Oct. 9, 1951 L. R. CRITTENDON 2,570,772

RECOIL OPERATED FIREARM WITH PIVOTED BOLT LOCK

Filed March 3, 1949 3 Sheets-Sheet 1

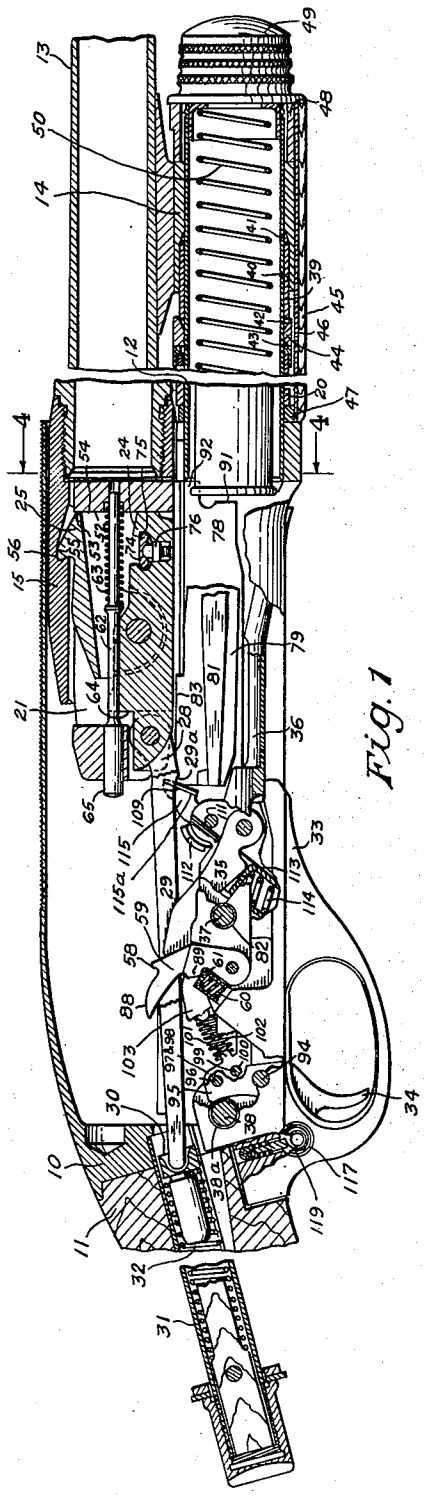

Fig. 1

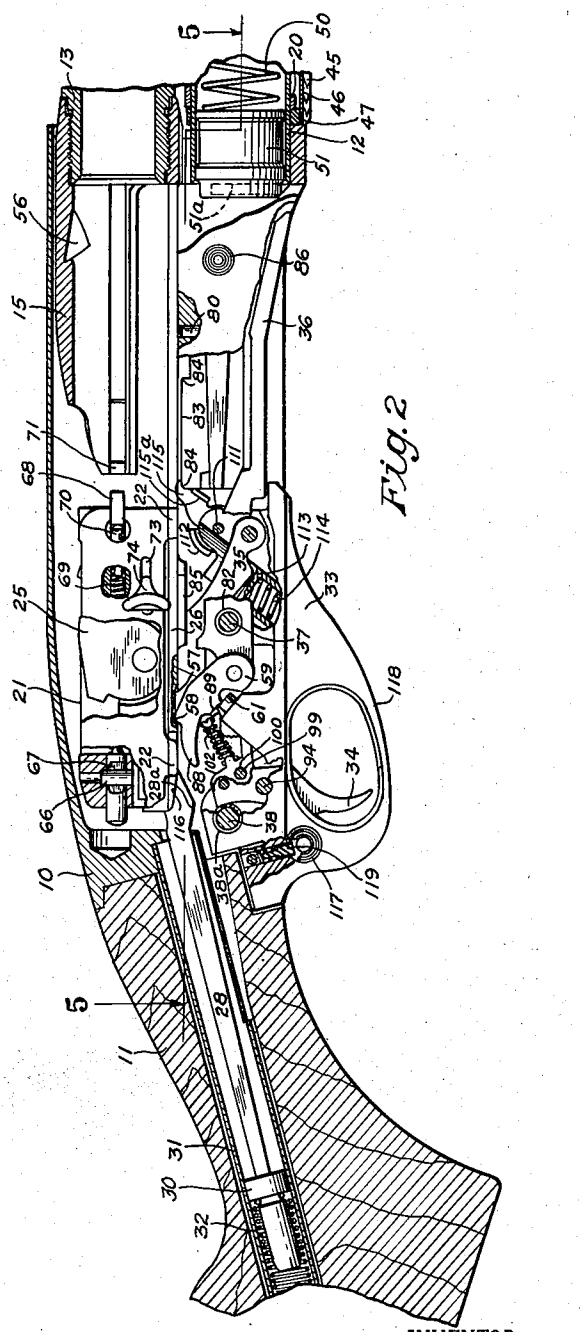

Fig. 2

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Filed March 3, 1949 3 Sheets-Sheet 2

