Oct. 4, 1955 L. R. CRITTENDON ET AL 2,719,375

FIREARM WITH A PAIR OF ACTION BARS

Original Filed Jan. 31, 1950 2 Sheets-Sheet 1

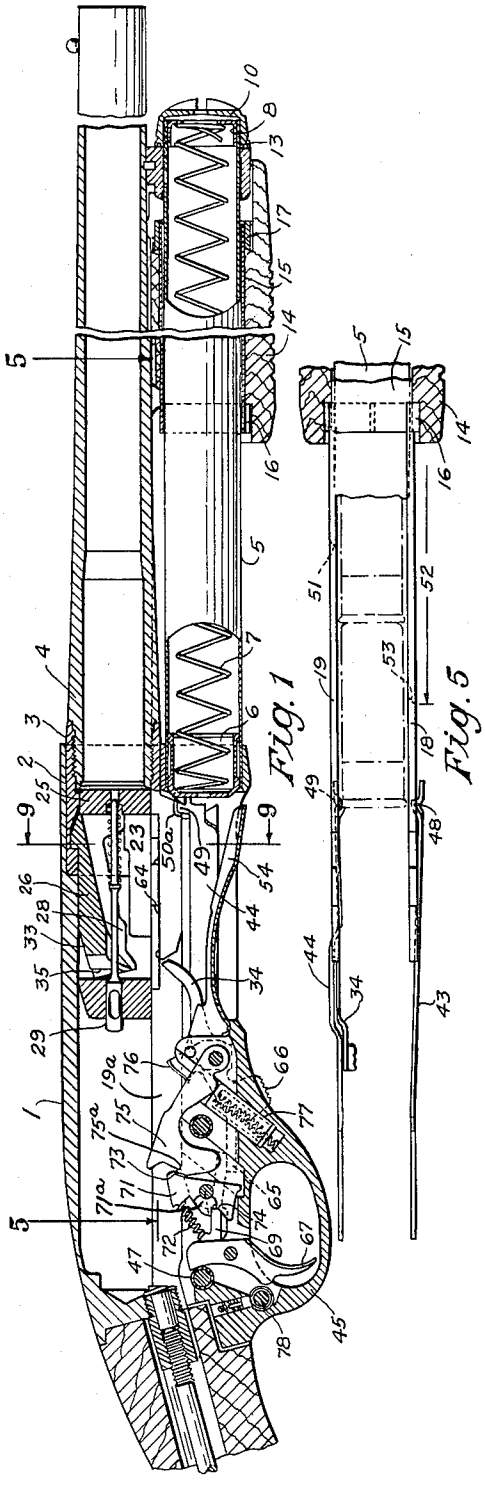


