Aug. 11, 1953 A. A. DICKE 2,648,153

OPERATING LEVER MEANS FOR BREECH CLOSING MECHANISMS

Original Filed Feb. 9, 1945 2 Sheets-Sheet 1

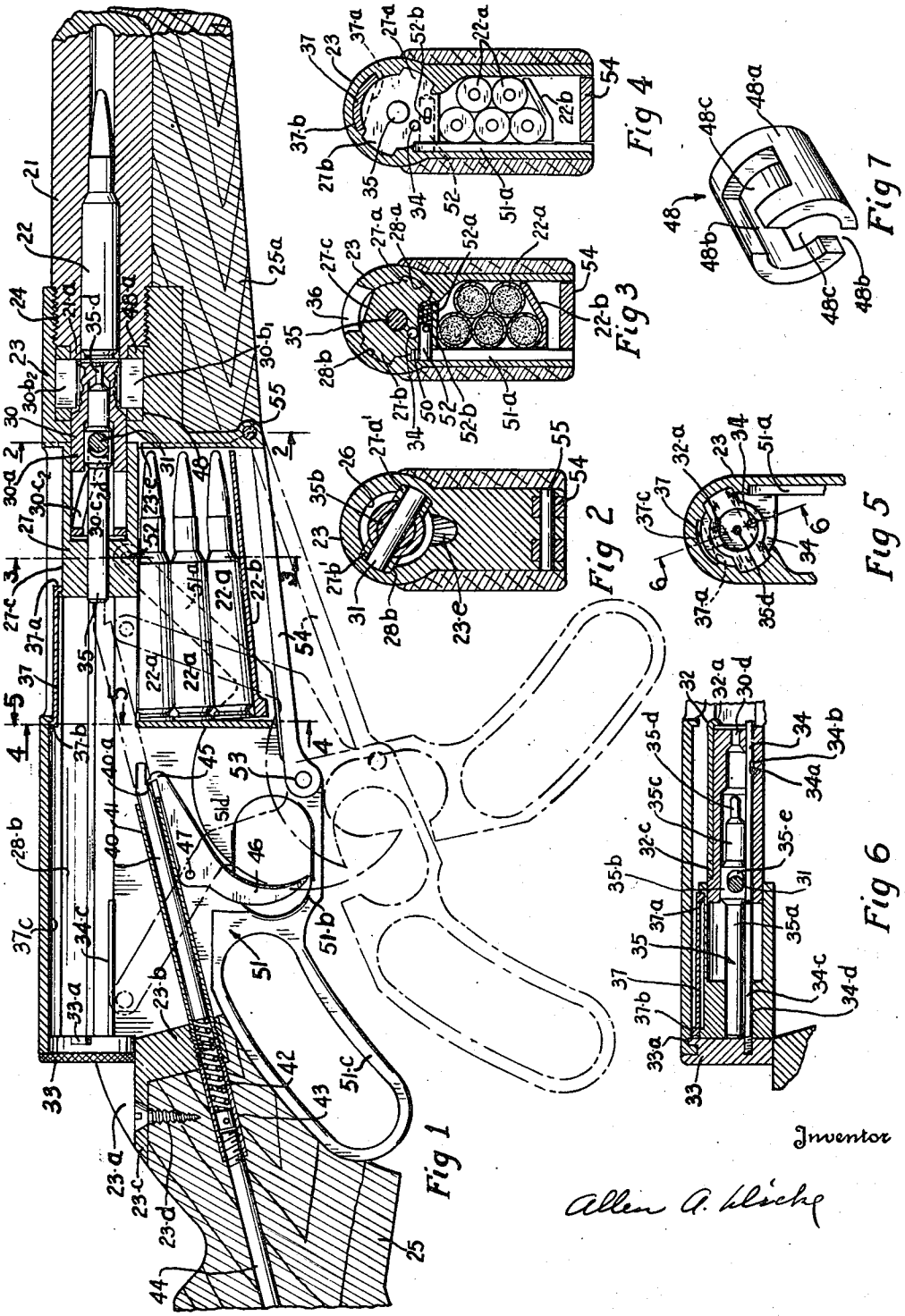


Fig 1

Fig 4

Fig 3

Fig 2

Fig 7

Fig 5

Fig 6

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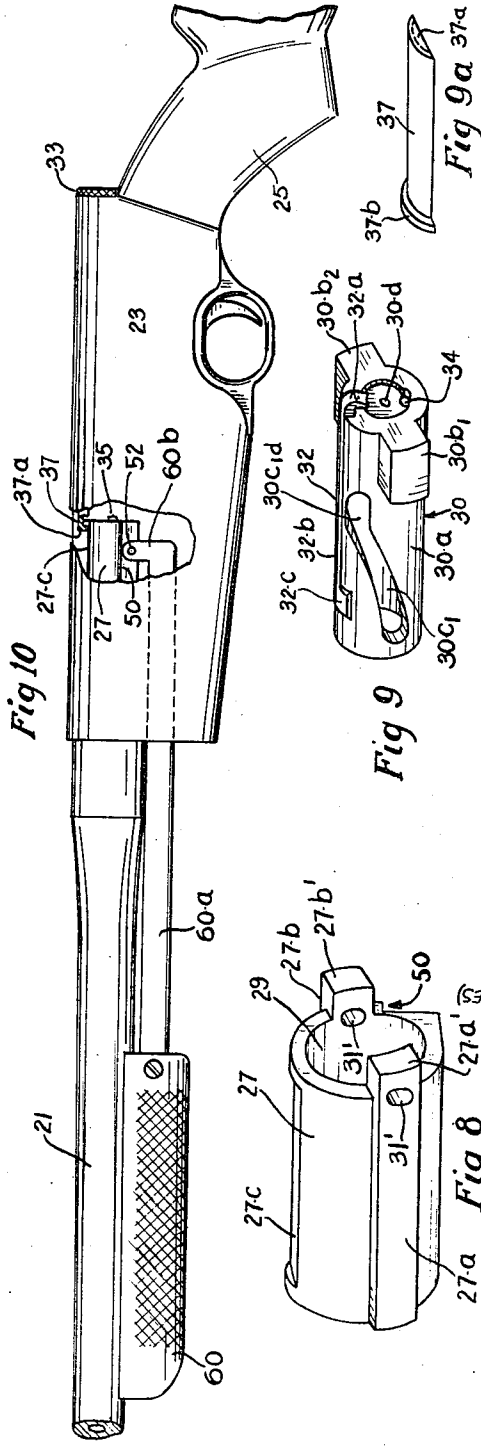


Fig 10

Fig 9a

Fig 9

Fig 8

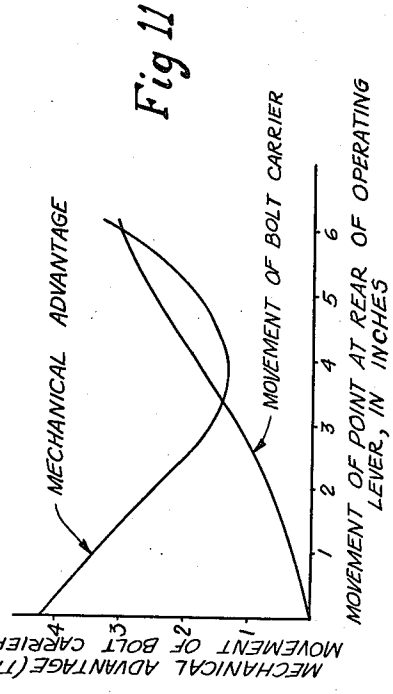


Fig 11

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OPERATING LEVER MEANS FOR BREECH CLOSING MECHANISMS

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Original application February 9, 1945, Serial No. 576,967. Divided and this application May 21, 1949, Serial No. 94,540

4 Claims. (Cl. 42—16)

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This invention relates to improvements in operating lever for breech bolt and this application is a division of application S. N. 576,967, filed February 9, 1945 (Patent 2,484,694, October 11, 1949). The invention has for an object to provide an improved rotary bolt firearm construction, most of the parts of which may be utilized in such guns whether the repeating operation is effected by a lever action device, a sliding fore-end, or is of the "straight-pull" construction.

Another object is to provide improved guns in which the breech is closed by means of a bolt having one or more locking lugs preferably near its front end, which bolt is helically connected to a bolt carrier, which is slidably mounted in a receiver.

