 moves with the said breech-bolt, the cartridge-casing 49 or its equivalent, will be drawn rearwardly out of the cartridge-chamber 22.

After the breech-bolt 28 moves rearwardly sufficiently to cause the cartridge-extractor 58 to pass rearwardly beyond the clearance-notch 66, the said cartridge-extractor will be again locked in position to positively hold its extractor-hook 61 in the cannelure of the cartridge-casing 49 as shown in Figs. 6 and 7. This locking will be caused by the engagement of the retaining-abutment 65 of the said cartridge-extractor with the longitudinal extractor-locking abutment 67 on the inner-face of the right side-wall 26 of the receiver 16.

As soon as the forward-end of the cartridge-casing 49 clears the rear-end of the barrel 18, the springpressed cartridge-ejector 54 will be free to thrust forwardly upon the lower-portion of the rear-face of the said cartridge-casing and thus swing the forward-end of the latter upwardly about the extractor-hook 61 as a center. The said cartridge-casing will thus be flipped upwardly and ejected through the ejection-opening 27.

The described swinging movement of the cartridge-casing 49 will impose an additional strain on the extractor-hook 61, with a tendency to retire the same against the tension of the extractor-spring 62. However, due to the fact that at this time the retaining-abutment 65 of the cartridge-extractor 58 is in engagement with the longitudinal extractor-locking abutment 67 on the right side-wall 26 of the receiver 16, the said extractor-hook will remain firmly in place, despite the added strain referred to. In this manner, uniform and effective ejection of cartridge-casings is assured.

After the ejection of the cartridge-casing 49 as above described, the breech-bolt will continue rearwardly to the limit of its movement in that direction, following which the breech-closing spring 40 will assert itself and again restore the parts to the positions in which they are shown in Figs. 1 to 4 inclusive.

As the breech-bolt 28 moves forwardly, it will force a fresh cartridge into the cartridge-chamber 22. Such fresh cartridge may be supplied by any suitable magazine.

When the breech-bolt 28, in its forward travel, reaches its breech-closing position and just prior to being turned in a counterclockwise direction to be locked, the forward-portion of the cartridge-extractor 58 will reenter the clearance-recess 63 in the forward-end of the bolt-receiving passage 23. Under these conditions, the cartridge-extractor will be free to pivot against the tension of the spring 62, to cause the extractor-hook 61 to ride over the head of the cartridge and enter the cannelure thereof.

The continued forward movement of the action-slide 35 under the urge of the breech-closing spring 40, will now turn the breech-bolt 28 in a counterclockwise direction to reengage the locking-lugs 29 and 30 thereof respectively with the locking-abutments 31 and 32 of the receiver 16. The described turning movement of the breech-bolt 28 will reengage the outwardly-facing retaining-abutment 65 of the cartridge-extractor 58 with the extractor-locking abutment 64 within the forward-end of the bolt-receiving passage 23 of the receiver 16.

Thus, the firearm will again be in condition for discharge and a repetition of the cycle above described.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A firearm-structure, including in combination: a breech-bolt constructed and arranged to both longitudinally reciprocate and transversely oscillate in the hereinafter-mentioned receiver;

a cartridge-extractor pivoted to the said breech-bolt for bodily movement therewith and pivotal movement relative thereto and provided with an outwardly-facing retaining-abutment; and a receiver having a bolt-receiving passage therein in which the said breech-bolt is movably mounted, the said receiver being formed within the forward-portion of its said bolt-receiving passage with an inwardly-facing extractor-locking abutment and with a clearance-recess circumferentially adjacent the said extractor-locking abutment, the said extractor-locking abutment being constructed and arranged in the said receiver to be engaged by the retaining-abutment of the said cartridge-extractor when the said breech-bolt is turned transversely into one position to thereby positively lock the said cartridge-extractor in engagement with a cartridge-casing, and the said clearance-recess being positioned to register with the retaining-abutment of the said cartridge-extractor when the said breech-bolt is turned transversely out of the position just referred to, to thereby free the said cartridge-extractor for pivotal movement relative to the said breech-bolt.

2. A firearm-structure, including in combination: a breech-bolt constructed and arranged to both longitudinally reciprocate and transversely oscillate in the hereinafter-mentioned receiver; a cartridge-extractor pivoted to the said breech-bolt for bodily movement therewith and pivotal movement relative thereto and provided with an outwardly-facing retaining-abutment; and a receiver having a bolt-receiving passage therein in which the said breech-bolt is movably mounted, the said receiver being formed within the forward-portion of its said bolt-receiving passage with a first inwardly-facing extractor-locking abutment and with a clearance-recess circumferentially adjacent the said first extractor-locking abutment, the said first extractor-locking abutment being constructed and arranged in the said receiver to be engaged by the retaining-abutment of the said cartridge-extractor when the said breech-bolt is turned transversely into one position to thereby positively lock the said cartridge-extractor in engagement with a cartridge-casing, and the said clearance-recess being positioned to register with the retaining-abutment of the said cartridge-extractor when the said breech-bolt is turned transversely out of the position just referred to, to thereby free the said cartridge-extractor for pivotal movement relative to the said breech-bolt; the said receiver also being formed in its said bolt-receiving passage with a second inwardly-facing extractor-locking abutment spaced rearwardly with respect to the aforesaid clearance-recess and constructed and arranged to be engaged by the retaining-abutment of the said cartridge-extractor to positively lock the latter with a cartridge-casing when the said breech-bolt is moved rearwardly sufficiently to cause the said cartridge-extractor to fully extract a cartridge-casing.

3. A firearm-structure, including in combination: a breech-bolt constructed and arranged to both longitudinally reciprocate and transversely oscillate in the hereinafter-mentioned receiver; a cartridge-extractor carried by the said breech-bolt for bodily movement therewith in a direction transverse of the firearm-structure and movable relative to the said breech-bolt to permit its riding over the head of a cartridge, the said cartridge-extractor being provided with an outwardly-facing retaining-abutment; and a receiver having a bolt-receiving passage therein in which the said breech-bolt is movably mounted, the said receiver being formed within the forward-portion of its said bolt-receiving passage with an inwardly-facing extractor-locking abutment and with a clearance-recess circumferentially adjacent the said extractor-locking abutment, the said extractor-locking abument being constructed and arranged in the said receiver to be engaged by the retaining-abutment of the said cartridge-extractor when the said breech-bolt is turned transversely into one position to thereby positively lock the said cartridge-extractor in engagement with a cartridge-casing, and the said clearance-recess being positioned to register with the retaining-abutment of the said cartridge-extractor when the said breech-bolt is turned transversely out of the position just referred to, to hereby free the said cartridge-extractor for movement relative to the said breech-bolt.

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