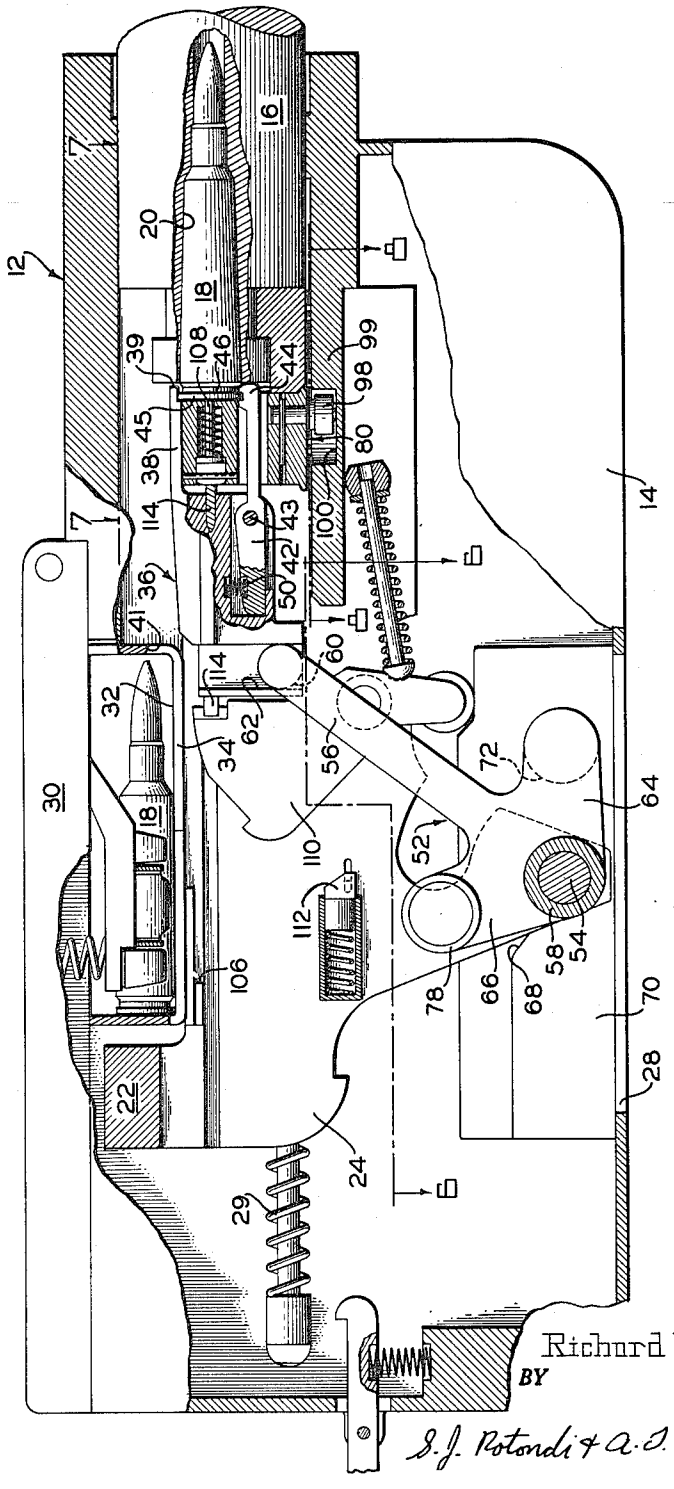
Sept. 20, 1960 R. H. COLBY 2,953,066

FIREARM BREECH MECHANISM WITH A LATERALLY OPERATED BREECH BLOCK

Filed Oct. 6, 1959 4 Sheets-Sheet 1

Fig. 1



INVENTOR.
Richard H. Colby
BY
S. J. Rotondi & A. J. Dupont

Sept. 20, 1960 R. H. COLBY 2,953,066

FIREARM BREECH MECHANISM WITH A LATERALLY OPERATED BREECH BLOCK

Filed Oct. 6, 1959 4 Sheets-Sheet 2

Fig. 2.

