(No Model.) 10 Sheets—Sheet 1.

E. G. PARKHURST.

BREECH MECHANISM FOR ORDNANCE.

No. 512,743. Patented Jan. 16, 1894.

Fig. 1.

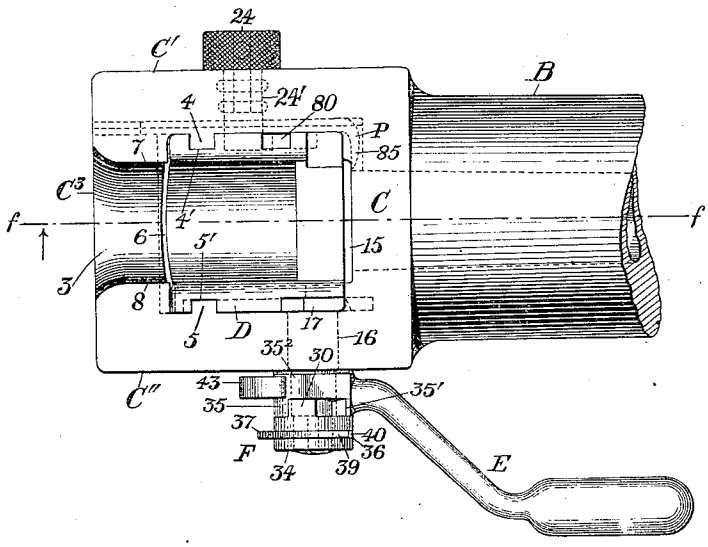
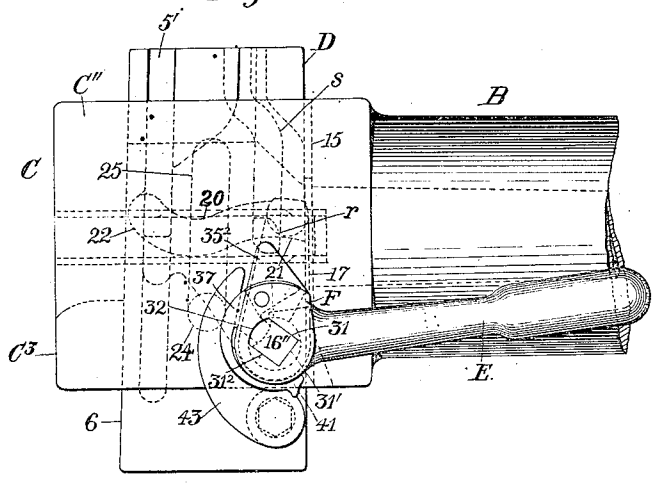


Fig. 2



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Inventor.
Edward G. Parkhurst.
By his Attorney,
F. A. Richards

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BREECH MECHANISM FOR ORDNANCE.

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Fig. 3.

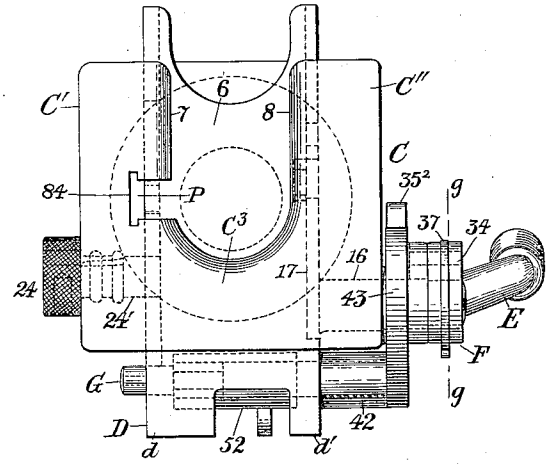
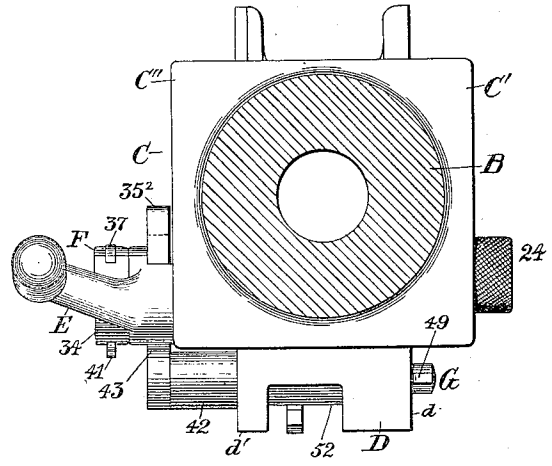


Fig. 4.