Another object is to provide improved operating means for such a gun comprising a hand lever pivoted at its upper and forward end to the breech closing member, such as a bolt carrier, and is pivoted at an intermediate point to a supporting link which is in turn pivoted to the receiver, whereby movements of said lever and link are such that the pivoted forward end of the operating lever may move rectilinearly, as enforced by the path of movement of the breech closing member whereby powerful leverage may be applied to the breech closing member during the early part of its movement while unlocking and extraction occurs.

Another object is to provide a bolt carrier, the rear end of which is located forwardly of the rear of the cartridge magazine, so as to permit of a corresponding shortening of the receiver, together with the provision of means for keeping closed that portion of the ejection opening located rearwardly of the bolt carrier.

Another object is to provide an improved arrangement for detachably connecting such an operating lever to the bolt carrier or other breech closing member or part thereof, said connection being accessible when the breech closing member is in its extreme rearward position so that the breech closing member may be withdrawn rearwardly from the gun.

Another object is to provide such a gun operated by means of a slidable fore-end and an action bar connected therewith and also to the breech closing member by means of a conveniently detachable means.

Another object is to provide an improved bolt lug abutment collar which is formed separately from the receiver and the barrel so that accurate abutment surfaces may be generated thereon to assure close mating engagement between the rear lug faces and the forwardly facing abutment faces, and likewise between the forward lug faces and the rearwardly facing abutment faces in such abutment collar.

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Further objects and advantages of this invention will be apparent from consideration of the specification as illustrated by the accompanying drawings of possible embodiments of the invention, in which drawings:

Fig. 1 is a vertical, substantially medial, cross-sectional view of a rifle intended for powerful bottle-necked cartridges, such as the 30–06 caliber Springfield cartridge, the operating mechanism being of the lever type,

Figs. 2, 3 and 4 are cross-sectional views taken along the lines 2—2, 3—3 and 4—4 of Fig. 1, respectively,

Fig. 5 is a cross sectional view, partly fragmentary, taken substantially along the line 4—4 but looking rearwardly, the breech mechanism being in its extreme rearward position,

Fig. 6 is a fragmentary cross-sectional view taken along the line 6—6 of Fig. 5, looking in the direction of the arrows,

Fig. 7 is a perspective view of the lug abutment collar,

Fig. 8 is a perspective view of the bolt carrier shown in Figs. 1 to 6, inclusive,

Fig. 9 is a perspective view of the bolt,

Fig. 9A is a perspective view of a shield for the ejection port,

Fig. 10 is a fragmentary side elevation, as viewed from the left, of a gun of the same type adapted for fore-end operation; and

Fig. 11 is a chart showing the movement of the breech closing member in relation to movements of the operating lever, and the mechanical advantage ratio of said lever relative to said member.

Referring primarily to Figs. 1 to 9, inclusive, the numeral **21** indicates a barrel of more or less usual construction formed with a chamber adapted to receive a cartridge **22**. The barrel is attached to a receiver **23** by any suitable means, such as screw threads **24**. The receiver has secured to it a stock **25** of wood or the like which may extend forwardly to provide the fore-end **25***a* and to enclose the lower part of the sides of the receiver. However, in the form shown in Fig. 10 the stock **25** terminates at the rear end of the receiver, which is entirely exposed, as is usual in sporting rifles.

The receiver is generally hollow, being formed with a bore **26** corresponding generally to the desired diameter of the bolt carrier **27** from a point at its rear open end to the forward end of the bolt carrier when the latter is in its extreme forward position. The bolt carrier **27** is formed with two guides or keys **27***a* and **27***b*, and the receiver is formed with corresponding guideways **28***a* and **28***b*, so that the bolt carrier is free to slide axially within the receiver but is prevented from rotating therein. As shown in Fig. 8, these keys are provided with forward extensions **27***a*′

and 27b', respectively, for a purpose to be described later.

The bolt carrier is formed at its forward end with a cylindrical bore 29 extending about two-thirds the length of the bolt carrier and serving to receive the shank portion 30a of a bolt 30, the forward end of which is provided with locking lugs $30b_1$ and $30b_2$. The shank of the bolt is provided with generally helical slots $30c_1$ and $30c_2$. The bolt is connected to the carrier by means of a pin 31, which preferably extends entirely through the bolt carrier and bolt, as shown. The generally helical slots are so located that their rearward ends are in line with the lugs $30b_1$ and $30b_2$. This is desirable because it causes the lugs to be in line with the guide grooves 28a and 28b so that they may be guided thereby during the rearward excursion of the bolt. This prevents unwanted rotation of the bolt. By having the helical slot located as described, the cross pin 31 may be located in alignment with the guide ribs 27a and 27b of the bolt carrier, being supported in holes 31' therein. (See Fig. 8.) This provides a stronger support for the pin 31 and permits making the balance of the walls of the bolt carrier thinner than would otherwise be the case.