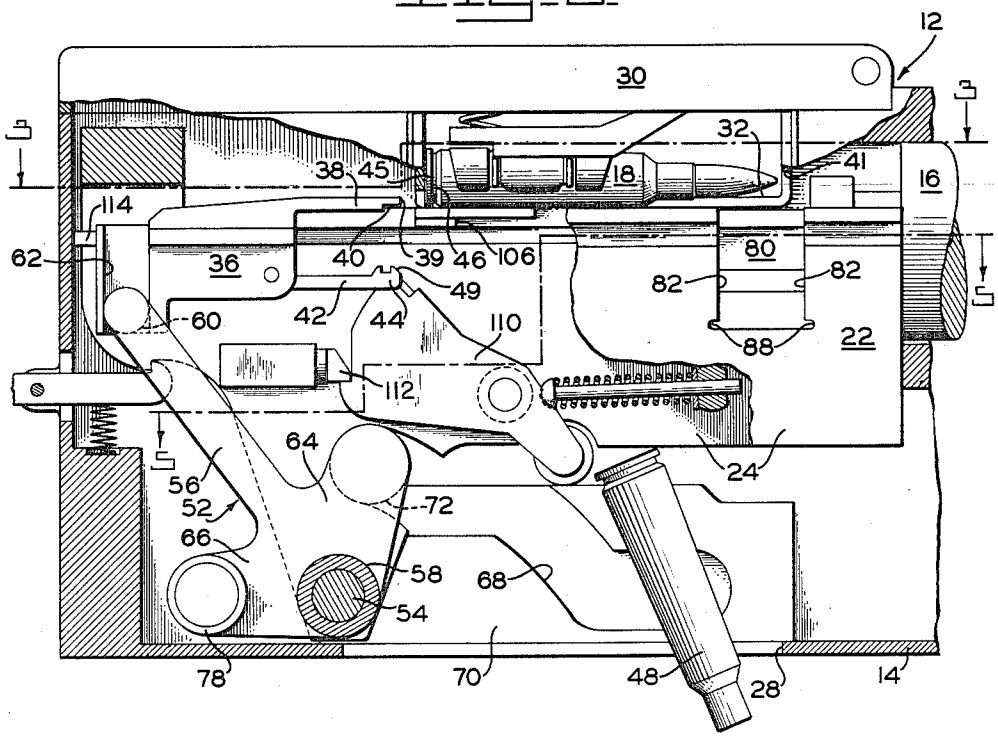
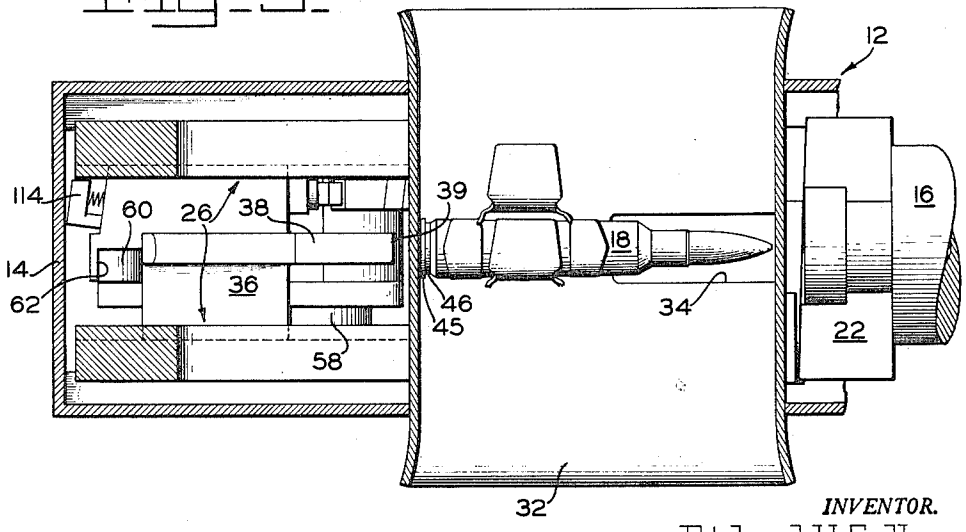


Fig. 3.



INVENTOR.

