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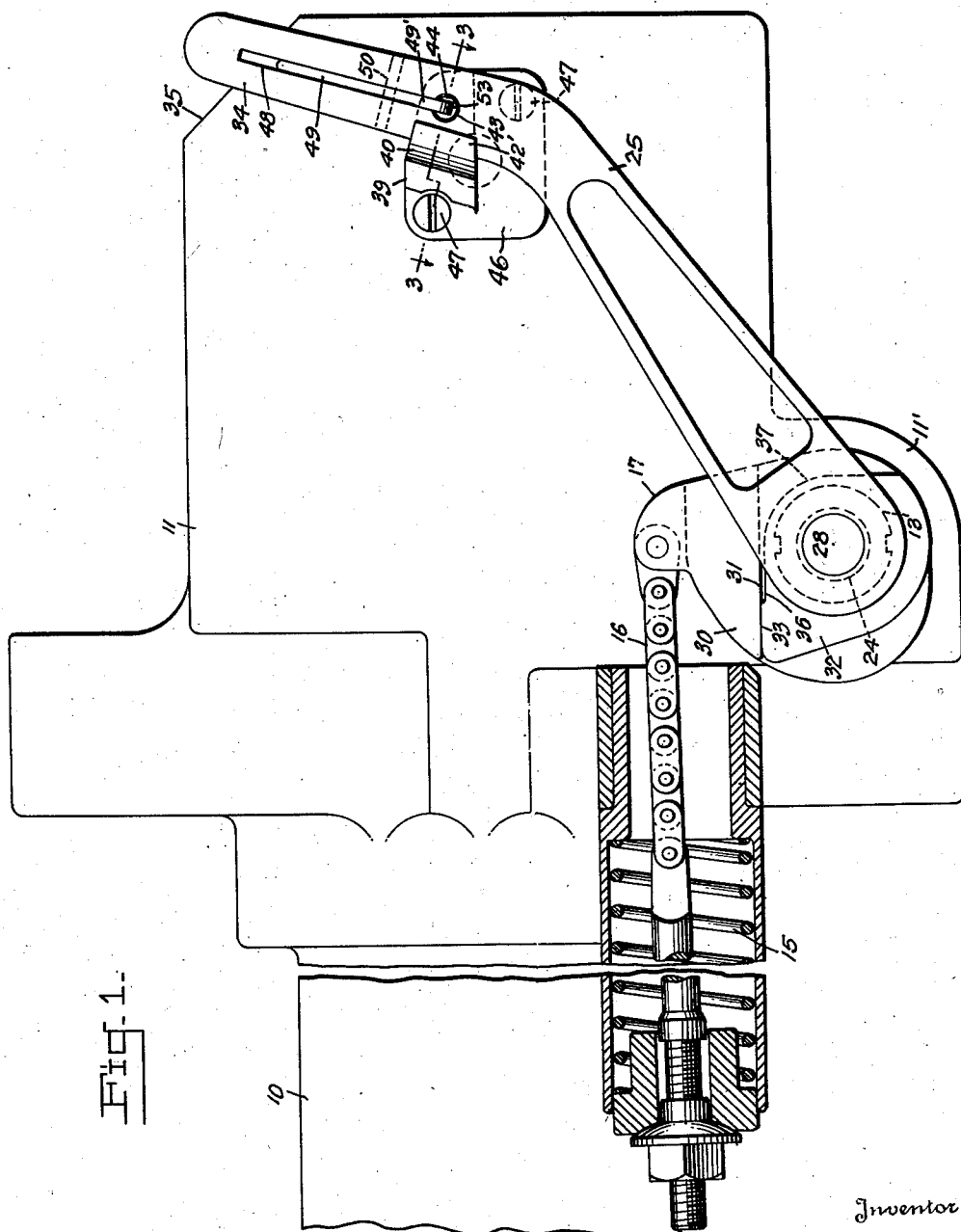
W. SUMMERBELL