In the form shown the bolt is rotated about 60° between its locked and unlocked positions. The lugs are substantially vertical in the locked position and are at an angle of about 30° from the horizontal in their unlocked position (see Fig. 5). This makes a desirable arrangement since the extractor of the construction shown must be located between the lugs and must, at the same time, be so located that the ejection opening will be in a satisfactory location. This is made possible by the arrangement shown, as the ejection opening can be made to face upwardly and slightly to the right (along the line 6—6 of Fig. 5 and as is apparent from Fig. 3). At the same time the generally helical slots $30c_1$ and $30c_2$ are so located that neither one is in line with the extractor 32 (see Figs. 5, 6, and 9). The extractor may be made relatively long and springy if desired. The extractor has a claw 32a which normally overlies the rim of the chambered cartridge and a shank portion 32b, the rear end of which is formed with a transverse dovetail 32c fitting in a corresponding slot in the bolt shank. The shank 32b of the extractor lies in a clearance slot in the bolt. Its external dimensions are such that clearance is provided to permit the extractor claw to pass over the cartridge into the extraction groove, and the extractor shank is made sufficiently thin and springy to permit this action.

The forward and rear faces of the locking lugs $30b_1$ and $30b_2$ are preferably made as helical surfaces of quite low pitch so that the helix angle is considerably smaller than the angle of repose. This construction provides a powerful primary extraction, since a comparatively small axial movement is enforced as a result of a rotary movement of some 60°. Furthermore, the lead of the helical slots $30c_1$ and $30c_2$ is comparatively great so that the rearward force applied to the bolt carrier provides a rearward extractive pull on the cartridge case many times said force. Furthermore, the rearward force applicable to the bolt carrier is multiplied greatly during the preliminary part of its movement by the lever operating mechanism to be described later. It will also be noted that the extractor rotates with the rotating bolt during the time of primary extraction so that a torque is applied to the cartridge case, tending to twist the case out of the chamber, and thereby facilitating the original, occasionally difficult, part of the extraction. Since the extractor lies in a groove in the bolt it is well supported against peripheral movement and, therefore, is well capable of applying such an extractive twist to the cartridge case.

The rear part of the receiver bore is shown closed by a closure plug 33, which has a generally cylindrical forward portion fitting into the bore 26 and is provided with lugs 33a capable of being seated in corresponding recesses in the receiver body. In order to remove the closure, it is twisted to the required extent and then withdrawn axially of the bore, that portion of the receiver being preferably formed as shown at 23a to permit such removal.

In order to provide for a satisfactory ejection of the fired cartridge case, the bolt may be formed as shown with a bore parallel with its axis arranged diametrically opposite the extractor (see Fig. 5), within which is housed an ejector pin 34 preferably held in place by a pin 34a carried by the bolt and received in part in a slot 34b in the ejector pin (Fig. 6). An ejector operating pin 34c is carried by the closure 33 in such a position that when the bolt is rotated to unlocked position it aligns with the ejector pin 34, therefore as the bolt carrier approaches the rearward limit of its excursion (as shown in Fig 6), the ejector operating pin 34c passes through an opening 34d in the bolt carrier and its front end stops the movement of ejector pin 34, causing its forward end to throw the cartridge case out of the receiver in a direction upwardly and to the right, as viewed from the shooter's position.

Firing pin 35 may consist of a shank portion 35a, an enlarged central portion 35b, a forward shank portion 35c, and a striker part 35d which is in line with a small opening 30d in the forward end of the bolt. The firing pin is formed with an elongated opening 35e, through which the cross pin 31 normally passes. Thus the cross pin not only serves to hold the firing pin against excessive rearward movement, but draws the firing pin rearwardly away from the cartridge as soon as the bolt carrier moves rearwardly. Furthermore, it prevents the firing pin from reaching the cartridge until the action is fully closed. To accomplish the latter purpose, the helical slots $30c_1$ and $30c_2$ are each formed with a dwell portion $30c_{1d}$ (Fig. 9) and $30c_{2d}$ (shown in dotted lines in Fig. 1) at their forward end. It will be seen further that the bolt will have been completely rotated to locked position before the bolt carrier is fully forward, so that the cross pin 31 holds the firing pin away from the cartridge until after the bolt carrier is given an additional forward movement. This dwell construction has the further advantage that rearward thrust of the bolt at the moment of firing, which might occur if excessive head space is present, is not capable of applying a rearward thrust to the cross pin and, therefore, to the bolt carrier which might, under certain conditions, cause the gun to shoot open.