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BREECH MECHANISM FOR ORDNANCE.

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Fig. 5.

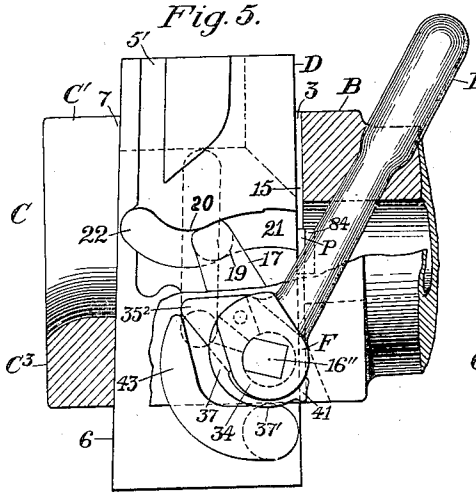


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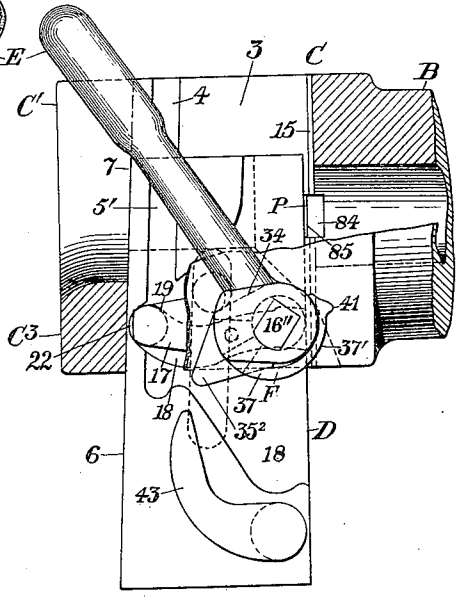


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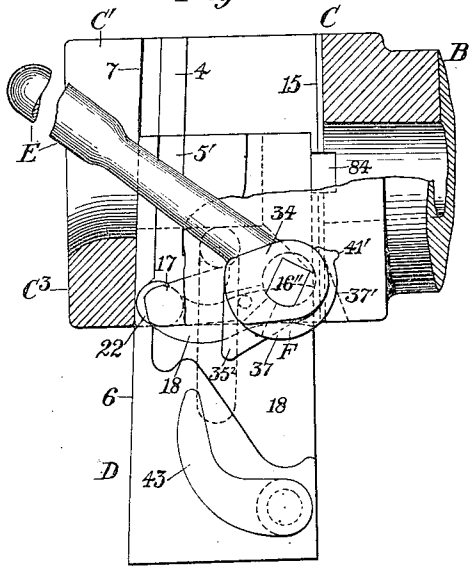
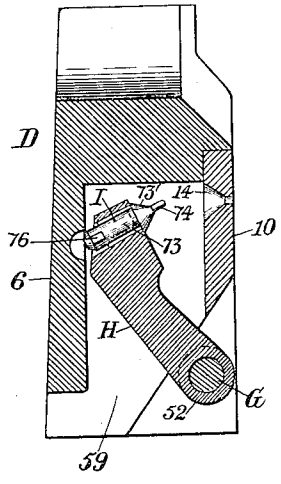


Fig. 8.



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Fig. 9.