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BREECH OPERATING MECHANISM

Filed June 1, 1944

2 Sheets-Sheet 1



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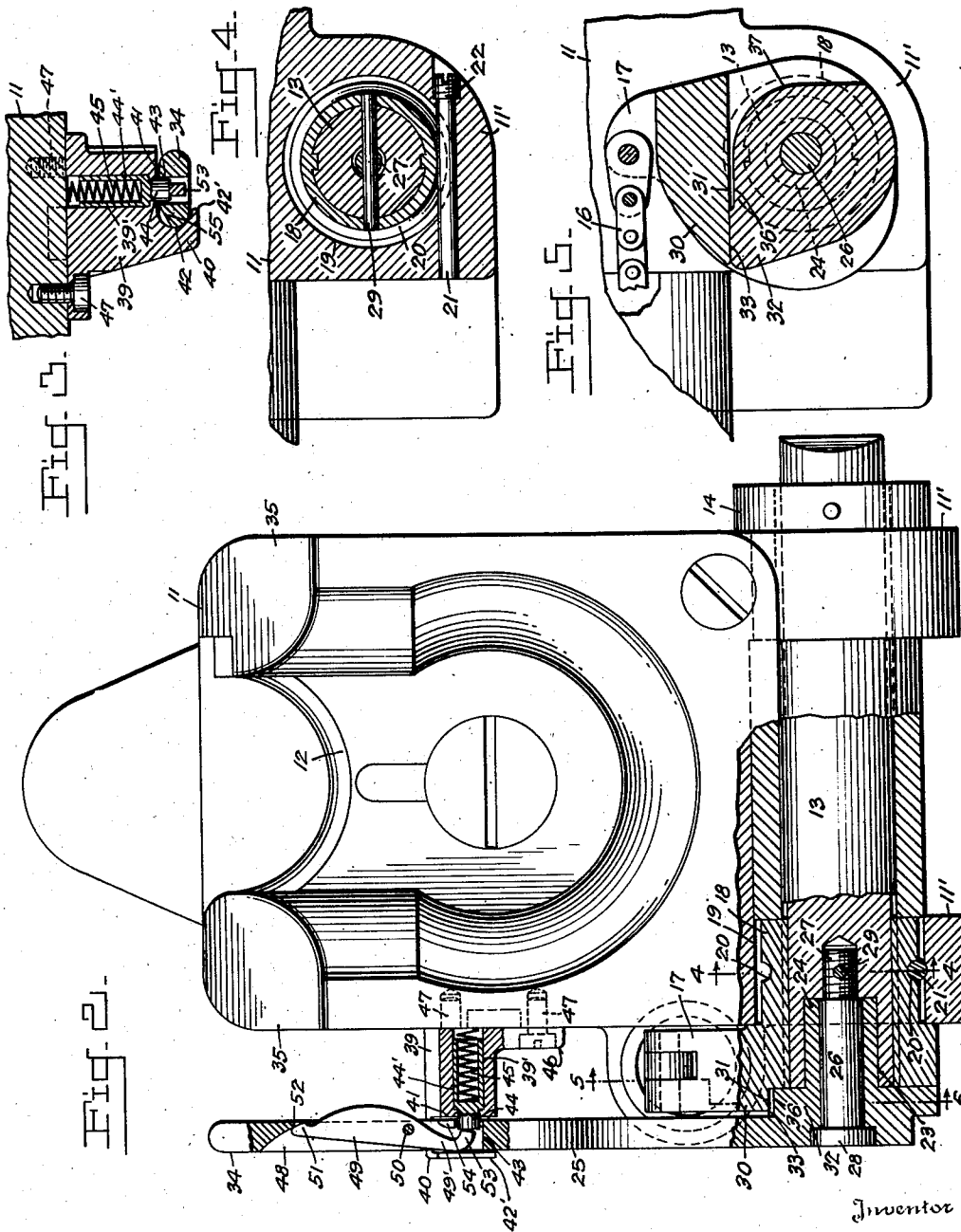
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UNITED STATES PATENT OFFICE

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BREECH OPERATING MECHANISM

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4 Claims. (Cl. 89-4)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

The invention relates to means for manually opening the breech closures in guns wherein a semiautomatic operation of the closure is effected, or where incomplete recoil action is involved.

The invention has for an object to enable the use of a hand lever to operate a breech closure to move it positively from closed to open position at will, yet enabling this lever to rest stationary during normal automatic opening and normal closing operations of the closure, avoiding danger from movements of the lever such as might occur if connected to move through its full stroke in both directions on each firing operation effected by the automatic members.

While the invention is adaptable to various constructions of breech mechanism, it is in the present instance applied to mechanisms such as have been used on 75 mm. tank guns and some others of other caliber, and it is a particular aim of the invention to embody such a device in an extremely simple and compact form making it exceptionally important for use on the large caliber armament of tanks. In the same direction it is sought to simplify and make more positive and certain the functioning of the lever latch in such a device.