It will be noted from Fig. 6 that the enlarged central portion 35b of the firing pin is formed with a groove to receive the rear portion of the ejector pin 34.

It will be noted that the rear end of the bolt carrier does not reach to the rear limit of the cartridge magazine and the ejector port, which is

designated 36 (see Figs. 1 and 3). In this way it is possible to shorten the receiver and therefore to reduce the length of the entire arm. This, however, leaves an opening comprising that part of the ejection port to the rear of the bolt carrier. This would be unsightly and would permit the entry of dirt, twigs, leaves, etc., which might interfere with the functioning of the arm. Means are provided to close this opening which, at the same time, are so arranged as not to prevent the bolt carrier from moving all the way back into engagement with the receiver closure cap 33. These means in the form shown comprise a cylindrical shield 37 (Figs. 1, 4, 5, 6, and 9*d*). The internal radius of such shield may preferably correspond to the external radius of the bolt carrier 27. It is, however, provided at its forward end with an inwardly extending flange 37*a* (shown in dotted lines in Figs. 4 and 5, and in cross-section in Fig. 6, in perspective in Fig. 9*a*, and in full in Fig. 10). This flange rides upon a flattened portion 27*c* formed at the top of the bolt carrier 27 (see Figs. 1, 3, 8, and 10). The external radius is slightly greater and the thickness of material is accommodated by a corresponding cut 37*c* in the interior of the receiver (Figs. 1 and 5). This cut is also made sufficiently deep to accommodate an outwardly extending flange 37*b* formed on the shield. It will be seen, therefore, that when the breech mechanism is in closed position the shield 37 will be drawn into the position shown in Figs. 1 and 10, but that when the action is fully open the shield 37 will be pushed backwardly to the position shown in Fig. 6; this resulting from the engagement of the forward end of cut-away portion 27*c* on the bolt carrier with the forward edge of the flange 37*a* on the shield 37. This mechanism provides a simple, cheap, foolproof arrangement for closing the opening referred to and makes possible the shortening of the receiver and, therefore, the shortening of the arm as a whole.

The rear end of the firing pin 35 must necessarily terminate at a point forwardly of the rear of the base of the cartridges in the magazine and the hammer must be so arranged that it normally lies to the rear of the magazine but must be able to reach upwardly and forwardly to strike the firing pin. This may be accomplished by a pivoted hammer with a forwardly extending nose but it is preferred to use the form of construction shown in Fig. 1. Therein the hammer comprises a longitudinally slidable rod 40, preferably slidably mounted in a tube 41 inclined at an angle, as shown. Within said tube to the rear of the hammer is shown a coil spring 42 shown as housed in part in a tube 43 in line with tube 41. These tubes are shown supported by being threaded into an extension 23*b* of the receiver 23, which also has a rearward extension 23*c* fitting against the stock 25 and secured thereto by means of screw 23*d*. The tube 43 may conveniently serve as a connecting point for a stock bolt 44 passing through to the butt of the stock. The hammer is provided with a sear notch 40*a* receiving the hook of a sear 45 operated at will by a trigger 46, which is shown as formed integral with the sear, the sear trigger member being pivoted at 47 and biased counterclockwise by any suitable spring (not shown). It will be readily understood that with the hammer in the position shown in Fig. 1 when the trigger is pulled the hammer will be released and will be urged forwardly and upwardly by spring 42 until it strikes the rear end of firing pin 35 (dotted line position). This drives the firing pin forwardly causing its end 35*d* to strike and explode the primer of the cartridge 22. When thereafter the action is opened by drawing the bolt carrier 27 rearwardly, the hammer 40 is forced rearwardly and downwardly by the firing pin and then by the rear face of the bolt carrier until it assumes substantially the position shown in full lines where its forward end has escaped below the bottom of the bolt carrier so that the bolt carrier may continue its rearward movement until it engages or substantially engages the closure cap 33. In the meantime the hook of the sear 45 is engaged in the sear notch and thus holds the hammer in retracted position ready for firing the next shot.