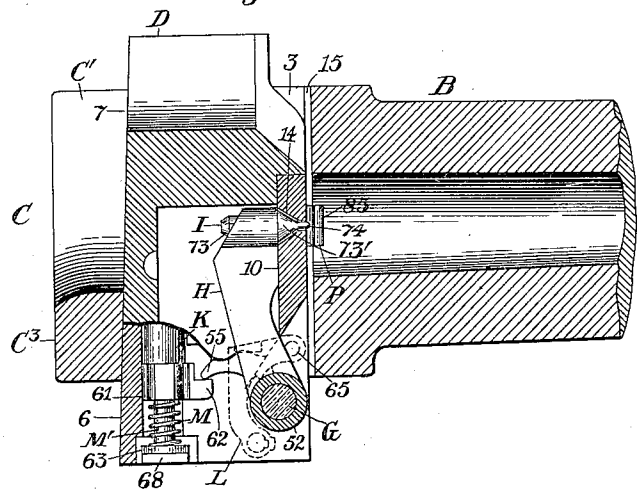
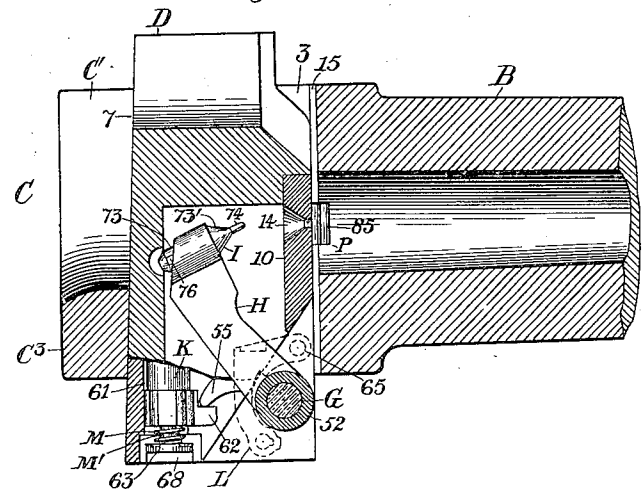


Fig. 10.



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Fig. 11.

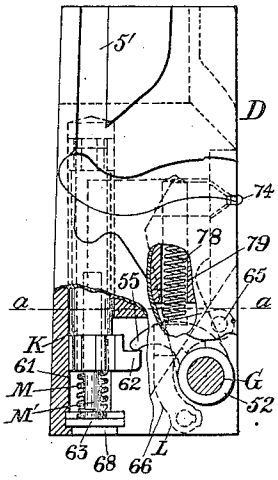


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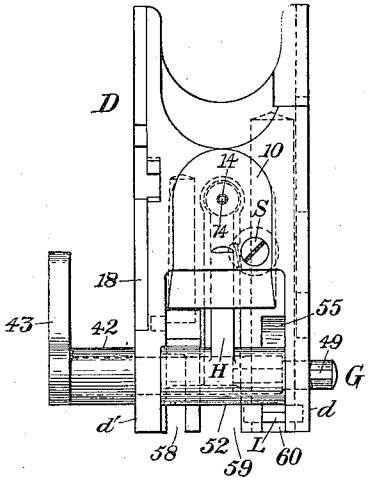


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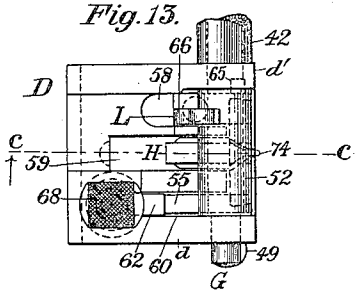


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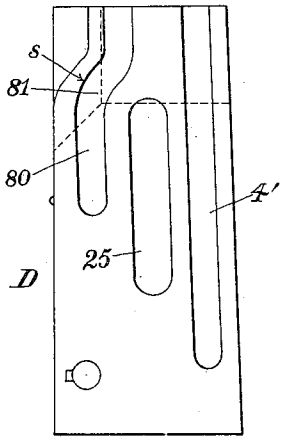
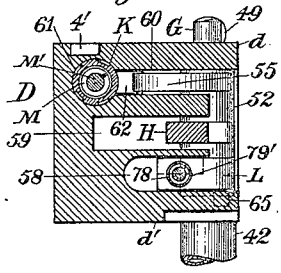


Fig. 15.