It is a special purpose to enable the quick and certain manipulation of the latch and lever in the hasty action often involved under combat encounters, and particularly to avoid requiring an exact position of the hand on the lever grip when releasing the lever latch, as well as to avoid requirement of preliminary motion of the lever incident to release of the latch.

A further aim of the invention is to present a construction which may be produced with a minimum complication in production, requiring a minimum amount of material, and enabling the use of standard production details heretofore used as a major portion of the mechanism required.

It is a feature of value that the lever may be operated with facility by either hand and from various directions by personnel about the gun.

Additional objects, advantages and features of invention reside in the construction, arrangement and combination of parts involved in the embodiment of the invention, as will be understood from the following description and accompanying drawings, wherein

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Fig. 1 is a fragmentary elevation partly in section of the left side of a gun on which my invention is incorporated;

Fig. 2 is a fragmentary rear elevation partly in section of the breech ring and operating handle;

Fig. 3 is a section on the line 3—3 of Fig. 1, enlarged;

Fig. 4 is a fragmentary section on the line 4—4 of Fig. 2;

Fig. 5 is a section on the line 5—5 of Fig. 2.

The gun 10 illustrated includes a well known form of breech closing and firing mechanism which is used without change of the principal elements. These are mounted as heretofore on a breech ring 11 into which the tube of the gun is fitted, the rear portion of the ring 11 being rectangular. The breech block 12 is shown, and the semi-automatic breech mechanism and firing mechanism are omitted. The breech block is operated as heretofore well known, by a crank device (not shown) but corresponding to construction in patents named below, which is mounted on a spline shaft 13, a portion of which is shown at the left of the breech ring, in which it is mounted as heretofore. The shaft is rocked by an operating crank 14 on its right end, which is cammed by gun carriage parts (not shown) in recoil or counterrecoil of the piece as is known, as, for example, in the patent to Dearborn, 798,882; or Driggs, 1,393,353. Patent to Adelman et al., 1,359,454, also shows such constructions as above mentioned to lower the breech block, operate extractor devices, and place a closing spring 15 under tension tending to reverse the motion of the shaft; the conventional mechanism also including detent means (not shown) to hold the block in open position against the reaction force of the closing spring until released by a cartridge shoved into the chamber of the gun such as in the patent to Driggs 1,393,353.

In the present instance a crank 17 at the left on the spline shaft is utilized similar to one before located at the right side of the gun, to operate the closing spring chain 16 which has likewise been moved to the left side. The shaft is revolvable in transversely bored lugs 11' projecting downwardly at the extreme lower forward part of the breech ring, and it projects at both sides of the ring. At the right it receives the operating crank 14, and at the left similarly holds the hub 18 of the chain terminal crank 17, by which the spring 15 is placed under compression and through which the spring acts to close the breech when the block is released for such movement.

Heretofore, a breech opening handle has been

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mounted on the shaft normally free on the shaft 13, and a manually operated clutch or connecting device was provided to be manipulated when the handle was to be used. This material has been dispensed with in the present instance and my improved construction substituted, which is always ready for normal operation without preliminary clutch manipulation, and still is inoperative and stationary during all other opening and closing operations of the breech block.

In the instant case, the breech ring 11 is recessed at 19 to receive the hub 18 slidably and revolubly, the hub being splined and freely slidable on the end of the shaft 13 except when pinned as hereinafter referred to. The shaft also extends through the crank 17, which rests close to the left planiform face of the breech ring, the shaft stopping flush with a lower relieved outer face of the crank 17.

The hub 18 is formed with a circumscribing round bottomed groove 20 midway of the depth of the recess 19, and a pin 21 is inserted slidably through the rear face of the lug 11' of the breech ring, this pin being aligned with and extending in a part of the groove as a retainer for the hub and chain crank 17. This pin may have a threaded screw head portion 22 engaging a corresponding threaded outer bore portion in the ring 11 to retain the pin, as in Figure 4.

The left end of the spline shaft 13 (Fig. 2) is bored and counterbored to form a large outer socket 23, in which there is revolubly fitted the hub 24 of a breech-operating handle or lever 25, this hub and handle being bored and counter-sunk to receive a retaining and pintle screw 23 having a threaded tenon 27 engaged in the small inner bore of the spline shaft. The flister head 28 of the screw 26 sets in the counter-sink in the handle 25. A diametrical bore is formed through the hub 18, shaft 13, and tenon 27, in the plane of the groove 20, and through this bore and groove there is set a pin 29, which fixes these parts relatively and prevents loosening of the screw 26. Withdrawal of the chain-crank and handle assembly is effected by removing the pin 21 and operating crank 14, and withdrawing the shaft 13 to the left until the pin 29 is uncovered, removal of the latter and the screw 26 leaving the crank 17 and handle free for disassembly.