The bolt lugs 30b_1 and 30b_2 may inter-engage with locking abutment surfaces formed integral with the receiver, in accordance with common practice. However, the present invention contemplates the provision of a separate member for this purpose. Said member may take the form of abutment collar 48 shown in perspective in Fig. 7. This consists of a continuous ring portion 48*a* and bifurcated rearwardly extending members formed by two longitudinal slots 48*b* into which the bolt lugs may pass when they are in unlocked position (Fig. 5), and generally circumferentially extending recesses 48*c* within which the bolt lugs are received when the bolt has been tuned to locking position (vertical in the form shown). In order to secure firm seating of the cartridge in the chamber and particularly to provide primary extraction, the surfaces defined by the recesses 48*c* preferably extend helically. This helix is of such small advance per turn that the angle is considerably smaller than the angle of repose so that no amount of thrust against the bolt face will cause the bolt to turn to unlocked position. The parts are so dimensioned that the lugs, which have correspondingly-formed helical forward and rearward faces, fit rather closely in the recesses 48*c*. Therefore, as the bolt is rotated toward locking position it is "screwed" forwardly to seat the cartridge in the chamber and when rotated to unlocking position the bolt is "screwed" rearwardly. This will be sufficient to cause primary extraction, i. e., to cause the extractor to loosen the fired case from the chamber.

The abutment collar 48 is located in a counter bore in the receiver (Fig. 1) with its forward continuous section 48*a* surrounding a reduced extension 21*a* on the barrel. This is preferably fitted quite closely so that the ring 48*a* will serve to strengthen the chamber against the explosion pressure.

The advantage of forming the lug-engaging surfaces in a separate member, such as 48, is that it is difficult or impossible to generate properly formed surfaces of this type within the receiver. When made as shown in Fig. 7, the surfaces may be generated accurately on a milling machine by using end mill or a slotting attachment. Such a helical surface is the only one whereby relative rotation will produce corresponding relative axial movement while maintaining full surface contact. This assures proper seating of the cartridge, minimum head-space, and easy extraction.

The arms shown as illustrative of the invention are of the box magazine type, i. e., extra rounds 22*a* are stored in a box magazine below the bolt carrier, these rounds being urged upwardly by means of a follower 22*b* of the usual construction urged upwardly by means of a

spring of usual construction (not shown). To facilitate transfer of the topmost round to the chamber, a bullet incline **23***e* is formed forward of the topmost round.

Means for operating the breech action by moving the bolt carrier **27** first rearwardly and then forwardly will now be described, attention being first directed to the lever operating device shown in Figs. 1 to 5, inclusive. The lower left side of the bolt carrier is shown cut away as at **50** to provide clearance for the arm **51***a* connected to an operating lever generally designated **51**. Said arm **51***a* is shown pivoted to the bolt carrier by means of a pivot pin or crossbolt **52** located in a bore in the bolt carrier and biased toward the left side of the gun by means of a spring **52***a*. This pin is preferably provided with a rearwardly extending pin **52***b* located in a slot in the rear of the bolt carrier (Figs. 3 and 4). Said pin is for the purpose of moving the pivot pin or crossbolt **52** toward the right for disconnecting the arm **51***a* from the bolt carrier when it is desired to remove the bolt carrier and associated parts from the receiver.

The operating lever **51** includes also a trigger guard portion **51***b* and a finger loop **51***c* in the usual manner. The operating lever **51** is shown hinged at **53** to a link **54**, the forward end of which is hinged as at **55** to the receiver or some member secured thereto.

By means of this construction a powerful leverage is assured during the early part of the movement of the bolt carrier since when the lever **51** is started downwardly it swings about hinge **55**. Since this hinge is only a short distance below the bolt carrier (measured perpendicularly to the line of motion of crossbolt **52**) a force multiplication of about 6 to 1 is attained. This applies a powerful rotative effort (torque) to the bolt, due to the high lead of the cam slots **30**c_1 and **30**c_2. This high torque acting through the small lead helix on the bolt lug faces and their mating surfaces in the member **48** provides an extremely powerful primary extraction.