Fig. 1

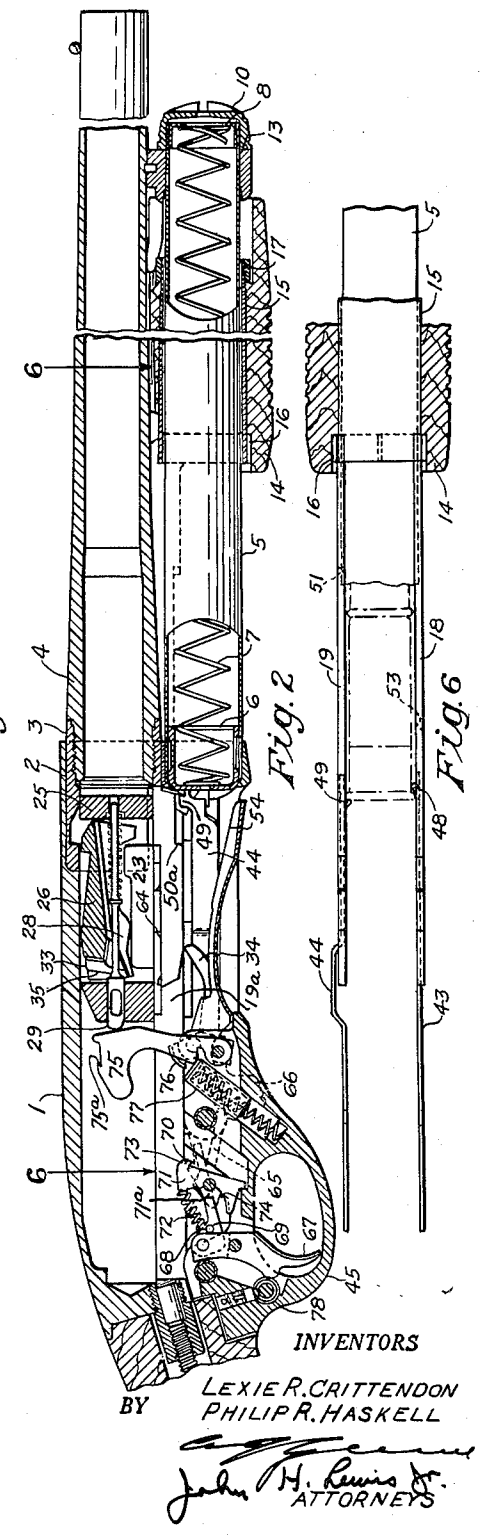


Fig. 2

Fig. 5

Fig. 6

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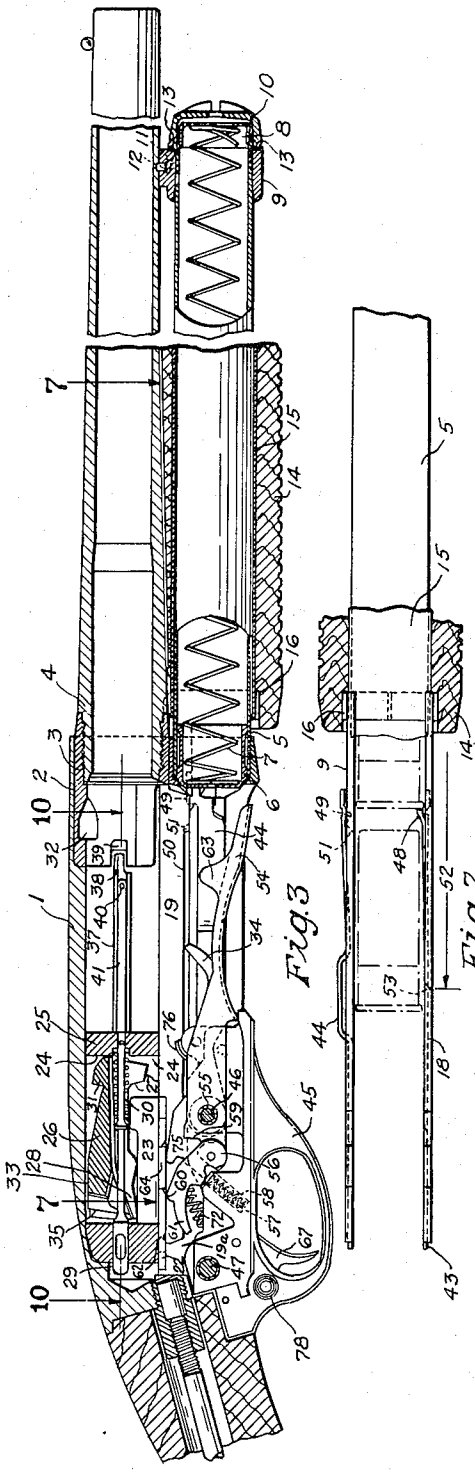