Richard H. Colby

BY

S. J. Rotondi & A. J. Dupont

Sept. 20, 1960 R. H. COLBY 2,953,066

FIREARM BREECH MECHANISM WITH A LATERALLY OPERATED BREECH BLOCK

Filed Oct. 6, 1959 4 Sheets-Sheet 3

Fig. 4.

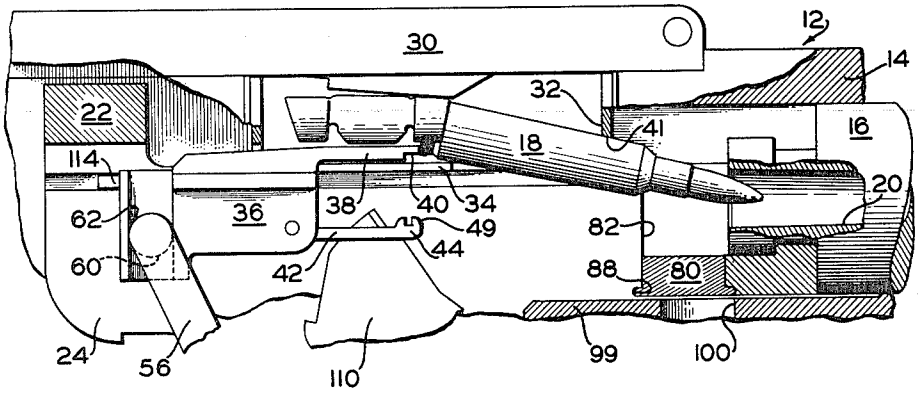


Fig. 5.

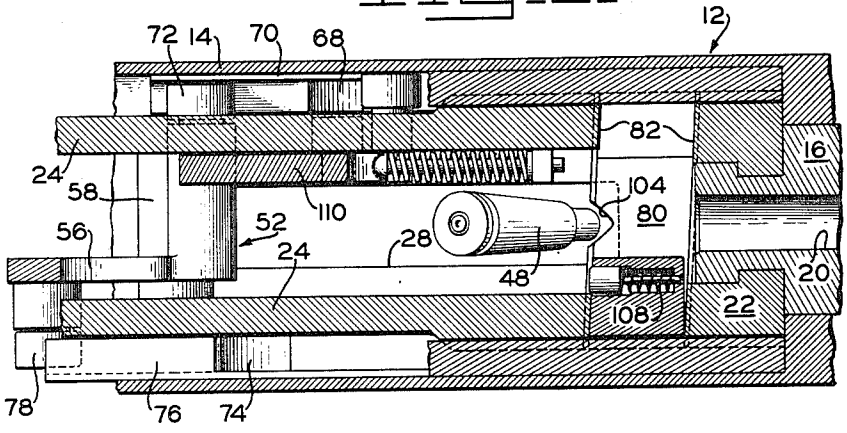
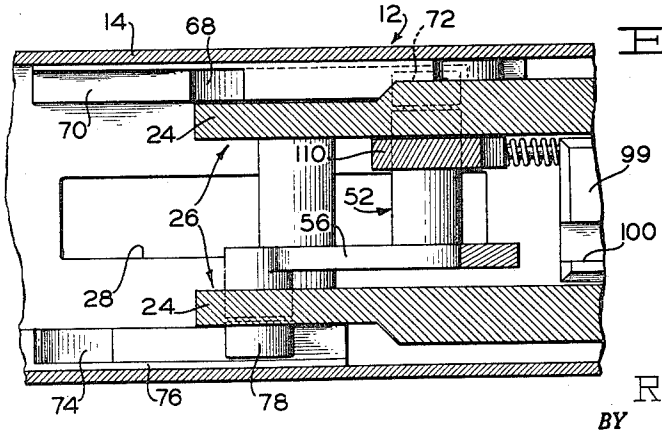


Fig. 6.