Unlocking action of the bolt takes place during the comparatively long movement of lever **51** from the full line position to the first dotted line position, during which the most important work is done. During this time the link **54** moves from the full line position to its first dotted line position. Continued movement of lever **51** from the first dotted line position to the second dotted line position causes the link **54** to move upwardly until it resumes its original (full line) position. The bolt carrier has now achieved its rearmost position where it engages the closure lug **33**. During the last part of this motion ejection occurs through the means shown in Figs. 1, 5, and 6, as described hereinabove. At this time the topmost round has jumped upwardly, as is common in guns of this type, to a position ahead of the bolt face, which is now in the position shown in Fig. 6. Return movement of the lever **51** to its first dotted line position will cause the bolt carrier and bolt to move forwardly to the position where the cartridge is substantially fully seated in the chamber. Further movement of lever **51** to the full line position serves merely to rotate the bolt to locking position. During this time the bolt moves forward only that slight distance which is caused by the coaction of the helical surfaces on the bolt lug faces and the corresponding surfaces on the abutment collar **48**. This movement causes the cartridge to be firmly seated in the chamber. This lever arrangement permits the use of a swinging lever to apply rectilinear motion to a breech-closing member with a powerful leverage and by means of a construction which permits the use of a receiver of proper height, and permits the construction of a gun of this type with pleasing lines and without unduly large dimensions at the receiver. The lever **51** is also preferably formed with a slot closing shield **51***d* of segmental form lying in the plane of arm **51***a*. This is used only if the arm **51***a* is so formed that in extracting position of lever **51** it will pass into the space in front of the trigger **46**. If that occurs a corresponding slot must be formed in the receiver, which slot will be normally closed by the shield **51***d*.

Fig. 11 shows in chart form the movement of the bolt carrier in relation to the movement of the operating lever. It will be noted that during the first part of the lever movement there will be only a small movement of the carrier. This gives a high leverage during the time while the bolt is being rotated (or other unlocking action occurs) and while primary extraction occurs. The chart also shows by means of another graph the mechanical advantage of the operating lever for various positions of the lever. The high mechanical advantage is useful not only at the beginning of the stroke of the lever for the purposes stated but is also available at the end of the closing stroke when the cartridge is seated and the locking of the breech occurs.

It will be noted that the mechanism described above comprises a firearm having a chamber, a receiver and a breech-closing unit reciprocating in the receiver, the breech-closing unit including locking means normally engaging with a forwardly facing surface on the receiver when the breech is closed, said breech-closing unit also including a member which is movable rearwardly in the receiver, the first part of such rearward motion serving to disengage the locking means from the forwardly facing surface on the receiver, and an operating lever pivoted at its forward end to said member, said operating lever being also pivoted intermediate its ends to a link whose other end is pivoted to the receiver. The motion of the operating lever is therefore controlled entirely by the motion of the breech-closing unit in the receiver and by its pivoted connection to the link. The word "pivoted" as used in this specification and the claims is defined as the connection of two parts to each other in such a way that either part is movable relatively to the other only by angular movement about a single axis. Since the lever **51** is pivoted to the longitudinally movable part **27** of the breech-closing unit and also pivoted to the link **54** which is, in turn, pivoted to the receiver at **55**, there is provided a two-link and slider kinematic chain linkage wherein the link **54** and the lever **51** are the two links and the breech-closing unit is the slider. Said linkage produces the reltive motion relationships shown graphically in Fig. 11.

While the above-described means serve admirably to provide an excellent bolt-action lever-operated high-powered firearm, many of the parts may be used or readily adapted to make an excellent slide-operated, bolt-action arm. Such an arm is shown in Fig. 10. In this case the receiver **23** is preferably not covered by the stock, which terminates near the rear end of the receiver. The breech-closing action is operated in this gun by means of a sliding fore-end **60** supported under the barrel **21** by any suitable means,

such as a dovetail, and which serves to operate an action bar **60***a*, which passes through a correspondingly-shaped recess in the front of the receiver and is formed with an upwardly-extending arm **60***b*, which is perforated to receive the pin **52**, described above in connection with the lever-operated gun.