Fig. 3

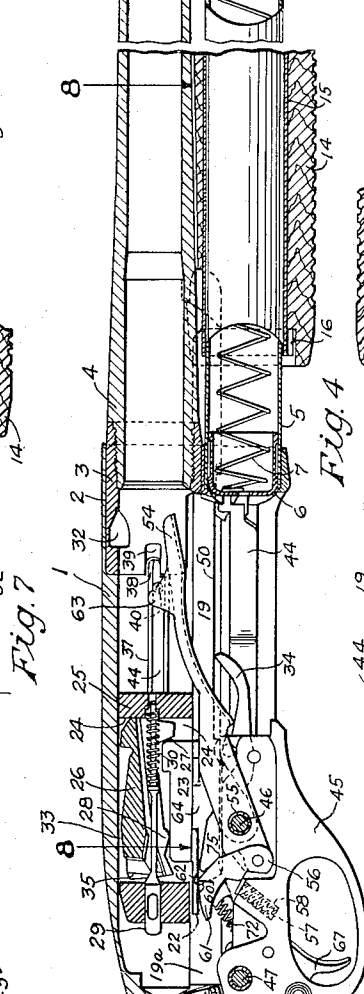


Fig. 7

Fig. 4

Fig. 8

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FIREARM WITH A PAIR OF ACTION BARS

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Original application January 31, 1950, Serial No. 141,532, now Patent No. 2,645,873, dated July 21, 1953. Divided and this application January 7, 1953, Serial No. 330,002

6 Claims. (Cl. 42—17)

This invention relates to improved breech loading firearms and finds its widest application in the type commonly identified as forearm slide actuated. The invention is illustrated by a showing of a shot gun of that type, although obviously certain principles of the design could be applied with equal utility to center-fire rifles. Although the widest application of the invention is in the forearm slide actuated field, some of the elements thereof, for example, the breech locking mechanism, could be applied with great utility to straight pull actuated or autoloading designs, either gas or recoil operated.

This application is a division of our pending application Serial Number 141,532, filed January 31, 1950, now Patent No. 2,645,873, issued July 21, 1953.

The principal object of this invention is the production of a firearm action which may be operated smoothly and with certainty that it will be free from malfunctions. It is a basic requirement that this object be achieved without in any way sacrificing existing standards of safety and fine appearance.

A further object is the production of a firearm which can be manufactured with greater economy and one which utilizes to the greatest extent parts and tooling which are interchangeable throughout a series of gauges and with companion models.

It is contemplated that these objectives can be best achieved by employing a construction in which barrel and breech bolt are locked to each other during firing through the agency of a barrel extension and a locking block which engages between cooperating surfaces on the breech bolt and barrel extension. A breech bolt slide may be provided to carry the breech bolt and actuate the locking block, the slide itself being suitably guided for reciprocation in the gun receiver. The slide may conveniently be arranged to be directly actuated by a straight pull handle thereon, may be actuated by action bars extending to a manually operated slidable foerarm, or to a suitable gas piston and spring assembly. In addition, without modification of the locking mechanism per se, a breech bolt return spring may be coupled to the slide and the barrel permitted to recoil as in certain well-known autoloading shot gun designs of the type first developed by the great John M. Browning. Accordingly, where the term "actuator" is used hereinafter and in the claims, it should be understood to refer interchangeably to a handle, slidable forearm, gas piston, or other means to actuate the breech bolt slide as discussed above.

The exact nature of the invention as well as other objects and advantages thereof will become apparent from consideration of the detailed specification referring to the accompanying drawings, in which:

Fig. 1 is a vertical, longitudinal sectional view of a firearm constructed in accordance with this invention. The mechanism is shown in hammer cocked, breech locked position.

Fig. 2 is a similar view with the parts in the position they would occupy just after firing. The hammer is in

engagement with the firing pin and the action just unlocked.

Fig. 3 is a similar view with the action completely open. In this view, the trigger plate assembly is shown in elevation to illustrate the action of the carrier and carrier dog.

Fig. 4 is a view similar to Fig. 3, during the action closing portion of the cycle. The hammer is cocked and the shell carrier is just about to be returned to its normal lower position.

Fig. 5 is a partial longitudinal horizontal sectional view taken on the line 5—5 of Fig. 1.

Fig. 6 is a view similar to Fig. 5 taken on the line 6—6 of Fig. 2.

Fig. 7 is a view similar to Fig. 5 taken on the line 7—7 of Fig. 3.

Fig. 8 is a view similar to Fig. 5 taken on the line 8—8 of Fig. 4.