INVENTOR.
Richard H. Colby

BY
S. J. Ratondi & A. T. Dupont

Sept. 20, 1960 R. H. COLBY 2,953,066

FIREARM BREECH MECHANISM WITH A LATERALLY OPERATED BREECH BLOCK

Filed Oct. 6, 1959 4 Sheets-Sheet 4

Fig. 7

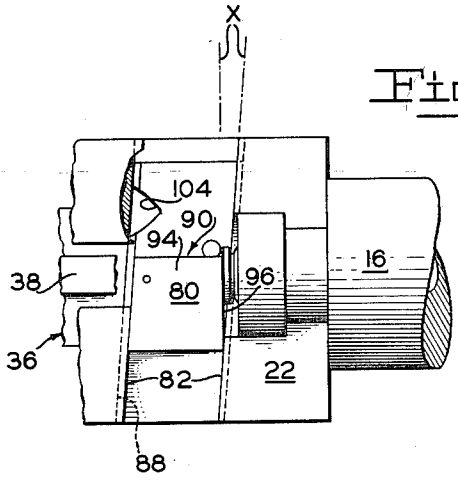


Fig. 8

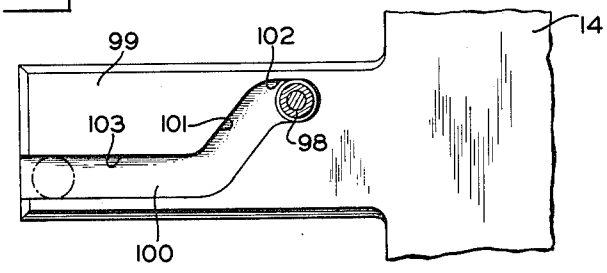
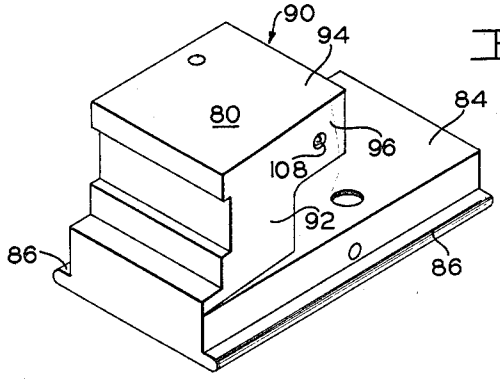


Fig. 9



INVENTOR.
Richard H. Colby
BY
S. J. Rotondi & A. T. Dupont

United States Patent Office

2,953,066

Patented Sept. 20, 1960

2,953,066

FIREARM BREECH MECHANISM WITH A LATERALLY OPERATED BREECH BLOCK

Richard H. Colby, South Hadley, Mass., assignor to the United States of America as represented by the Secretary of the Army

Filed Oct. 6, 1959, Ser. No. 844,832

3 Claims. (Cl. 89—186)

(Granted under Title 35, U.S. Code (1952), sec. 266)

This invention relates to breech mechanisms for recoil operated firearms and is a continuation-in-part of application, Serial No. 639,834, filed February 12, 1957, which in turn is a continuation-in-part of application, Serial No. 429,138, filed May 11, 1954 now abandoned.

It is the principal object of this invention to provide an automatic firearm in which the breech mechanism is arranged for minimum longitudinal displacement so that the inclosing receiver may be short in length and suited for mounting in a small space as required when used in a tank.

It is another object of this invention to provide such a breech mechanism wherein the functions of a conventional bolt are divided between a breech closure member, which is actuated laterally to reduce the mass of the longitudinally recoiling members and the space required therefor in the receiver, and a longitudinally reciprocating carrier member for loading and unloading of the firearm which carrier member need have only sufficient mass to accomplish such functions.

It is a further object of this invention to provide such a breech mechanism wherein the laterally operated breech closure member travels in a path slightly angular to a plane normal to the longitudinal axis of the barrel so as to clear those cartridges in the barrel chamber having maximum length during the initiation of the movement of the breech closure member to the breech closed position and then accommodate the maximum length cartridges to the barrel chamber by crush-up by the forward component of such angular movement.

It is still another object of this invention to provide for such breech mechanism in which the loading and unloading of the cartridges is accomplished by vertically spaced rammer and extractor members, a breech closure member which is insertable laterally therebetween for supporting the chambered cartridge for discharge.