The chain crank 17 is thickened at its outer upper part at the left side, to form a cam 30, terminating below at an abrupt planiform shoulder 31, which, when the crank is in closed-breech position, is horizontal, with the cam body and crank extending thereabove, as shown in Fig. 1. It extends a good distance forwardly of the vertical radius of the shaft 13. The form and radius of the crank 17 and cam 30 otherwise, the manner of connecting the chain thereto, and the mounting of the latter and the spring 15, conform to prior practice, and will not be described, though illustrated.

The handle 25 is formed or provided with a complementary cam 32 thereon having a top, planiform, forwardly located flat face 33, arranged flat against the shoulder 31, when the lever is in its normal and initial position, and the crank 17 in its closed breech position, both shown in Fig. 1.

In this position of the handle, it extends rearwardly and upwardly at an angle of approximately 45 degrees to the horizontal to a point near the rear or breech face of the ring 11, where a grip portion 34 continues therefrom, more nearly perpendicular, in the present instance being at an angle of approximately fifteen degrees to the per-

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pendicular. Its extremity is at or near a level with the top of the breech ring 11, and also near or at the plane of the breech face.

The upper corner portions of the breech ring are bevelled as at 35 so that the extremity of the grip 34 lies above and rearwardly thereof. In this way, the grip does not project into the paths of ordinary movements of personnel or ammunition in the servicing of the gun, yet is immediately at the hand of the gunner or other of the gun squad, for prompt operation when required. This is an important improvement, as, heretofore the handle was located at a lower and more forward position and could not be seen or reached readily from positions rearwardly of or to the right of the breech. The angular form of my handle lever does not impair its utility, but on the contrary, in its downward movement it is easy to move, because it moves clear of the breech so that rapid movement is attainable with greater leverage advantage, by the greater length provided and also because the weight of the operator may be thrown thereon with greater facility.

The flat 33 is above and parallel to a shoulder face 36 on the cam 32, tangent to a concentric surface 37 on the rear part of the cam which will be clear of the shoulder 31 whenever the crank 17 rotates rearwardly from the position shown in Fig. 1, thus avoiding friction with the handle. With reference to the handle, on the contrary, any rearward and downward movement thereof will cause the flat 33 to engage the forward part of the shoulder 31 and cause the crank 17 to move with the handle. This compresses the closing spring and rotates the spline shaft, so that the breech block is moved to open position where it will be held by the extractors, as heretofore.

The handle lever 25 in the present instance is represented as a cast member, generally flat throughout, with its major medial plane parallel to the left side of the breech ring. Owing to the thickness of the crank 17 and cams interposed between the handle and side of the ring 11, the grip is spaced from the side of the ring 11 amply for the insertion of the hand of an operator in this space, so that the handle may be operated by either the right or left hand.

In order to hold the handle 25 at normal initial inoperative position, a stop bracket 39 is bolted to the side of the ring 11 forwardly of the handle, and located to receive the base portion of the grip 34 against a lug 40 extended to the left from the bracket. The bracket consists of a block body having a flat side 41 (Figs. 2 and 3) parallel to and close to the plane of the handle movement, this side 41 lying close beside the base of the grip 34 when the latter is in initial forwardmost position against the lug 40. The latter is slightly recessed as at 42 so as to receive partly therein the forward edge portion of the handle sufficiently to prevent lateral bending of the handle away from the ring 11. The recess provides a lip 42' lapping the forward part of the handle shank only, projecting rearwardly beside the shank for a part of its major cross sectional dimension. The minor cross sectional dimension of the lever is extremely small, and less than usual in such levers. This is important in enabling the use of less material in the handle, while affording adequate resistance to lateral shocks and stresses.

The base of the grip, beside the flat side 41 of the bracket, has formed therethrough an aperture 43, which receives therein the outer end portion of a spring-pressed detent, latch, or plung-

er 44 set in a suitable socket bore 39' in the bracket 39. The socket bore is enlarged at its inner part to receive an enlarged integral sleeve part 44' of the detent, a coiled spring 45 being confined between the detent and the face of the ring 17. The bracket is fixed on the ring 11 by screws 47 engaged through a foot flange 46 formed at the lower and forward sides only of the bracket 39.