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BREECH MECHANISM FOR ORDNANCE.

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Fig. 16.

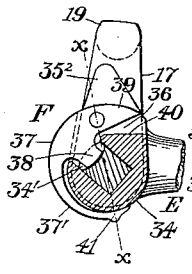


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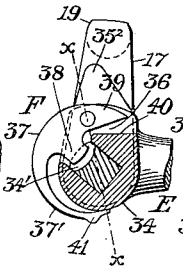


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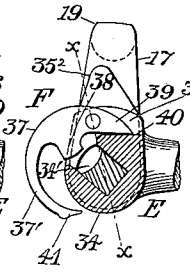


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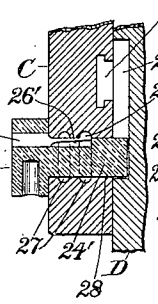


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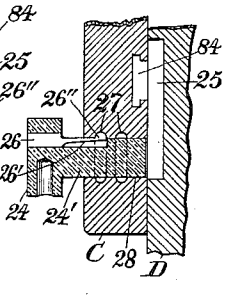


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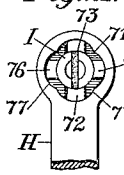


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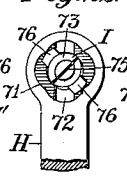


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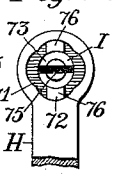


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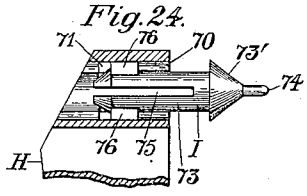


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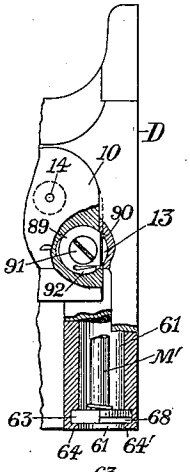


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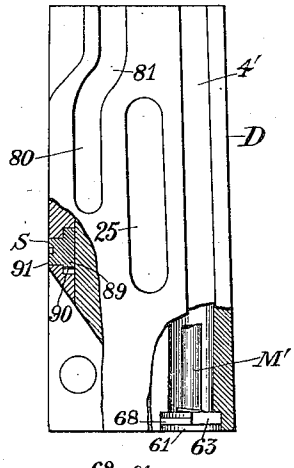


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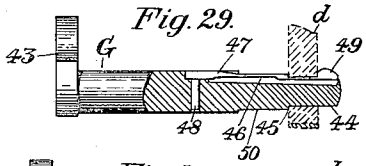


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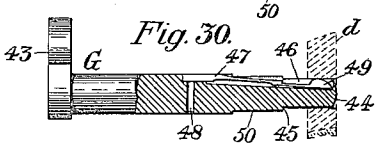


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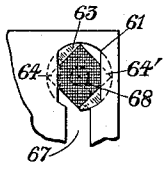
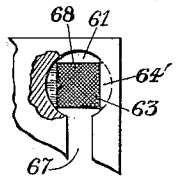


Fig. 28.



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E. G. PARKHURST.

BREECH MECHANISM FOR ORDNANCE.

No. 512,743. Patented Jan. 16, 1894.