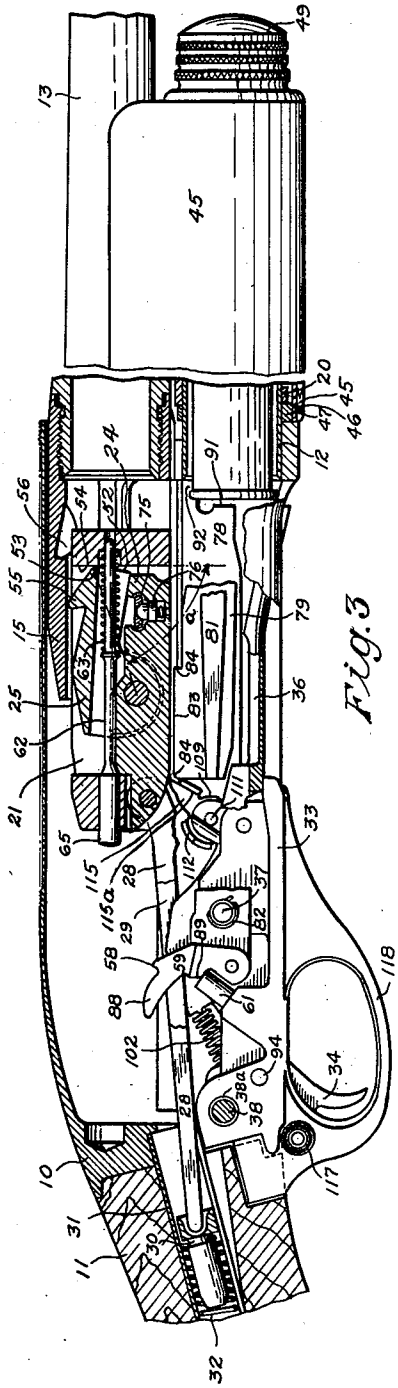

Fig. 3

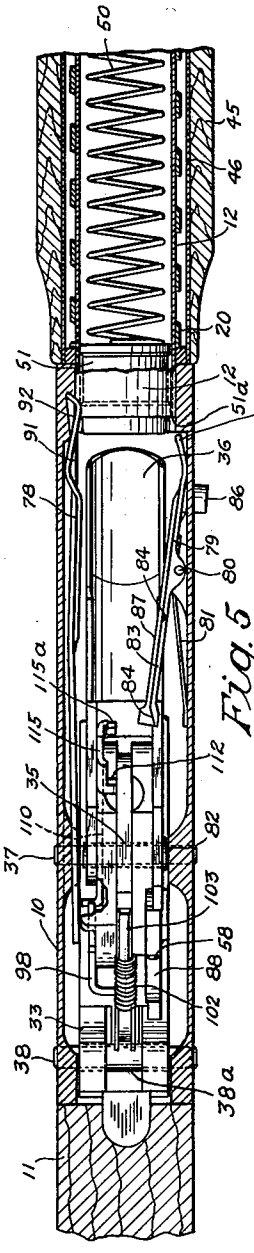

Fig. 5

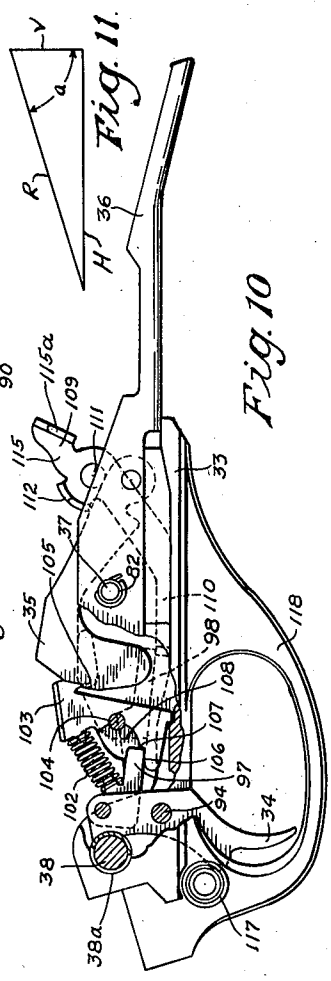

Fig. 11.