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 longitudinal view of the firearm shown partially cross sectioned to show the relationship of the members when the firearm is in battery;

Fig. 2 is a view similar to Fig. 1 but showing the relationship of the members when the barrel is in the recoil position;

Fig. 3 is a view taken along line 3—3 of Fig. 2;

Fig. 4 is a side view showing a cartridge partially rammed into the barrel chamber;

Fig. 5 is a view taken along line 5—5 of Fig. 2;

Fig. 6 is a view taken along line 6—6 of Fig. 1;

Fig. 7 is a view taken along line 7—7 of Fig. 1;

Fig. 8 is a view taken along line 8—8 of Fig. 1; and

Fig. 9 is an enlarged perspective view of the breechblock.

Shown in the figures is a firearm 12 including a rectangular receiver 14 with a barrel 16 mounted to the front end thereof for sliding longitudinal movement in recoil and counter-recoil strokes responsive to the discharge of a cartridge 18 in chamber 20 of the barrel. Disengageably secured to the breech end of barrel 16 is a barrel extension 22 which is bifurcated vertically to form a pair of side plates 24 with a vertical channel 26 therebetween which provides communication between chamber 20 and an ejection port 28 in the bottom of receiver 14. A pair of springs 29 are disposed between barrel extension 22 and the rear end of receiver 14 to bias the barrel extension and barrel 16 forwardly to a battery position. A feeding mechanism 30 having a laterally arranged tray 32 is mounted to the top of receiver 14 for successively indexing a linked supply of the cartridges 18 in a throat 34 leading to the inside of the receiver from the tray.

The cartridges 18 are successively moved through throat 34 and transferred to chamber 20 by means of a carrier 36 which is mounted between the side plates 24 for longitudinal reciprocation in axial alignment with barrel 16 between a forward and a rearward position. Engagement is made between carrier 36 and the cartridge 18 indexed in throat 34 by means of a rammer 38 which extends integrally forward from the carrier and which is provided with a front end 39 which is disposed for contact with the base of the indexed cartridge during movement of the carrier to the forward position, and which, as the engaged cartridge is chambered, slips over rim 45 of the base for contact of the underside of the rammer, noted at 40, therewith. A guide portion 41 at the front end of throat 34 contacts cartridge 18 while being rammed forwardly by rammer 38 to direct the cartridge angularly downward into chamber 20.

An extractor 42 is mounted to the underside of carrier 36 on a laterally disposed pin 43 for pivotal movement in the vertical plane occupied by rammer 38 and extends forwardly substantially parallel to the rammer for jointly engaging rim 45 of the chambered cartridge 18 with the rammer. A hook 44 at the front end of extractor 42 releasably engages an extractor groove 46 in cartridge 18 for removing fired case 48 thereof from chamber 20 during movement of carrier 36 to the rearward position thereof. A spring 50 is disposed between extractor 42 and carrier 36 rearwardly of pin 43 for biasing hook 44 into extractor groove 46 and pressing rim 45 of the engaged cartridge 18 into frictional contact with underside 40 of rammer 38 to oppose displacement of fired case 48 by the extractor and maintain the fired case in a longitudinal position while being carried rearwardly from chamber 20 by carrier 36. A ramp portion 49 is provided at the end of extractor 42 so that hook 44 may ride over rim 45 to engage extractor groove 46 during continued forward movement of carrier 36 after cartridge 18 is chambered in barrel 16.

Carrier 36 is actuated between the forward and rearward positions thereof responsive to reciprocation of barrel extension 22 by means of an accelerator 52 which is pivotally mounted in channel 26 on a pin 54 disposed laterally between the side plates 24. Pin 54 is mounted to the side plates 24 adjacent the bottoms of each thereof and spaced equidistantly between the positions of the rear end of carrier 36 when in the forward and rearward positions thereof. Accelerator 52 includes a beam 56 which extends upwardly from a hub portion 58 adjacent the right one of the side plates 24. A roller 60 is rotatingly mounted to the left side of the upper end of beam 56 for sliding engagement with a vertical groove 62 in the rear portion of the right side of carrier 36 for converting pivotal movement of accelerator 52 to translational movement of the carrier.