The operation of this slide-operated arm is similar to that of the lever operated arm. After firing the fore-end **60** is drawn rearwardly by the shooter. This, through bar **60***a*, arm **60***b*, and cross pin **52**, causes the bolt carrier **27** to be retracted. During this motion cross pin **31** operates in helical cam slots **30**c_1 and **30**c_2 to rotate the bolt from locked to unlocked position. During this unlocking movement primary extraction takes place. Further rearward movement causes the completion of the extraction, ejection, and cocking of the hammer. Forward movement of fore-end **60** causes transfer of the topmost round from the magazine to the chamber and rotation of the bolt to locked position. To disassemble a gun of this form the fore-end **60** is merely drawn back to its extreme rearward position, the receiver cap **33** is removed and the user can then reach pin **52***b* (Figs. 3 and 4) and thereby move pin **52** to the right, disconnecting it from action bar **60***a*. The bolt carrier with the firing pin, bolt, and extractor can thereupon be moved rearwardly out of the receiver. This also permits cleaning of the barrel from the rear.

It will be noted that the constructions shown and described will serve admirably to accomplish the objects stated above. It is to be understood, however, that the constructions disclosed above are intended merely as illustrative of the invention and not as limiting as various modifications therein may be made without departing from the invention as defined by a proper interpretation of the claims which follow.

I claim:

1. In a breech-loading firearm, in combination, a receiver formed with an abutment face, a breech closing member including a locking member cooperating with said abutment face, a reciprocable member mounted for movement rearwardly and forwardly in said receiver and so connected with said breech closing member that when moved rearwardly it first disengages the locking member from the abutment face and then moves said breech closing member rearwardly, and means for reciprocating said reciprocable member comprising a lever pivoted at one end to said reciprocable member and pivoted intermediate its ends to one end of a link whose other end is pivoted to the receiver, whereby the breech closing member serves to guide and control the movement of that end of the lever which is pivoted thereto and a relatively large movement of said lever during the first part of its movement gives a relatively small movement to the reciprocating member while the locking member is being disengaged.

2. In a breech-loading firearm, in combination, a receiver, a breech closing member reciprocable within said receiver between rearward and forward positions, means pivoted to said breech closing member for reciprocating said breech closing member, and means forming the pivotal connection of said reciprocating means to the breech closing member comprising a crossbolt in the breech closing member spring-projected into an opening in the reciprocating means, and means, accessible when the breech closing member has been moved rearwardly, to move said crossbolt to a position where it may be disconnected from said reciprocating means.

3. In a breech-loading firearm, in combination, a receiver formed with a forwardly facing abutment face, a breech-closing member including a rotary bolt formed with a locking lug engaging with said abutment face when rotated to locking position, a bolt carrier reciprocably mounted in said receiver for movement rearwardly and forwardly therein and helically connected with said bolt so that when the bolt carrier is moved rearwardly the bolt is first rotated out of locking position to disengage the locking lug from the abutment face and then moved rearwardly with said bolt carrier, and means for reciprocating said bolt carrier comprising an operating lever pivoted at one end to said bolt carrier and pivoted intermediate its ends to one end of a link whose other end is pivoted to the receiver below the point where the lever is pivoted to the bolt carrier, whereby a two link and slider kinematic chain linkage is provided, the two links being the said link and the said operating lever and the slider being said bolt carrier slidable in said receiver, by means of which linkage a relatively large movement of said lever during the first part of its movement gives a relatively small movement to the reciprocating bolt carrier while the bolt is being rotated to disengage the locking lug from said abutment.

4. In a breech-loading firearm, in combination, a receiver formed with a forwardly facing abutment face, a breech-closing unit reciprocably mounted in said receiver for movement rearwardly and forwardly therein comprising a locking member having a rearwardly facing surface engaging with said abutment face when in locking position and a member for operating said locking member, and means for reciprocating said breech closing unit consisting of an operating lever pivoted at one end to said member which operates said locking member and pivoted intermediate its ends to one end of a link whose other end is pivoted to the receiver below the point where the lever is pivoted to the member which operates said locking member, whereby a link and slider kinematic chain linkage is provided, the links being the said link and the said operating lever and the slider being said breech closing unit reciprocable in said receiver, by means of which linkage a relatively large movement of said lever during the first part of its movement gives a relatively small movement to the reciprocating breech closing unit while the locking member is being moved to disengage its locking surface from said abutment and whereby the breech closing unit serves to guide and control the movements of the operating lever and the link.

ALLEN A. DICKE.

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