Fig. 10

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RECOIL OPERATED FIREARM WITH PIVOTED BOLT LOCK

Filed March 3, 1949 3 Sheets-Sheet 3

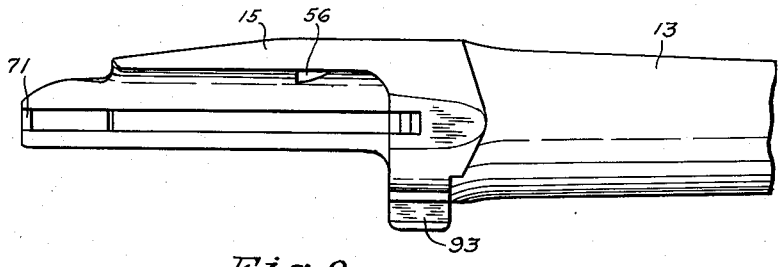

Fig. 9

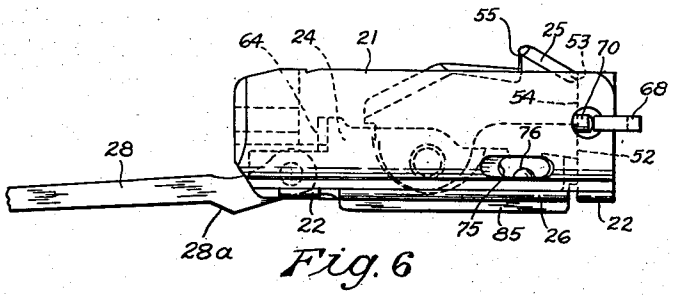

Fig. 6

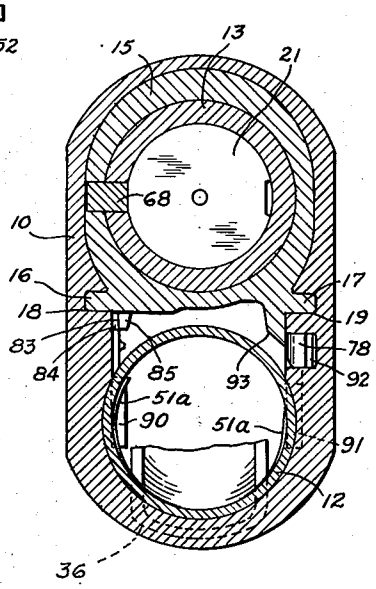

Fig. 4

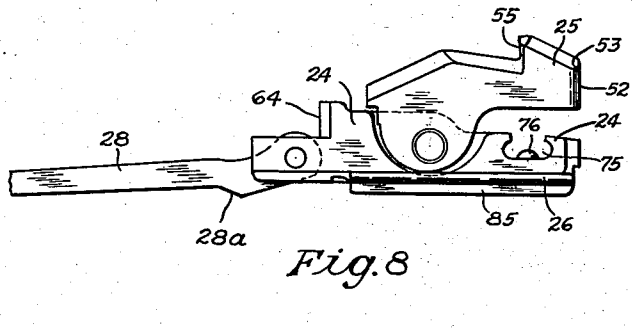

Fig. 8

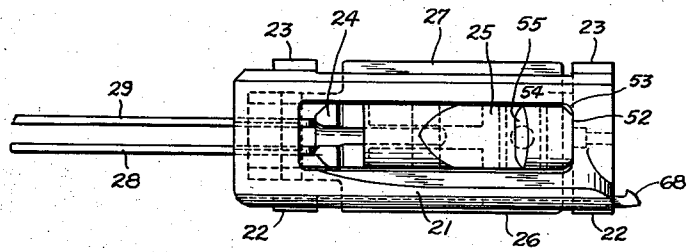

Fig. 7

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UNITED STATES PATENT OFFICE

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RECOIL OPERATED FIREARM WITH PIVOTED BOLT LOCK

Lexie Ray Crittendon, Ilion, N. Y., assignor to Remington Arms Company, Inc., Bridgeport, Conn., a corporation of Delaware

Application March 3, 1949, Serial No. 79,368

13 Claims. (Cl. 89—190)

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This invention relates particularly to a firearm of the type which is automatically reloaded and made ready for a subsequent shot by utilizing the energy of recoil imparted to a movably mounted barrel. Typical firearms of the prior art having these characteristics are shown, for example, in the following patents of the late John M. Browning: Nos. 659,507, 689,283, and 710,094, to which reference may be made for the general principles underlying the construction of such firearms. Reference will also be made to Rutherford Patent No. 2,278,589 for certain features incorporated in the firearm exemplifying the invention.

The principal objects of this invention are the provision of a firearm of this type having an improved streamlined appearance and the provision of such a firearm which can be efficiently and economically manufactured.

In general, these objectives have been accomplished without change in the operating principles exemplified in the Browning patents and largely by such expedients as changing the exterior shape of the receiver and fitting thereinto parts of simplified design having functions equivalent to those of the Browning designs.

The exact points where the improved arm differs inventively from the Browning designs, as well as other objects and advantages thereof, will appear from consideration of the following specification and claims, referring to the attached drawings in which:

Fig. 1 is a vertical longitudinal sectional view showing the action in breech closed and locked position.

Fig. 2 is a similar view showing the action in breech open position.

Fig. 3 is a similar view showing the action in an intermediate position during the closing of the breech.

Fig. 4 is a cross-sectional view taken on the plane indicated by the line 4—4 in Fig. 2.

Fig. 5 is a longitudinal horizontal sectional view taken on the plane indicated by the line 5—5 in Fig. 2.

Fig. 6 is a side elevational view of the breech bolt and breech bolt slide assembly.

Fig. 7 is a top plan view of the same assembly shown in Fig. 6.

Fig. 8 is a side elevational view of the breech bolt slide and locking block assembly.

Fig. 9 is a side elevational view of the rear portion of the barrel and barrel extension assembly.

Fig. 10 is a side elevational view partially in section of the trigger plate assembly, portions

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of the carrier mechanism having been broken away for clarity in illustration of the fire control mechanism.

Fig. 11 is a diagram illustrating the resolution of the forces acting on the locking block during closing of the breech.

General description

Referring to the drawings by characters of reference, it may be seen that the firearm comprises a receiver 10 to which a butt stock 11 is secured. The receiver serves as the main frame of the firearm and at the same time provides a casing to enclose the working parts thereof. Secured in a bore in the lower forward wall of the receiver and extending forwardly therefrom is the cylindrical magazine tube 12. A barrel 13 is provided with a barrel guide ring 14 encircling the magazine tube and with a barrel extension 15 which is received within the receiver and guided for reciprocation therein by feet 16 and 17 received respectively in tracks 18 and 19 formed in the inner side walls of the receiver. As in the Browning patents, a recoil spring 20 encircles the magazine tube and by engagement between the receiver and barrel guide ring, acts to maintain the barrel in a forward position.