Referring to the drawings by characters of reference, it will be seen that the illustrated shotgun comprises a receiver **1** having a counterbore **2** in which there is received a barrel extension **3** secured to or integral with a barrel **4**. A magazine tube **5** extends into the receiver in axial parallelism with the barrel and is rigidly secured to the receiver, as by a furnace or induction brazing operation. The magazine tube houses the usual magazine follower **6** and follower spring **7**, the latter abutting at its forward end against a magazine spring retainer **8**. A barrel guide ring **9** is secured to the barrel **4** in position to embrace the forward end of the magazine tube when the barrel extension is seated in the receiver. Assembly of the barrel to the receiver may be maintained by the magazine cap **10** which threadably engages the magazine tube and bears against the forward face of the barrel guide ring **9**. The cap is releasably retained in position by a detent plunger **11** and spring **12** housed in the barrel guide ring and engageable with suitable notches **13** in the rear face of the magazine cap.

A fore-end **14** is secured on a sleeve **15** between an abutment **16** and the nut **17** to provide a hand grip for operating the action. Secured to the rear end of the sleeve **15**, as by a brazing operation, and having portions forming the abutment **16**, are a pair of laterally spaced rearwardly extending action bars **18** and **19**. These action bars extend into the receiver and are there guided for reciprocation in suitable tracks **18***a* and **19***a* formed in the side walls of the receiver.

Breech locking action

The upper surface at the rear end of each action bar is cut away to interengage with notched laterally projecting guide ribs **20** and **21** formed integrally with the breech bolt slide **22**. These guide ribs are received, with the action bars, in the guide tracks **18***a* and **19***a* in the receiver and constrain the slide **22** to straight reciprocating movement within the receiver. A generally rectangular lug **23** formed on the slide is received in an aperture **24** in the body of the breech bolt **25**. This lug fits closely within the aperture in a lateral direction and limited longitudinal movement of the lug within the aperture is permitted. By this means, the breech bolt, which is of a shape complementary to the inside of the receiver above the guide tracks **18***a* and **19***a*, is also constrained to straight fore and aft movement in the receiver.

The slide aperture **24** also receives the locking block **26** which is formed to define on its lower surface a breech locking cam **27** and a breech unlocking cam **28**, both of which cooperate with the slide lug **23**. As will be noted from Fig. 9, the locking block is of inverted U-shaped cross-section and straddles the firing pin **29** and firing pin retracting spring **30**. The upper surface of the block is formed to define a locking lug **31** which engages a lock-

ing recess 32 in the barrel extension. The rear end of the upper surface of the locking block is relieved at 33 to permit the locking block to turn about an imaginary center under the urging of either of the cams 27 or 28 without allowing the locking block to bind or rattle in the receiver.

It will be noted that the upper surface of the slide lug 23 is raised somewhat at the front end and that the locking block is more deeply indented on its lower surface immediately to the rear of the locking cam 27. This lack of symmetry is deliberately introduced to make it impossible to assemble the gun with the locking block in reversed position.

As will be noted in Fig. 1, the slide lug 23 has been drawn forward by the action bars completely past the locking cam 27 and is fully beneath the front end of the locking block securely holding the lug 31 in the recess 32. The forces incident to the explosion of a chambered shell are transmitted through the breech bolt to the front face of the locking block and through the locking block to the barrel extension. As long as the action bars are in their fully forward position, the breech block will be locked to the barrel extension and only a small percentage of the locking loads due directly to gas pressure in the barrel will be shared with the receiver. Since the receiver serves mainly to guide the parts and to transmit recoil forces to the buttstock, the receiver design or material specification is not particularly critical and a light weight action is possible without sacrificing safety or durability.

As shown in Fig. 2, the fore-end and action bars may be drawn rearwardly after firing, disengaging the lug 23 on the slide from the breech locking cam 27 and immediately thereafter engaging the unlocking cam 28. This operation causes the locking block to turn about a fulcrum in contact with the top of the receiver and disengages the locking lug from the recess in the barrel extension. After the locking block has reached its fully unlocked position, the lug 23 on the slide contacts the rear end of the aperture 24 in the breech bolt and thereafter carries the breech bolt with it to the position shown in Fig. 3.