Fig. 31

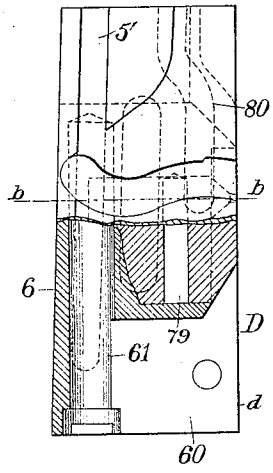


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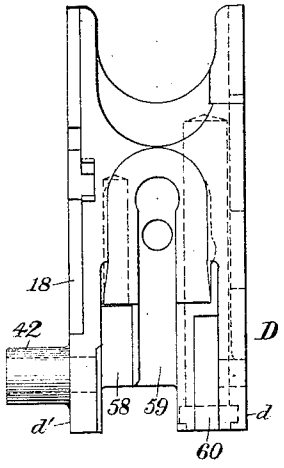


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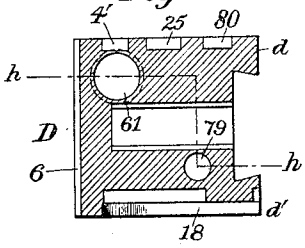


Fig. 39. Fig. 40.

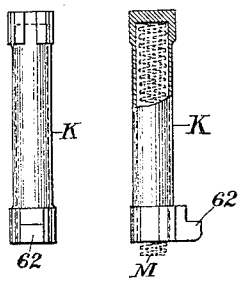


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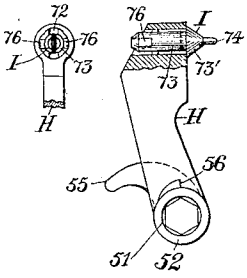


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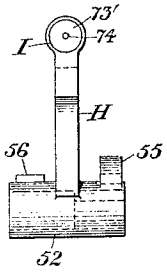


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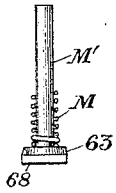


Fig. 38.



Fig. 41.

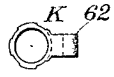


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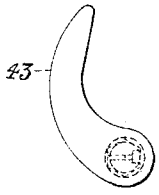


Fig. 43.

Fig. 44.

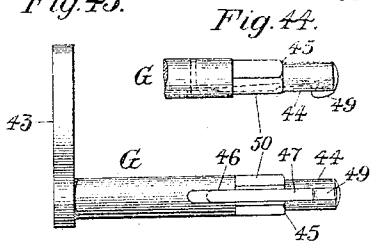
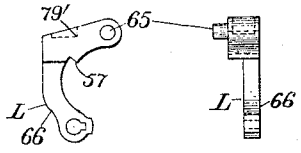


Fig. 45. Fig. 46.



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BREECH MECHANISM FOR ORDNANCE.

No. 512,743. Patented Jan. 16, 1894.

Fig. 47.

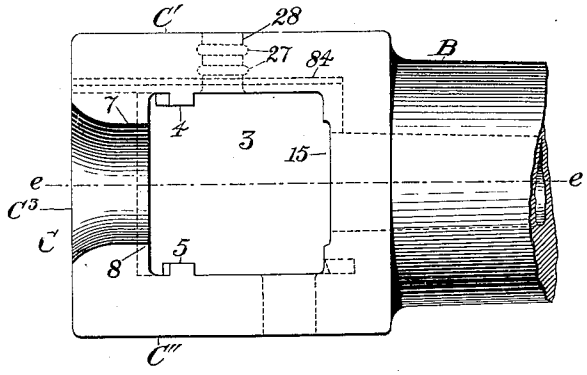


Fig. 48

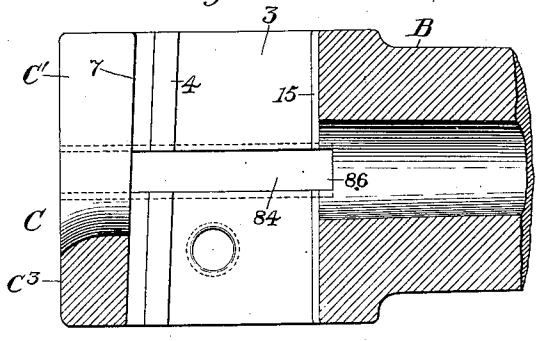
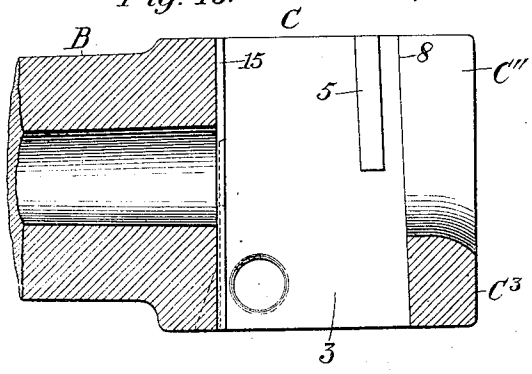


Fig. 49.