Within the receiver a breech bolt 21 is slidably supported on feet 22 and 23 engaging the receiver tracks 18 and 19 in position to close the breech end of the barrel. A breech bolt slide 24 provides a pivotal mounting for a breech bolt locking block 25 and is supported for reciprocation in the tracks 18 and 19 by rails 26 and 27 formed on the sides of the slide. Right and left links 28 and 29 are pivotally attached to the slide in laterally spaced relation and extend rearwardly into engagement within the cupped end of the action spring follower 30. The action spring follower 30 is supported for reciprocation in an action spring tube 31 which has the double function of serving as a butt stock bolt and as a housing for the action spring 32. This spring acts to urge the breech bolt into breech closed position.

The bottom of the receiver is partially closed by a trigger plate 33 in which there are mounted the trigger 34, hammer 35, carrier 36, and their associated parts. Front and rear trigger plate pins, 37 and 38, respectively, pass through the opposite side walls of the receiver and through holes in the trigger plate bushed respectively by bushings 82 and 38a to retain the assembly. The trigger plate is provided with suitable de-

tents to prevent the accidental removal of either of the pins.

Barrel mounting

The arrangement for supporting the recoiling barrel **13** is probably obvious from the foregoing general description but a few details may be added for completeness. Between the barrel guide ring **14** and the barrel recoil spring **20** there may conveniently be located a friction brake assembly which is a modification of those employed by Browning. This brake consists of a split cylindrical friction piece **39** received in a counterbore **40** in the guide ring in engagement with a conical shoulder **41** defining the end of the counterbore. The rear end of the friction piece is engaged by one of the conical surfaces **42** or **43** on a friction control ring **44**. By the selection of the conical surface **42** making the smaller angle with the axis of the magazine tube, a greater percentage of the recoil force will appear as a radial component, causing the friction piece to grasp the tube more firmly and compensate for the more severe recoil of heavy loads. A wooden fore-end **45** slips over the magazine tube to provide a gripping surface and to serve as a housing for the barrel recoil spring. This fore-end is preferably lined with a sheet metal liner **46** which fits over a fore-end support block **47** on the front wall of the receiver and which has formed integrally therewith a barrel return stop bushing **48**. A magazine cap **49** screws onto the end of the magazine tube and is there retained by any suitable detent means, not shown, to secure the fore-end in place and provide a positive stop for the barrel return. Within the magazine tube there are provided the usual magazine spring **50** and magazine follower **51**. Stop shoulders **51***a*, provided in the receiver adjacent the rear end of the magazine tube **12**, serve to prevent expulsion of the follower.

As noted in the general description, the forces of recoil serve to move the barrel rearwardly into the receiver against the opposition of the barrel recoil spring **20** as each shot is fired. Some of the energy of recoil is frictionally absorbed by the engagement of the friction ring with the magazine tube and the remainder is utilized to operate the action, as will presently appear.

Breech locking action

As noted in the general description, the barrel extension **15**, breech bolt **21**, and breech bolt slide **24** are all arranged for linear reciprocation guided in the tracks **18** and **19** formed in the receiver. It will be noted that the breech bolt slide **24** has capacity for limited fore and aft movement relative to the breech bolt and that the locking block **25** is pivotally mounted thereon. The forward end of the locking block is formed to define a flat surface **52**, and a smoothly rounded corner surface **53**. In the position in which the parts are shown in Fig. 1, the flat surface **52** is in engagement with a substantially vertical rearwardly facing surface **54** formed in the breech bolt and the locking lug **55** is engaged within the slightly undercut locking recess **56** in the barrel extension. The action spring **32** acting through the links **28** and **29** against the slide **24** tends to maintain the parts in this condition. Obviously, the breech bolt cannot be unlocked from the barrel extension, as a function of pressure exerted on the bolt face for such pressure acts directly to press the surface **54** on the bolt against the face **52** of the locking block so that a component of this force acting in the undercut recess **56** tends to force the lug **55** on the block into deeper engagement with the recess **56**. As is desirable in any autoloading arm, the breech bolt will thus remain locked until after the projectile or projectiles have left the barrel and the pressure has dropped to a safe level. After the recoiling parts have reached the rearward limit of their recoil excursion, the breech bolt slide **24** will be caught and retained in the rearward position shown in Fig. 2. In this position a notch **57** in the lower surface of the slide **24** is engaged by the detent **58** on the carrier dog **59**. The carrier dog is pivotally mounted on the carrier **36**, which at this point in the cycle of operations is locked in place by means to be later described in connection with the shell feeding cycle. A carrier dog spring **60** acting through a follower **61** urges the carrier dog to swing clockwise as viewed in Figs. 1, 2, and 3, to insure that the slide will be caught thereon.