Fig. 4 shows the mechanism during the closing stroke of the breech bolt and it will be noted that, although the slide lug is engaging the breech locking cam on the locking block, the locking lug simply slides along the smooth top of the receiver and barrel extension until the breech bolt reaches its foremost position. At that point, the locking lug swings into the recess in the barrel extension and the slide lug moves in completely beneath the front end of the locking block to retain it in locked position. An action bar lock 34, actuated by means to be later described, is provided to engage the rear end of the left hand action bar to retain the mechanism locked until the shell has been fired or the action bar lock manually released.

As a safety feature, the head of the firing pin 29 is enlarged and cooperates with buttresses 35 formed in the walls of the slot in the locking block to insure that the firing pin cannot be caused to protrude from the face of the breech bolt unless or until the breech bolt is securely locked to the barrel extension. In addition to the safety function of preventing firing from an unlocked breech, this action positively retracts the firing pin, in case the retracting spring has failed to accomplish its function, and thus avoids any chance that a protruding firing pin might interfere with ejection.

Shell feeding

As in the usual repeating shotgun, shells are retained in a magazine 5 under the urging of a follower 6 and spring 7 and fed therefrom to the chamber as needed to replace shells fired therein. The release of shells from the magazine is under the control of a right hand shell latch 43 and a left hand shell latch 44, and these latches are, in turn, controlled by the right and left hand action bars, respectively, 18 and 19.

The shell latches 43 and 44 are each a generally flat spring member received in corresponding longitudinal grooves in the side of the receiver in substantial opposition to the edges of a horizontal plane including the diameter of the magazine tube. At the rear end of the shell latches, the edges of the grooves are deformed by a staking operation to temporarily retain the latches during assembly. After assembly, they are confined in their grooves in the receiver walls by the trigger plate 45 which has a tight fit between the receiver walls and is secured therein by a front trigger plate pin 46 and a rear trigger plate pin 47. The spring action of the shell latches is such that they normally extend into the receiver in position to block the escape of shells from the magazine tube. The right hand shell latch is provided with an upwardly extending cam lug 48 and a similar lug 49 is provided on the left hand shell latch. Each of these lugs extends into the track occupied by its respective action bar in position to be controlled by the cam surfaces and clearance cuts in the lower edge of the action bars. Figs. 1 through 4 show the left hand action bar 19 in elevation with the lower edge cut away at 50 to permit the left hand shell latch 44 to extend into shell stopping position. A cam surface 51 is provided and cooperates with the cam lug 49 to withdraw the left hand shell latch just prior to the time the breech bolt and action bars reach their rearmost position in the receiver. Figs. 5 through 8 show the operation of the shell latches and correspond directly to Figs. 1 through 4. From these figures, it can be seen that the left hand shell latch is in shell stopping position during all portions of the cycle except while the action is completely open.

Although the right hand shell latch 43 is not shown in elevation, it is formed the same way as the left hand latch except for the different position of the cut-away portion 52 and cam 53. These elements are indicated by dotted lines on Figs. 5 through 8 and from consideration of these figures, it will be seen that the right hand shell latch 43 is held in an inactive position when the action is locked and remains inactive except during a time interval somewhat longer than that in which the left hand latch is inactive. At least one of the shell latches is always in active position to prevent uncontrolled release of shells. It will be further noted that the left hand latch is positioned so that its active front edge is somewhat further from the mouth of the magazine than the front edge of the right hand latch.