A narrow longitudinal slot 48 is formed through the grip 34 in a plane at right angles to the left face of the ring 11 and opening at its lower end into the outer or left part of the aperture 43. This slot extends longitudinally through the greater part of the length of the grip, and near its lower end a latch lever 49 is pivoted therein for movement in the slot on a pin 50 set across the slot in the medial major dimensional plane of the grip. The slot is extended further toward the extremity of the grip at the outer side of the latter, than at the inner side, the underlying material at the inner side of the grip thus forming a stop 52, and the latch lever 49 is similarly lengthened at its outer or left edge, affording a tongue 51 to rest against the stop material 52 at the shorter part of the slot and check movement of the latch lever toward the inner side of the grip. The latch lever is shaped so as to lie within the left hand surface of the grip when checked against the stop 52 and at its inner side is enlarged so as to project from the grip a distance sufficient to be readily depressed by the fingers or palm of a hand in which the grip is grasped. The latch lever consists of a flat planiform plate which may be pressed entirely into the slot from the inner side of the grip. At its lower end the latch lever extends from its pivot pin 50 into the outer part of the aperture 43 with a size reduced sufficiently for free movement from an initial position at the left toward the right. This extremity or arm 49' of the latch lever has an inturned finger 53 thereon, alined with the aperture 43 and resting against the outer end of the detent 44 normally. The latch lever is free in the slot 48 at all times and the movement of the finger 53 toward the right is limited by a portion of material 54 of the handle, extending across the extreme lower part of the slot 48 next to the finger 53, against which material the arm 49' engages so as to stop the finger flush with the innerside of the grip or at the plane of the surface 41. The plunger and its spring serve to hold the latch lever in initial position with the finger retracted to the left when the handle is in initial or inoperative position as in Figs. 1, 2, and 3; and at the same time, the plunger, due to its engagement in the aperture 43, holds the handle in this position (which is its normal one), at which the plunger is engaged in the recess 42 in the lug 40. In order to give the detent plunger 44 a good bearing in the socket bore 39', its enlarged part 44' is extended longitudinally a distance less than the remaining depth of the bore to the face of the ring 11, and it is bored axially to form a sleeve receiving the left end of the spring 45.

The grip has a thickness substantially greater than the distance to which the plunger 44 engages therein, and at the forward edge of the grip a bevel surface 55 is formed on the inner side thereof, of such extent that, when the handle 25 is to the rear and is returned to initial position, the bevel will cam against the outer end of the plunger 44 and press the latter inward toward the right until the handle reaches its initial position, when the detent will move to the left

into the aperture 43 by urging of the spring 45, pressing the finger 53 outward, retracting the latch, and holding the handle in place in the recess 42.

In the use of this invention, the handle is used ordinarily only to open the breech for the first round fired in an action; but in case of a misfire, it is also required in order to open the breech and enable removal of the faulty round, or other correction of the fault causing malfunctioning.

When the breech is to be opened by my device, it may be done by a member of the gun squad at the left of the gun most conveniently, by extending the right hand forwardly between the breech ring 11 and the grip 34 with fingers extended and the thumb disposed at the upperside of the hand; and when the mounts of the palm are adjacent the latch lever 49, pressing the hand to the left against the grip, depressing the latch and causing the finger 53 to press the plunger 44 clear of the grip; while at the same time the fingers of the soldier are bent around the grip and the handle pulled rearwardly, pressed downward through a full stroke movement, and released. Or, instead of being so released, the handle may be returned manually to its initial position at once. In the latter case, the breech block will remain in its opened position, which in the case of the sliding block of the 75 mm. gun is a lowered position clear of the gun chamber, as shown.

The latch lever may of course be moved to releasing position by the palm of the hand or the fingers or other parts of the hand, and the handle may be operated very readily by the left hand as well as the right; left hand operation being most convenient for a gunner or squad member to the rear or at the right of the breech. In such operation, the fingers of the left hand, in grasping the grip 34 will extend therearound to its right side, and press against the latch lever, releasing the detent 44 thereby; at the same time that a rearward pull is applied to the handle to draw the latter rearward.