If the recoiling barrel has any excess of momentum above that absorbed by the friction piece and required to carry the mechanism rearwardly to a point where the slide will be picked up by the carrier dog, the barrel and breech bolt will be stopped by the rear wall of the receiver, and the barrel recoil spring **20** will immediately return the barrel to its normal forward position. As it does so, it will be apparent that, with the slide held on the carrier dog detent **58**, the locking lug recess **56** in the barrel extension will pull forward on the lug **55** and a force will be exerted tending to rotate the locking block clockwise about the point of its pivotal support on the then stationary slide **24** which will unlock the breech bolt from the barrel extension. As a function of this unlocking movement, the breech bolt **21** will move forward relative to the slide **24**, then locked by the carrier dog **58**, for a distance slightly under ⅛ inch and, in the event that the firing pin **62** has not been retracted by its retracting spring **63**, the safety abutments **64** on the slide will engage the enlarged head **65** of the firing pin to positively cause such retraction. This engagement also has an important safety function in that it positively prevents forward movement of the firing pin sufficient to fire a shot shell primer until the breech bolt is positively locked to the barrel extension. A firing pin retainer pin **66** seated in a vertical bore in the breech bolt engages a cut-away portion **67** of the firing pin head to prevent disassembly thereof.

A conventional extractor **68** spring-loaded by spring **69** acting through plunger **70** serves by engagement with a shot shell rim to retain a fired shot shell in rearward position engaged with the face of the bolt **24** as the forwardly moving barrel is stripped from it. Immediately after the open end of the shell clears the chamber mouth, an ejector **71** mounted on the rear end of the barrel extension hooks the rear face of the shell at a point almost diametrically opposite the extractor and flips the shell laterally through a conventional ejection port in the side wall of the receiver.

To avoid complicating consideration of the breech locking action with other operations, it will only be noted that the carrier is released soon after the barrel returns to its forward position by means which will be more fully described in connection with the shell feeding operation. When the carrier is so released, the breech bolt slide **24** and breech bolt **21** are driven forward by the action spring **32** through the position

shown in Fig. 3 to return to the position shown in Fig. 1. As the parts reach the position shown in Fig. 3, the rounded corner **53** on the locking block is in engagement with the surface **54** of the breech bolt at a point such that a line between this point of contact and the point at which the locking block is pivotally attached to the slide makes an angle *a*, shown between the dot-dash lines on Fig. 3, of substantially less than 90 degrees with the surface **54**. The resultant force R, applied by the spring **32** acting through the links **28** and **29**, the slide **24**, and the locking block **25** pivotally mounted on the slide, may, as shown in Fig. 11, be resolved into two components. One component H acts along the axis of movement of the slide, tending to move the breech block forward. The other component V acts vertically upward at right angles to the movement of the slide and tends to rotate the locking block upward or counter-clockwise. At the forward limit of movement of the breech bolt, the locking lug **55** is opposite the recess **56** in the barrel extension and the force component V, referred to above, rotates the locking block to lock bolt and barrel extension together. It will be noted that as the lug **55** enters the recess **56** the angle *a* becomes more acute and the component V increases proportionately, accelerating and insuring the completion of the movement into locked position.

The cycle described above is repeated after each shell is fired.

To permit manual opening of the breech bolt, an elongated opening **73** is formed in the side of the breech bolt, which is exposed through the ejection port. An operating handle **74** passes through this opening into engagement with a snugly fitting aperture **75** in the breech bolt slide. Spring-urged detent means **76** in the slide engage an appropriate depression in the handle shank to releasably secure the parts. The oversize opening **73** permits the relative movement between slide and breech bolt required to unlock the action. To permit the full length of recoil of the breech bolt, an operating handle slot as used in the Browning designs may intersect the ejection port and extend rearwardly therefrom. Whenever the barrel is removed, as in taking down the gun for cleaning or packing, the breech closing spring will urge the slide forwardly and the operating handle may engage the forward edge of the ejection port, thus preventing inadvertent removal of the breech bolt. A deliberate effort to remove the operating handle will overcome the detent **76**, allowing the handle to come free, whereupon the breech bolt assembly with the attached links may be removed from the receiver for cleaning or inspection.

Obviously the utility of this breech locking arrangement is not confined to a long recoil operated firearm, for it may be applied with equal facility to a short recoil action. Further, without modification of its essential locking principle, it may be applied to fixed barrel firearms of the gas operated or manually actuated types by coupling to the breech bolt slide either a gas pressure actuated operating rod or a manually actuated action bar or bars leading to a slidable fore-end. In the case of such a fixed barrel action, the recess in which the locking block lug is received might be formed either in the top wall of the receiver or in a stationary barrel extension. The essential feature is that the recess be located in some member of adequate strength which has a fixed relationship to the breech face of the barrel.

Shell handling

The carrier **36** and carrier dog **59** have been previously referred to in regard to their incidental function of temporarily locking the breech bolt slide in its rearward position. The primary function of the carrier is to effect a properly timed transfer of a loaded shell from the magazine tube **12** to a position in front of the forwardly moving breech bolt which then chambers the shell in the barrel. In performing this function, the carrier is assisted by the shell latch **78** and the combined shell latch and carrier latch **79**. For more detailed discussion of the construction and operation of the carrier latch, reference may be had to Rutherford Patent No. 2,278,589. For the purpose of this specification, reference may best be made to Fig. 5 herein, which shows that the combined shell and carrier latch **79** is a longitudinally extending member pivoted intermediate its ends on a carrier latch pivot pin **80** supported in the right side wall of the receiver. A flat leaf carrier latch spring **81** is riveted or otherwise secured to the latch and engages the wall of the receiver to the rear of the pivot pin **80**, tending to swing the rear end of the latch into the receiver in a position in which it overlies the carrier **36** forward of the bushing **82** which passes laterally through the trigger plate **33** and forms the pivot on which the carrier is supported. When the breech bolt, however, is in any other than its rearward or action-open position, as shown in Fig. 2, the carrier latch is held against the urging of its spring by means of an upwardly extending rib **83** formed at each end with a cam portion **84** and engageable with a downwardly extending control rib **85** formed on the lower surface of the breech bolt slide. Thus, when the action is open as in Fig. 2, the carrier latch is free to swing at its rear end into the receiver. In this position the carrier latch prevents the carrier from rising, and the carrier, through the medium of the carrier dog **59**, retains the breech bolt slide and breech bolt in action open position.