Reviewing the action of the shell latches, it will be seen that the left hand latch is active and holding a shell in the magazine when the breech is completely closed, as in Fig. 5. As the action is opened, the right hand action bar presents its cut-away portion opposite the cam lug 48 and the right hand latch moves into active position, as shown in Fig. 6. However, by reason of the difference in the fore and aft position of the latches, the right hand latch is forward of the rim of the shell, then retained by the left hand latch, and cannot influence the motion of that shell. As the action reaches very nearly the maximum breech opening, the cam 51 on the left hand action bar engages the cam lug 49 and moves the left hand shell latch to inactive position, as shown in Fig. 7, releasing the rearmost shell to spring rearwardly into position to be raised into the action. At the same time, the right hand latch catches the succeeding shell. As the action is closed, the released shell is aligned with the chamber by means to be presently described and inserted thereinto by the breech bolt. As the cut-away portion 50 of the left hand action bar comes opposite the cam lug 49, the left hand latch returns to active position, as shown in Fig. 8. Shortly before the action reaches its fully closed position, the cam 53 engages the cam latch 48, releasing the right hand latch and permitting the shell to move rearwardly into engagement with the left hand latch, as again shown in Fig. 5.

The shell released from the magazine when the action is open is raised into position in front of the breech bolt

by a carrier **54**, pivotally mounted on the trigger plate **45** by means including a carrier pivot tube **55** through which the front trigger plate pin **46** extends in securing the trigger plate. This carrier is generally similar to those employed in Browning Patents Nos. 659,507, 689,283, and 710,094. Like the constructions shown in those patents, the carrier extends rearwardly behind the pivot and there furnishes pivotal support for a carrier dog **56**. A carrier dog spring **57** and plunger **58** are received in a bore in the trigger plate and act on the carrier dog, urging the dog to swing clockwise on its pivot to a position at substantially right angles to the carrier and after contacting the stop shoulder **59** to swing the carrier to a normal downward position. When shells are to be loaded into the magazine, the carrier may be raised against the spring **57** and the curved lower face thereof serves as a loading ramp directing a shell into the magazine tube where it is retained by the left hand shell latch **44**. The upper face of the carrier dog is formed to define a heel **60** and a toe **61**. As the breech bolt slide **22** rides thereover when the bolt is retracted, the carrier dog, as shown in Fig. 3, is forced to turn counter-clockwise, compressing the carrier dog spring, and through a leverage action, acting to hold the carrier in its lowermost position. A notch **62** in the lower face of the slide catches the heel **60** of the carrier dog as the breech bolt and slide are moved forwardly. During this forward movement, the carrier dog acts as a strut between the slide and the rear end of the carrier, with the inevitable result that the front end of the carrier moves up to position the shell previously released by shell latch **44** in front of the breech bolt. During this movement, control of the shell is rendered more certain by the provision of a finger **63** on the right hand edge of the carrier. In certain positions, particularly when single loading through the ejection port and operating the action slowly, this finger may prevent dropping a shell through the ejection port. As the breech closing portion of the operating cycle reaches the point shown in Fig. 4, it will be noted that the toe **61** of the carrier dog is working against the bottom face of the breech slide and that only a little more movement will result in prying the heel of the carrier dog out of the notch **62** and releasing the carrier to return under spring-urging to its normal lower position. With the action in completely closed position, a slot **64** in the breech bolt slide and an aligned recess in the bottom face of the bolt receive the finger **63** to permit the carrier to be displaced upwardly for loading shells into the magazine, as previously described.

Fire control

The fire control assembly for this gun is, in most respects, identical in parts and in operation with the mechanism shown in the copending application of L. R. Crittendon, Serial No. 79,368, filed March 3, 1949, now Patent No. 2,570,772, issued October 9, 1951. In this case, the only substantial change has been to make the action bar lock **34** integral with the disconnector **65** and to provide an action bar lock finger piece **66** extending through a slot in the bottom of the trigger plate **45**. Both types of fire control are claimed in the copending Crittendon application, Serial No. 204,706, filed January 6, 1951, now Patent No. 2,675,638, issued April 20, 1954, which is a continuation-in-part of application Serial No. 79,368, above noted, to now be Patent No. 2,570,772.