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Fig. 50.

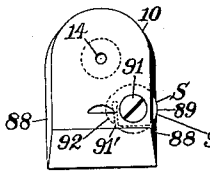


Fig. 51.

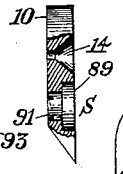
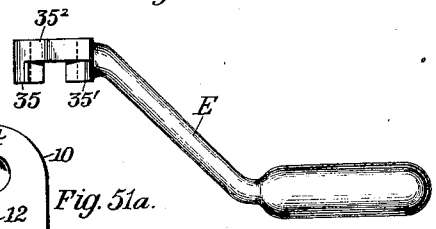


Fig. 54.



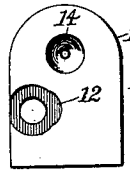


Fig. 51a.

Fig. 52.

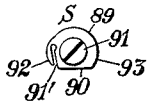


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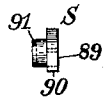


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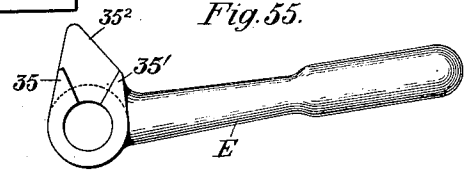


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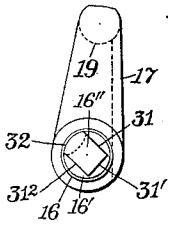


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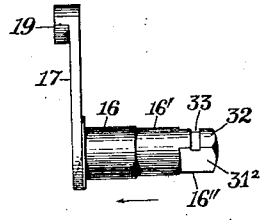


Fig. 58.

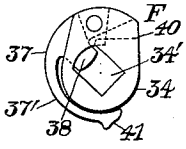


Fig. 59.

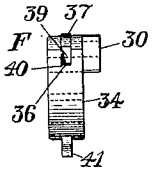


Fig. 60.

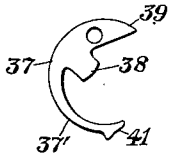


Fig. 61.

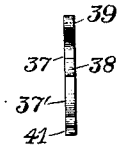


Fig. 62.

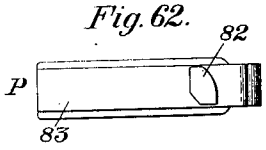


Fig. 63.

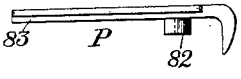


Fig. 64.

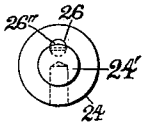
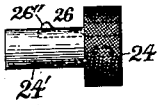


Fig. 65.



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(No Model.) 10 Sheets—Sheet 10.

E. G. PARKHURST.

BREECH MECHANISM FOR ORDNANCE.

No. 512,743. Patented Jan. 16, 1894.

Fig. 66.