Two means are provided for releasing the carrier latch and hence allowing the action to close under the urging of the action spring **32**. The first of these means is manual, through the agency of the carrier latch button **86** which extends through a hole in the right side wall of the receiver and engages the carrier latch at a point forward of the pivot. The other means of releasing the carrier latch is automatic in operation and functions as a result of the release of a shell from the magazine by the shell latch **78** in a manner which will soon be described. When such a shell is released it springs rearwardly into the receiver on top of the carrier and since the rim at the head of the shell is of a diameter nearly equal to the inside width of the receiver, engages the inner face **87** of the rear end of the carrier latch **79** and cams that portion outward and out of engagement with the upper surface of the carrier.

When the carrier is released, either manually or automatically, a component of action spring force acting through the carrier dog swings the carrier upwardly to position a shell in front of the forwardly moving breech bolt. After a short forward movement, the carrier dog tail **88** comes into engagement with the lower face of the breech bolt slide and causes the detent **58** to unhook from the notch **57** in the lower face of the slide. The carrier, however, remains raised until it is over-ridden by the slide, which occurs shortly

after the complete disengagement of the carrier dog from the lower face of the slide. At that point the carrier dog snaps upwardly, bringing the spring thrust member 61 squarely under the step 89 on the carrier dog and applying the full force of the spring 60 to lowering the carrier. The carrier latch, however, does not snap out to lock the carrier down, as in the Browning guns previously referred to, but is held out by the control rib 85 on the slide. Thus, with the action closed, the carrier may be manually raised against the urging of the spring 60 to facilitate loading in the manner described in the Rutherford patent referred to.

With the carrier latch held against its spring by the control rib, the forward end thereof extends into the receiver and renders the shell latch portion 90 operative in retaining shells in the magazine. Since the carrier latch, as a whole, is made of fairly thin material and spring tempered, it will yield to permit a shell being loaded into the magazine to pass by, whereupon it will spring back to retain the shell.

The shell latch 78 comprises an elongated leaf spring received in a clearance cut in the left wall of the receiver and secured therein by engagement of a hole in its rear end with the forward trigger plate pin 37 and by lateral confinement between the trigger plate and the receiver. This latch is formed so that the natural tendency of its spring construction is to cause its front end 91 to extend into the receiver in position to oppose the release of shells from the magazine. This forward end is disposed fore and aft in a position to stop a shell at a position rearward of that in which it is supported by the latch end 90 on the carrier latch by a distance not materially greater than the thickness of a shell rim. An upward and forwardly extending finger 92 in the shell latch is disposed in the path of a downwardly extending control cam 93 on the lower surface of the left barrel extension foot 17. The interengagement of the control cam 93 and finger 92 is such as to retain the shell latch in an inoperative position whenever the barrel occupies its normal forward position. However, at any time during the recoil movement of the barrel, the shell latch is operative and serves to prevent the release of shells from the magazine.

In review of operations during the shell feeding cycle, it may be assumed that we start as would normally be the case with an empty gun in which the breech bolt is latched rearwardly in open position. One shell may be dropped through the ejection port 72, either into the chamber of the barrel or on top of the carrier. When the carrier latch button is depressed, the carrier will swing upwardly and the breech bolt will move to closed position. During the closing movement, the carrier will retire to its lower position where it will be held by its spring. One or more additional shells may then be sequentially fed into the magazine through the open bottom of the receiver, the carrier being raised during this operation usually by the engagement of the incoming shell with the lower face of the carrier. Each shell, in turn, is fed into the magazine past the shell latch 90 on the front end of the carrier latch and will be there retained.

When the chambered shell is fired, the barrel will recoil and the fired shell will be ejected during counter recoil as described in connection with the breech locking operation. As soon as the barrel has recoiled about 3/8", the shell latch controlled from the barrel extension will move out into position to stop the release of shells from the magazine. At a position of substantially full recoil, the carrier latch will be released from the control rib on the lower face of the breech bolt slide and its forward end 90 will release the rearmost shell in the magazine to the shell latch 78. During the counter recoil of the barrel, the parts associated with shell feeding remain stationary until the control cam 93 on the barrel extension engages the shell latch finger 92. The rearmost shell is thereupon released and springs rearwardly into the receiver. As it does so, it encounters the face 87 of the carrier latch which it forces out of engagement with the carrier. Simultaneously, the front end of the carrier latch moves in to position the shell latch portion 90 in the path of the succeding shell in the magazine. As the carrier rises, it lifts the shell into a position in front of the forwardly moving breech bolt which chambers it and locks to the barrel extension, as previously described. While the carrier is raised, it serves to hold the carrier latch against the carrier latch spring 81, and before the carrier has been lowered the control rib 85 on the slide will have engaged the retaining rib 83 on the carrier latch to take over this function.