To briefly review the operation of these fire controls and thus minimize the need for reference to the above-identified copending applications, it may be pointed out that the trigger **67** is pivotally mounted in the trigger plate **45** and provided at a point above its pivotal mounting with means arranged to pivotally receive a connector assembly **68** comprising a right hand connector arm **69** and a left hand connector arm **70**, both extending in a generally forward direction. When assembled to the trigger, these arms act as a unit. A sear **71** is also pivotally mounted in the trigger plate and at its upper end engages a compression spring **72** which acts at its rear end upon the connector assembly. This spring thus serves to urge the upper end of the sear forwardly and the upper end of the trigger rearwardly while simultaneously urging the arms of the connector to swing downwardly. The upper end of the sear is also formed to define a hammer hook **73** which is adapted to engage the hammer **75** at notch **75***a* and thereby to releasably retain the hammer in cocked position. The right hand connector arm **69** is arranged to act on a step **74** on the sear and, when the trigger is pulled, will urge the sear to swing upon its pivot and release the hammer **75**. A clearance recess **71***a* is also formed in the sear adjacent the step **74** to receive the end of the arm **69** and to permit the trigger to be held back without effect upon the sear. The connector may be moved to this inactive position by means of a disconnector **65** which is pivotally mounted near the forward end of the trigger plate and engages beneath the forward end of the left hand connector arm **70**. The disconnector may be actuated manually by means of depression of the action bar lock finger piece **66** which, at the same time, operates the action bar lock **34**, permitting the action bars to be drawn rearwardly, unlocking the action. The disconnector is also operated as a function of the fall of the hammer **75** by means which include a short arm **76** on the disconnector positioned in the path of the hammer spring plunger **77**. The very last stage of hammer plunger movement in this way swings the disconnector into operation and releases the action bar. However, the end of the action bar lock and the action bar have a frictional engagement such that no component of pull on the action bar acts to swing the disconnector into disconnecting position. Instead, the engagement is, at a minimum, arranged so that a rearward pull on the fore-end **14** will apply sufficient frictional force at the engaging faces to prevent the disconnection from taking place until that rearward pull is relaxed. At a maximum, the surfaces may engage at such an angle that actual forward movement of the action bars is required before disconnection is possible. When the gun fires normally, such a relaxing or actual forward movement is involuntary as the gun recoils relative to its support by the fore-end. In a misfire, or hangfire, this relationship prevents unlocking the action involuntarily with the hazard of a hangfire exploding with an unlocked breech. When the disconnector has operated, the trigger will remain inoperative until the action has been again closed and completely locked with the action bar lock in its proper place. Thus, the trigger cannot be accidentally pulled to fire the shell as the breech is being closed. Further, if the trigger is held back while the action is operated, the sear will retain the hammer until such time as the trigger has been released and the action bar lock engaged. The usual type of manually operable cross bolt safety **78** is also provided to positively block inadvertent trigger operation when the gun is carried loaded and locked. This fire control is as safe as possible in that it may be positively locked, cannot fire on an open breech, cannot fire a second shot without deliberately releasing, and cannot be involuntarily opened during a hangfire. Further, it will be noted that the sear and trigger are centrally pivoted and thus almost perfectly balanced with respect to jolts and jars from any direction. Substantially the only condition which could cause accidental firing if the gun were dropped or otherwise jarred with the safety off would be an actual physical impact of the trigger upon some relatively fixed object.

Take-down

This gun may be taken down for cleaning or packing by simply removing the magazine cap and pulling the barrel and barrel extension forwardly out of the receiver. Obviously, in the case of the shooter who desires to use interchangeably a long full choke barrel and a shorter open bored barrel, costs will be at a minimum. With

most of the presently available types of take-down guns, it is necessary also to replace the magazine tube, fore-end, and action bar assembly.