In the movement of the handle, the chain crank 17 will be drawn rearward by the upward and rearward pressure of the cam top face 33 against the cam shoulder 31 of the chain crank cam 30, the breech being opened at the same time. The chain 16 thereby puts the breech closing spring 15 under compression so that its reaction through the chain and crank 17 may move the breech block 12 back to closed position when the handle 25 is free or in initial position and when the block is released by the detent for such movement. If the handle is not returned manually to its initial position after manual opening of the breech as described, but is left in its rearward lowered position, the first automatic closing of the breech when the block is released will move the handle back to its initial position by reverse action of the cam 30 against the cam 32, snapping the handle past the detent to the recess 42 in the lug 40, where it will be held, as before indicated, and where it will remain throughout all subsequent semiautomatic operations of the breech mechanism. The cams 30 and 32 constitute a lost motion connection between the handle and spline shaft, and the normal operation of the breech and shaft is within the extent of the lost motion.

My invention is specially advantageous when smoke shells are employed with low propellant values, and the recoil produced is not sufficient to open the breech. Likewise, where subcaliber

practice is carried out, with current equipment in which the standard breech mechanism functions in battery with the subcaliber ammunition to close the breech and fire the rounds, but the recoil is insufficient to completely open and lock the block.

I have disclosed the invention in the best construction known to me, but it will nevertheless be understood that this is purely exemplary, and that changes and modifications in the construction, arrangement and combination of parts otherwise than as specifically claimed, and substitution of materials and equivalents mechanical or otherwise, may be made without departing from the spirit of the invention set forth in the appended claims wherein I claim:

1. In a breech mechanism for a gun having a gun breech body, a recoil-opened breech closure, a transverse closure operating rock shaft on said body operatively connected with said closure, a crank on said rock shaft, a closure spring means operatively connected to said crank, said spring means being adapted to be tensioned by said shaft upon rotation thereof in one direction to open said closure and being adapted to rotate said shaft in the reverse direction to close said closure, said crank having a shoulder projected axially of said shaft, a pintle on the end of said shaft adjacent said shoulder, an operating lever revolvably mounted on said pintle, means on said gun breech body for holding releasably said lever at an initial inoperative position, a lug on said lever extending into the path of said shoulder whereby said shaft can rotate in either of said directions independently of said operating lever when the same is held at said initial inoperative position and whereby said lug abuts said shoulder upon rotation of said operating lever from said initial position to rotate said shaft in a direction to open the closure.

2. The structure of claim 1 in which said crank is beside the said body and has a hub slidably splined on the shaft and inserted revolvably in the said body, said shoulder being offset longitudinally outward of the shaft, said shaft terminally bored adjacent said shoulder, said pintle being fixed coaxially in the shaft and in said bore, said lever having a hub part extended into said bore around the pintle, said pintle being headed.

3. The structure of claim 1 in which said crank is beside the said body and has a hub slidably splined on the shaft and inserted revolvably in the said body, said shoulder being offset longitudinally outward of the shaft, said shaft terminally bored adjacent said shoulder, said pintle being fixed coaxially in the shaft and in said bore, said lever having a hub part extended into said bore around the pintle, said pintle being headed, said hub of the crank being peripherally grooved, a pin engaged through a part of said body tan-

gentially to the hub of said lever and slidably in said groove, and a pin engaged through said pintle in the plane of the groove and flush at its ends with the bottom of the latter.

4. A breech block operating lever and detent therefor comprising a gun-carried mount close beside the path of the lever, a guide bore in the mount normal to said path and having a reduced shoulder next to said path, said detent comprising a spring pressed plunger slidable in the bore and having a reduced part slidable past said shoulder and extended into said path, said lever having an aperture arranged to aline with said extended part of the plunger at an initial inoperative position of the lever, said lever having a grip portion thereon longitudinally outward of the aperture and having therethrough a slot alined with said aperture and plunger at said initial position of the lever and extending longitudinally in the grip, a release lever pivoted in the slot adjacent the base of the grip and having an attenuated presser finger extended toward said aperture for depressing engagement with and clearance of said plunger from said path on operative movement of the release lever, said release lever being extended to near the extremity of the grip and having a part extended laterally from the grip at initial position, said plunger being spring loaded to move the release lever to said initial position when said presser part is alined and engaged therewith, yieldable to manual pressure, a cam face on the first lever arranged to wipe the plunger on return movement of the first lever, means to limit said return movement, and means in said slot to limit operative and return movements of the release lever.

WILLIAM SUMMERBELL.

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