Also extending from hub portion 58 are an extraction arm 64 and a ramming arm 66. Accelerator is pivoted to move carrier 36 for the initial half of an extraction stroke and the final half of a ramming stroke through the cooperation of extraction arm 64 with a cam path 68 formed in a vertically disposed cam plates 70 fixed to the left side of receiver 14. Extraction arm 64 is disposed on the left side of beam 56 and slidingly engages cam path 68 by means of a rotary follower 72 which is mounted to the left side of the free end of such extraction arm. Cam path 68 and extraction arm 64 are so related that extraction starts midway of the recoil movement of barrel 16 and ramming finishes at such mid point. The final half of the extraction stroke of carrier 36 and the initial half of the ramming stroke thereof is accomplished through the cooperation of ramming arm 66 with a cam path 74 formed in a vertical cam plate 76 mounted to the right side of receiver 14. Ramming arm 66 is disposed on the right side of beam 56 and slidingly engages cam path 74 by means of a rotary follower 78 mounted to the right side of the free end of such ramming arm. The distance between pin 54 and roller 60 is greater than that between such pin and the rotary followers 72 and 78 and the ratio of such distances is such that carrier 36 is movable between the forward and rearward positions thereof during one-half the distance of the longitudinal displacement of barrel 16.

After cartridge 18 is transferred into chamber 20 by rammer 38, the base of the cartridge is supported for discharge thereof by a breech block 80 which is slidingly disposed in barrel extension 22 for substantially lateral movement therein by means of a passage 82 extending through the side plates 24. Breech block 80, as best shown in Fig. 9, includes a rectangular base 84 having flanges 86 which extend longitudinally from the front and rear ends of the breech block and which are slidingly received by mating recesses 88 formed in passage 82 to control the sliding movement of the breech block.

Extending integrally upward from the right side of base 84 is an anvil 90 which includes a vertical support 92 and a block 94 which extends laterally towards the left from the top side thereof for an inverted L configuration. When breech block 80 is in the breech open position, block 94 is arranged so as to be free of cartridge 18 when rammed into chamber 20 and, when the breech block is actuated to the breech closed position, the block is insertable between rammer 38 and extractor 42 to provide full support for the chambered cartridge when the breech block reaches the breech closed position. The rear end of support 92 contacts the rear side of passage 82 in the right one of the side plates 24 when breech member 80 is in the breech closed position to support anvil 90.

Because of the variations in the lengths of the cartridges 18 resulting from the tolerances permitted in the manufacture thereof, chamber 20 is formed to the mean dimensions of the cartridges. Consequently, the bases of those cartridges 18, which are above the mean in length, project from the breech end of barrel 16. Therefore, to prevent interference between breech block 80 and the bases of the cartridges 18 which are about the average in length, passage 82 is arranged so that block 94 is spaced sufficiently rearwardly of the breech end of barrel 16 so that anvil 90 clears the bases of those cartridges which are of the maximum dimensions when the breech block moves from the breech open position. Passage 82 is also arranged angular to a plane normal to the longitudinal axis of barrel 16 so as to form an angle noted at "X" for progressively moving anvil 90 forwardly towards the breech end of barrel 16 when breech block 80 advances laterally to the breech closed position to press those cartridges which are above the mean in length by crush-up into chamber 20. The front face of block 94, noted at 96, is arranged angular to the front end of base 84, as noted in Figs. 7 and 9, so as to be disposed normal to the axis of barrel 16 during the lateral displacement of breech block 80. Whereby face 96 is disposed parallel to the base of the chambered cartridge 18 and is moved progressively forward to a predetermined headspace relationship in respect to chamber 20 when breech block 80 is moved to the breech closed position. Breech block 80 is actuated between the breech open and breech closed positions through the cooperation of a roller 98 depending from the bottom of base 84 with a cam groove 100 provided in a shelf 99 extending rearwardly and integrally from the front end of receiver 14. Cam groove 100 includes a curved portion 101 which receives lug 98 during the first half of the recoil stroke of barrel 16, and, consequently, the final half of the counterrecoil stroke thereof and which is formed so that breech block 80 is actuated to the breech closed position during the final half of the counterrecoil movement of barrel 16, after carrier 36 has moved a cartridge 18 into chamber 20, and is moved to the breech open position during the first half of the recoil movement of the barrel so as to be clear of the chamber before fired case 48 is removed by extractor 42. A linear portion 103 extends rearwardly from curved portion 101 to receive roller 98 during the rearward half of the recoil displacement of barrel 16 and thereby hold breech block 80 in the breech open position clear of chamber 20 during the extraction of fired case 48 by extractor 42 and the ramming of cartridge 18 by rammer 38. Cam groove 100 also includes a dwell portion 102 which extends forwardly of curved portion 101 whereby a delay is introduced after the discharge of the chambered cartridge 18 before breech block 80 is actuated by curved portion 101 to uncover the base of the fired case. The length of dwell portion 102 is arranged to provide a delay so timed that sufficient gas pressure remains in the bore of barrel 16 to assist in the extraction of fired case 48 when breech block 80 reaches the breech open position. Provided in the rear side of breech block 80 is a vertically disposed notch 104 which provides clearance for the neck of fired case 48 during ejection thereof. Such ejection is provided by an ejector 106 which engages the upper portion of the base of the extracted fired case 48 during movement of carrier 36 to the rearward position thereof to pivot rim 45 around hook 44 and propel the fired case downwardly through channel 26 and out ejection port 28.