The breech bolt and fore-end assembly may be readily removed for further cleaning or inspection by inserting the finger into the receiver from the bottom and manually depressing the left hand shell latch **44** to disengage the cam lug **49** thereon from the forwardly facing stop abutment **50***a* formed by the rear terminus of the cut-away **50** in the left hand action bar **19**. The fore-end, action bars, and breech bolt assembly may then be removed through the front of the receiver vacated by the previous removal of the barrel. The locking block may be lifted from the recess in the breech bolt, the bolt lifted from the breech bolt slide, and the slide disengaged from the inter-engaging notches in the action bars. Assembly of the breech bolt mechanism may be performed in the reverse order, it being noted, however, that it is necessary to manually depress the right hand shell latch **43** to clear the lug **48** from the path of the right hand action bar **18** and, after a short further movement, to perform the same operation on the left hand shell latch **44**. The assembly may then be completed by pulling rearwardly on the fore-end and the barrel replaced by reversal of the initial take-down operation. Although not ordinarily necessary for cleaning or inspection, the fire control assembly may be readily removed by pushing out the front and rear trigger plate pins and removing the trigger plate from the bottom of the receiver.

Although a specific slide operated shotgun has been illustrated and described in detail, it will be obvious that features of our invention are applicable to other types of weapons. For example, the breech locking mechanism would function equally well if the slide were operated from a gas piston and the only other required change within the receiver would be to trim off the end of the action bar lock to permit its ready depression by rearward movement of the action bars. Similarly, the same breech locking means could be utilized in a recoil operated gun by the simple expedient of coupling an action closing spring to the slide, as in the copending Crittendon application Serial Number 79,368, previously referred to.

Accordingly, it is not intended that the invention be considered as limited to the specific construction shown, and reference may be made to the appended claims for a definition of the scope of our invention.

We claim:

1. In a firearm having a receiver, a breech bolt mechanism reciprocably mounted therein, and a tubular magazine opening thereinto, the combination comprising a pair of laterally spaced reciprocable action bars extending into said receiver and operatively connected to the breech bolt mechanism; a pair of shell latches mounted in said receiver in lateral spacing corresponding to that of said action bars and spring urged to a position closing the opening to said magazine; and cam means on each of said action bars engageable with the shell latch corresponding thereto and arranged to move said latch to a position clear of said magazine opening, said cam means being longitudinally spaced on said action bars to effect the controlled release of a single shell only for each reciprocation of the action bars.

2. The combination described in claim 1, one of said shell latches being positioned nearer the mouth of said magazine than the other of said latches, the cam for said nearer latch being arranged to hold the nearer latch out of magazine blocking position until after a shell has been urged into contact with said other latch, whereby said other latch may control the release of a shell from the magazine and said nearer latch prevent the simultaneous release of succeeding shells.

3. The combination described in claim 2, said action bars being formed to define at least one forwardly facing stop abutment engageable with a rearwardly facing surface on one of said shell latches to limit forward movement of the action bars and the breech bolt mechanism connected thereto.

4. A shotgun comprising in combination a receiver; a tubular magazine secured to said receiver; a barrel having a guide ring embracing the magazine and a barrel extension received in the receiver and providing a breech locking shoulder therein; a cap on the magazine tube engaged with the face of said guide ring remote from the receiver to retain the barrel in the receiver; a fore-end longitudinally slidable on the magazine tube; a pair of laterally spaced action bars rigidly assembled with the fore-end and extending rearwardly therefrom into said receiver; opposed guide tracks formed in the walls of the receiver to guide said action bars in reciprocation; a breech bolt slide supported for reciprocating movement along said guide tracks within the receiver by engagement between both of the action bars and the corresponding guide tracks; a breech bolt supported on said breech bolt slide for reciprocation therewith and with capacity for limited reciprocation relative thereto; a tiltable locking block supported in said breech bolt and arranged for co-operation with said slide to tilt the locking block as a function of relative reciprocation between said breech bolt and said slide; and a locking lug on said locking block adapted for interengagement with said breech locking shoulder.

5. A shotgun as described in claim 4, having a pair of shell latches, laterally spaced and each positioned adjacent one of the action bars to control the release of shells from the magazine; and cam means formed on each action bar for engagement with and control of the corresponding shell latch.

6. A shotgun as described in claim 5, at least one of said action bars being formed to define a forwardly facing stop abutment engageable with a rearwardly facing surface on the corresponding shell latch to limit forward movement of the action bars and prevent inadvertent removal of the breech mechanism when the gun has been taken down by removal of the barrel.

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