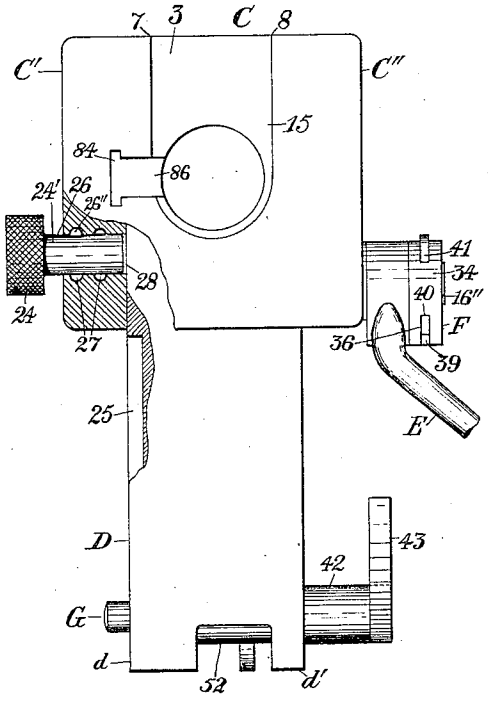
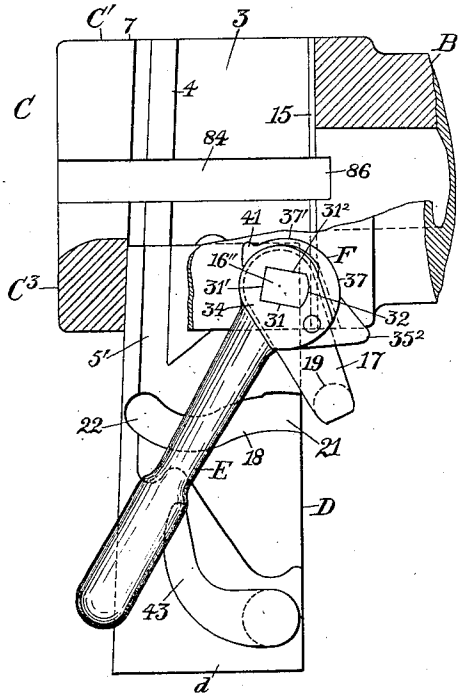


Fig. 67.



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UNITED STATES PATENT OFFICE.

EDWARD G. PARKHURST, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE HOTCHKISS ORDNANCE COMPANY, LIMITED, OF LONDON, ENGLAND.

BREECH MECHANISM FOR ORDNANCE.

SPECIFICATION forming part of Letters Patent No. 512,743, dated January 16, 1894.

Application filed July 13, 1893. Serial No. 480,406. (No model.)

To all whom it may concern:

Be it known that I, EDWARD G. PARKHURST, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Breech-Loading Ordnance, of which the following is a specification.

This invention relates to breech-loading ordnance, and has special reference to that class of ordnance, or rapid-fire guns, in which the opening of the breech, extracting the empty shell, and cocking the gun are accomplished by the movement of an actuating-lever or crank-arm in one direction, and the closing of the breech and making ready for firing are accomplished by the reverse movement of the same lever.

My invention has for its object to furnish an improved breech-mechanism for rapid-firing guns of the class specified, having improved means for actuating the breech-block, and having improved devices and combinations thereof for actuating, locking and releasing the cartridge-firing devices and for effecting the assembling and disassembling of the mechanism of the gun.