The operation just described may be repeated until the last shell in the magazine has been chambered and fired. At that time, the same sequence is started again, but since there are no more shells in the magazine the carrier latch will not be disengaged from the carrier and the breech will remain open.

Fire control

Referring particularly to Figs. 5 and 10, it will be observed that the trigger plate 33 forms with the carrier and fire control mechanism a complete sub-assembly which is removably secured in the receiver. This construction greatly facilitates manufacture, inspection, and assembly. The trigger plate proper is conveniently a die casting upon which a minimum of machine operations are necessary.

The trigger 34 is supported on a pivot pin 94 and is provided above the pivot with a pair of laterally spaced upwardly extending arms 95. A pivot pin 96 passes laterally through these arms and serves to pivotally mount a connector assembly comprising a right hand arm 97 and a left hand arm 98, both extending generally forward from a point below the pivot pin 96. These arms are secured together to act as a unit by means of their common engagement upon pivot 96 and between the trigger arms 95, while they are required to rotate together as a result of the engagement of a button 99 struck up from the left hand arm with a hole 100 in the right hand arm. Intermediate the forwardly extending arms 97 and 98 and the pivot 96, a spring seat button 101 is formed to receive one end of the combined trigger and sear spring 102. The other end of the sear spring has a similar engagement with the sear 103 which is swingably supported on sear pin 104 and arranged to engage a hammer hook 105 formed on the hammer 35. Obviously, the spring 102 acts between the trigger and sear to urge the finger engaging portion of the trigger forward and to urge the sear forwardly into hammer retaining position. At the same time, it acts to rotate the connector assembly clockwise as viewed in Fig. 10, with the result that the toe at the forward end of the right hand connector arm 97 tends to engage the bottom surface 106 of a

recess cut in the sear below the sear pivot and in rear of a connector abutment 107 formed in the sear surface 106. In this condition a normal pull upon the trigger serves to move the end of connector arm 97 into engagement with the abutment 107 and further movement causes the sear to turn counter-clockwise on the sear pivot and release the hammer.

Doubling or the firing of repeated shots from one operation of the trigger is prevented by the provision of a clearance recess 108 in the sear to receive the end of the connector arm after it has been disconnected from the abutment 107. When this has occurred, the trigger may be held back without effect upon the sear, which will catch and retain the hammer the next time it is cocked. Disconnection at each fall of the hammer is brought about by the disconnector 109, which has a rearwardly extending tail 110 formed to engage beneath the forward end of the left hand arm 98 of the connector assembly. The disconnector is supported by a disconnector pin 111 fitted in the trigger plate in a position which disposes an arm 112 on the disconnector in the path of the plunger 113, which communicates the force of the spring 114 to the hammer. Whenever the hammer falls, the plunger 113 engages the arm 112, raising the tail 110 and thus swinging the connector assembly counter-clockwise to disengage it from the sear. To furnish additional safety, the disconnector 109 is also provided with a safety arm 115, which extends forwardly and upwardly into a position which will be over-run by the breech bolt slide 24 whenever the slide is materially to the rear of its fully locked position. To insure that this control is maintained at all times except when locking is substantially complete, an inturned extension 115*a* is provided on the arm 115 and disposed beneath a cam 29*a* formed on the breech bolt link. Before the cam 29*a* disengages from the extension 115*a*, the lower face of the slide will have engaged the arm proper.

Summarizing, disconnection will take place as a result of hammer fall, and during the period in which the automatic loading cycle is being completed, will be maintained by the engagement of the link cams or the lower face of the slide with the arm 115. The connector can only re-engage the sear after the breech is closed and locked, and even then, it cannot re-engage until the trigger has been released and allowed to return to its normal position. If, at any time thereafter, the breech is partially or fully opened, the cam 29*a* and the lower rear corner 116 of the breech bolt slide act in succession to urge the disconnector to operate and disconnect the trigger from the sear, thus preventing inadvertent firing from an open breech.

The normal type of cross bolt safety comprising a slidable bolt 117 in the trigger guard 118 is provided. This bolt is, in the usual way, provided with a body portion having two diameters and when disposed to extend to the right of the guard and obstructing the usual position of a trigger finger, the large diameter portion will obstruct the rearward movement of the trigger finger piece. A spring-urged detent 119 mounted in the trigger plate releasably retains the safety in either position selected.

Summary

The foregoing specification has been divided into sections each dealing with one of the principal trains of directly related parts and operations. In view of the general similarity of functioning between this arm and the prior art arms exemplified by the Browning patents, it does not appear necessary to provide here a detailed account of the over-all operations of the gun. Each of the sections referred to above has included a summary of the operation of that mechansim, and the interrelation is believed to be obvious.

While a specific firearm embodying the invention has been described in detail, it is not intended that the invention should be considered as limited to the exact structure illustrated. It is intended to include all equivalent devices and combinations within the scope of the claims appended hereto.

I claim:

1. In a firearm comprising a barrel having therein a cartridge receiving chamber, means rigidly secured to said barrel and extending rearwardly from the mouth of said chamber, a chamber closing breech bolt reciprocable between a forward breech closing position and a rearward breech open position, and an operator for said breech bolt comprising a slide reciprocable with and movable relative to said bolt; the combination of means for locking said bolt in breech closing position comprising a locking block supported for rotation about a pivot on said slide from a breech locking position engaged with said barrel means to a breech unlocking position, and means for rotating said locking block to breech locking position comprising elements defining cooperating surfaces on said locking block and breech bolt respectively, said surfaces being so relatively inclined that pressure of either one upon the other urges said locking block toward breech locking position.