The chambered cartridge 18 is discharged by a firing pin 108 which extends through block 94 for contact with the primer of the cartridge. Firing pin 108 is actuated to strike the cartridge primer by a hammer 110 which is pivotally mounted in channel 26 adjacent the left one of the side plates 24 so as to be clear of the ejected fired case 48 during movement to ejection port 28. Hammer 110 is pivoted to a cock position responsive to recoil movement of barrel extension 22 and is releasably held in the cock position by a sear 112. Contact between hammer 110 and firing pin 108 is made by a firing pin extension 114 which is mounted angularly through carrier 36.

Thus, when firearm 12 is ready to be fired, carrier 36 is in the forward position thereof with rammer 38 and extractor 42 jointly engaging a cartridge 18 housed in chamber 20, breech block 80 is in the breech closed position with block 94 thereof inserted between the rammer and extractor for support of the cartridge when discharged and for alignment of firing pin 108 with the primer of the chambered cartridge, and hammer 110 is releasably held in cock position by sear 112.

To fire firearm 12, sear 112 is actuated by conventional trigger means, not shown, to release hammer 110 for discharge of the chambered cartridge 18. Barrel 16 is energized for recoil displacement by the forces produced by the discharge of the chambered cartridge 18 with roller 98 on breech block 80 first passing along dwell portion 102 of cam groove whereby the breech block is

restrained in the breech closed position until the gas pressure in barrel **16** is reduced to safe limits. Roller **98** then enters the curved portion of cam groove **100** to actuate breech block **80** to the breech open position and clear of the base of fired case **48** before the final half of the recoil stroke of barrel **16**.

When breech block **80** reaches the breech open position, carrier **36** is actuated rearwardly through the camming engagement of extraction arm **64** and ramming arm **66** with cam paths **68** and **74**, respectively. As carrier **36** is moved rearwardly, extractor **42** thereon pulls fired case **48** from chamber **20** through the engagement of hook **44** with extractor groove **46** with the fired case being held in a longitudinal position through the joint engagement of underside **40** of rammer **38** and hook **44** of extractor **42** with rim **45** of the fired case. Before carrier **36** reaches the rearward position thereof, the base of fired case **48** contacts ejector **106** for pivotal disengagement from extractor **42** and jettisoning through ejection port **28**. At the same time, hammer **110** is pivoted to cock position to be releasably held by sear **112**.

At the end of the recoil stroke of barrel **16**, the springs **29** which were compressed during the recoil movement of barrel extension **26**, energize the barrel and barrel extension for the counterrecoil stroke. As barrel **16** moves forwardly, accelerator **52** is pivoted to actuate carrier **36** to the forward position thereof. As carrier **36** moves forwardly, rammer **38** engages the base of cartridge **18** indexed by feeding mechanism **30** in throat **34** and transfers the cartridge into chamber **20** before the final half of the counterrecoil stroke of barrel **16**. When cartridge **18** is chambered, breech block **80** is actuated to the breech closed position through the cooperation of roller **98** and cam groove **100** with block **94** being inserted between rammer **38** and extractor **42** to support the chambered cartridge when discharged at the predetermined headspace position. When breech block **80** is moved laterally to the breech closed position, front face **96** of block **94** is simultaneously moved forwardly to the predetermined head space position to accommodate in chamber **20** by crush-up any cartridges **18** which are above the average in length. Breech block **80** is locked in breech closed position through the engagement of lug **98** with dwell portion **102** of cam groove **100**.

From the foregoing it is clearly apparent that there is provided herein a breech mechanism which requires a minimum length receiver for the inclosure thereof and which is simple and rugged in design and positive in operation.

Although a particular embodiment of the invention has been described in detail herein, it is evident that many variations may be devised within the spirit and scope thereof and the following claims are intended to include such variations.

I claim:

1. In a firearm having a receiver with a barrel slidingly mounted therein for longitudinal reciprocation in a recoil stroke and a counterrecoil stroke to a battery position responsive to forces produced by the discharge of a cartridge in a chamber of the barrel, a feeding mechanism mounted to the top of the receiver for successively indexing a cartridge having a rim and extractor groove in a throat leading into the receiver, a barrel extension connected to the breech of the barrel for reciprocation therewith, a vertical channel disposed in the barrel extension for communication with the chamber, a carrier slidingly disposed in the barrel extension for longitudinal reciprocation in the channel between a forward and a rearward position, means for actuating the carrier to the rearward position during the last half of the recoil stroke of the barrel and to the forward position during the initial half of the counterrecoil stroke, a rammer extending integrally forward from the carrier for transferring the cartridges from the throat to the barrel chamber during movement of the carrier to the forward position and disposed to contact the rim of the cartridge when chambered, and an extractor pivotally mounted on the underside of the carrier to extend forwardly therefrom substantially parallel to the rammer and disposed to engage the extractor groove of the cartridges when in the chamber for extraction therefrom, a breech mechanism including a breech block slidingly mounted in the barrel extension for lateral movement from a breech open to a breech closed position and for forward movement to a predetermined headspace position simultaneously therewith, said breech block being provided with an anvil disposed for insertion between the rammer and the extractor to support the chambered cartridge at the predetermined headspace position when said breech block is in the breech closed position, a roller depending from said breech block for sliding engagement with a cam groove in the receiver for actuating the breech block between the breech open and breech closed positions during reciprocation of the barrel extension, said cam groove including a dwell portion cooperating with said roller for locking said breech block in the breech closed position when the barrel is in the battery position and a curved portion extending from said dwell portion for actuating said breech block to the breech open position during the initial half of the recoil stroke of the barrel and to the breech closed position during the final half of the counterrecoil stroke thereof.

2. The breech mechanism as defined in claim 1 wherein said anvil includes a vertical support and a block extending laterally from the top thereof, said block being disposed so as to be clear of the chamber of the barrel when said breech block is in the breech open position and so as to be insertable between the rammer and extractor when said breech block is actuated to the breech closed position and wherein a firing pin is mounted longitudinally through said block in position for discharge of the cartridge in the barrel chamber.

3. The breech mechanism as recited in claim 2 wherein said block includes a front face disposed for right angular relationship to the longitudinal axis of the barrel during reciprocation of said breech block between the breech open and breech closed positions, and a passage for slidingly mounting said breech block to the barrel extension, said passage being arranged so that said front face is spaced sufficiently rearward of the chamber when said breech block is in the breech open position to clear a chambered cartridge which has a maximum length and so as to progressively move said breech block forwardly for disposition of said front face at the predetermined headspace position when said breech block is actuated to the breech closed position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,594,359	Simpson	Apr. 29, 1952
2,635,377	Higson	Apr. 21, 1953
2,804,810	Stevens	Sept. 3, 1957