2. In a firearm comprising a barrel having therein a cartridge receiving chamber, means rigidly secured to said barrel and extending rearwardly from the mouth of said chamber, a chamber closing breech bolt reciprocable between a forward breech closing position and a rearward breech open position, and an operator for said breech bolt comprising a slide reciprocable with and movable relative to said bolt; the combination of means for locking said bolt in breech closing position comprising a locking block supported for rotation about a pivot on said slide from a breech locking position in engagement with said barrel means to a breech unlocking position, and means for rotating said locking block to breech locking position comprising an element of said bolt defining a rearwardly facing surface and an element of said locking block defining a surface adapted for line contact with said rearwardly facing surface, the relative inclination of said surfaces being such that pressure of either surface upon the other surface urges said locking block toward breech locking position with a torque that increases as said locking block moves toward breech locking position.

3. In a firearm comprising a barrel having therein a cartridge receiving chamber, means rigidly secured to said barrel and extending rearwardly from the mouth of said chamber, a chamber closing breech bolt reciprocable between a forward breech closing position and a rearward breech open position, and an operator for said breech bolt comprising a slide reciprocable with and movable relative to said bolt; the combination of means for locking said bolt in breech closing position comprising a locking block supported for rotation about a pivot in said slide from a breech locking position to a breech unlocking position, means for rotating said locking block to breech locking position comprising an

element of said bolt defining a rearwardly facing surface adjacent the forward end of said breech bolt and an element of said locking block defining a surface adapted for line contact with said rearwardly facing surface, the relative inclination of said surfaces being such that pressure of either one of said surfaces upon the other one of said surfaces urges said locking block toward breech locking position with a torque that increases as said locking block moves toward breech locking position, a lug on said locking block, and a shoulder on said barrel means adapted for engagement by said lug when said locking block is in breech locking position.

4. The combination described in claim 3, the relative inclination between said rearwardly facing surface and a line connecting said pivot with the point of line contact of said locking block surface with said rearwardly facing surface being substantially less than ninety degrees when said locking block is in breech unlocking position and reduced to a more acute angle when said locking block is in breech locking position.

5. The combination described in claim 4, including spring means arranged for moving said slide toward breech locking position.

6. The combination described in claim 5, including means actuated by firing of a cartridge in said chamber for automatically moving said slide toward breech unlocking position and a manual operator directly connected to said slide for manually moving said slide toward breech unlocking position.

7. In a firearm comprising a spring-opposed recoiling barrel having therein a cartridge receiving chamber, barrel extension means rigidly secured to said barrel and extending rearwardly from the mouth of said chamber, a chamber closing breech bolt reciprocable with and relative to said barrel along a path parallel to the line of recoil of said barrel between a forward breech closing position and a rearward breech open position, an operator for said breech bolt comprising a slide reciprocable with and relative to both said barrel and bolt along a path parallel to the line of recoil of said barrel, and spring means arranged to urge said slide forwardly; the combination of means for locking said bolt to said barrel extension in breech closing position comprising a locking block supported for rotation about a pivot in said slide from a breech locking position to a breech unlocking position, means for rotating said block to breech locking position comprising an element of said bolt defining a rearwardly facing surface and an element of said locking block defining a forwardly facing surface arranged for sliding contact with said rearwardly facing surface, said surfaces being relatively so inclined that pressure of either one upon the other urges said locking block to slide across said rearwardly facing surface toward breech locking position, a lug on said locking block, and a shoulder on said barrel extension adapted for engagement behind said lug when said locking block is in breech locking position, whereby when said spring urges the slide forwardly said locking block lug will engage in front of the shoulder on said barrel extension as a result of the contact between said surfaces and will remain so engaged as long as one of said surfaces exerts pressure on the other of said surfaces.

8. The combination described in claim 7, the relative inclination and disposition of said contacting surfaces being such that the torque urging said locking block toward breech locking position will increase to a maximum as said locking block reaches breech locking position.

9. The combination described in claim 8, the relative inclination between said rearwardly facing surface and a line connecting said pivot with the point of sliding contact of said locking block with the rearwardly facing surface being substantially less than ninety degrees when the locking block is in breech unlocking position and reduced to a substantially more acute angle when said locking block is in breech unlocking position.

10. The combination described in claim 9, including a manually operable member directly attached to said slide to manually move same rearwardly, whereby said surfaces no longer exert pressure upon each other and said locking block may move to breech unlocking position.

11. The combination described in claim 10, said slide having limited capacity for reciprocation with respect to said breech bolt and arranged to move the bolt rearwardly with the slide when said locking block is in breech unlocking position.

12. The combination described in claim 11, wherein said breech bolt has a laterally extending slot formed therein and said manually operable member passes through said slot with sufficient clearance to permit relative reciprocation between said slide and the breech bolt while preventing inadvertent disassembly of said slide and bolt.

13. The combination described in claim 12, wherein a firing pin having a shoulder is mounted in said breech bolt and safety abutments are provided on said slide engageable with said shoulder to positively retract and to retain said firing pin in a rearward position in the bolt when the locking block is in breech unlocking position.

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