In the drawings accompanying and forming a part of this specification, Figure 1 is a plan view of a portion of a rapid-fire breech-loading gun, of the so-called "Hotchkiss" type, embodying my present improvements. Fig. 2 is a side elevation of the gun, as seen from below in Fig. 1. Fig. 3 is a rear elevation of the same, as seen from the left-hand in Fig. 1. Fig. 4 is a front elevation of the same, as seen from the right-hand in Fig. 1. Figs. 5, 6, and 7 are side elevations, partially in section, of a portion of a gun, showing the breech-block and actuating-lever in the three positions it successively occupies in the operation of opening the breech-mechanism to insert a cartridge. Fig. 8 is a central vertical section of the breech-block removed, taken on the dotted line *c—c*, Fig. 13, looking in the direction of the arrow, the firing-pin-arm being shown in a retracted or cocked position. Figs. 9 and 10 are vertical longitudinal sectional details of the gun, taken on the dotted line *f—f*, Fig. 1, looking in the direction of the arrow, said figures showing the firing-pin-arm with its firing-pin in its forward and retracted positions, respectively. Fig. 11 is a side elevation of the breech-block, portions being broken away to more clearly show the firing-pin-actuating mechanism. Fig. 12 is a front elevation of the same. Fig. 13 is an under side view of the breech-block, the firing-pin-actuating shaft being broken off. Fig. 14 is a side elevation of the breech-block, as seen from the right-hand of Fig. 12. Fig. 15 is a horizontal transverse section of the breech-block and mechanism carried thereby, taken on dotted line *a—a*, as seen from the top in Fig. 11. Figs. 16, 17 and 18 are cross-sectional detail views, taken on dotted line *g—g*, Fig. 3, of the breech-block-actuating crank-shaft, its crank, the actuating lever, and fastening devices, said figures showing three relative positions of the locking-arm or key with relation to the crank-shaft. Figs. 19 and 20 are sectional detail views showing the stop for limiting the movements of the breech-block. Figs. 21, 22 and 23 are enlarged rear views of the upper portion of the firing-pin-arm and the firing-pin, illustrating the successive positions of the firing-pin during the insertion thereof into its seat in the firing-pin-arm. Fig. 24 is a vertical longitudinal section of a portion of the firing-pin arm, showing the firing-pin partially inserted. Fig. 25 is a sectional detail view of a portion of the breech-block, showing the manner of securing the recoil-plate therein. Fig. 26 is a side elevation, partially in section, of the breech-block, showing the means for securing the recoil-plate therein. Figs. 27 and 28 are detail views, looking from the under side of the breech-block, showing the manner of securing the firing-pin-holding devices in the breech-block. Figs. 29 and 30 are sectional detail views showing the manner of securing the firing-pin-shaft against longitudinal movement in the breech-block. Fig. 31 is an irregular vertical sectional detail view of the breech-block, (partially in side elevation,) taken on dotted line *h—h*, Fig. 33. Fig. 32 is a front elevation of the breech-block. Fig. 33 is a transverse section taken on dotted line *b—b*, Fig. 31, looking downward. Figs. 34, 35 and 36 are detail views, in side and end elevation, of the firing-pin-arm and firing-pin. Figs. 37,

38, 39, 40 and 41 are detail views of the firing-spring, firing-spring-supporting pin, and slide, or plunger, which constitute the firing-pin-actuating devices. Fig. 42 is a side elevation of the cocking-lever, its shaft being shown in dotted lines. Fig. 43 is a front elevation of said cocking-lever and its shaft, said figure showing the spring detent-catch for securing the shaft in position in the breech-block. Fig. 44 is a plan view of a portion of said shaft. Figs. 45 and 46 are side and rear elevations, respectively, of the sear. Fig. 47 is a plan view of a portion of the gun, showing the breech-piece with the breech-block removed. Fig. 48 is a central vertical section of the same, on dotted line *e*—*e*, looking from the under side of Fig. 47. Fig. 49 is a similar sectional view, looking from the opposite side in Fig. 47. Figs. 50 and 51 are front and side elevations, respectively, of the recoil-plate locking-device. Fig. 51ª is a rear view of the recoil plate with the fastening device removed. Figs. 52 and 53 are front and side views, respectively, of the fastening device which secures the recoil plate to the breech-block. Figs. 54 and 55 are plan and side elevations, respectively, of the breech-block-actuating lever. Figs. 56 and 57 are side and front elevations, respectively, of the breech-block-engaging crank-arm and its shaft. Figs. 58 and 59 are side and front elevations, respectively, of the locking-device for securing the breech-block-actuating lever in place upon the crank-shaft. Figs. 60 and 61 are side and front elevations, respectively, of the locking-arm or key for the locking-device shown in Figs. 58 and 59. Figs. 62 and 63 are side and plan views, respectively, of the extractor. Figs. 64 and 65 are end and side elevations, respectively, of the stop for limiting the movements of the breech-block. Fig. 66 is a rear elevation of the ordnance, partially in section, showing the breech-block in the position it occupies when first inserting the same in the breech-piece of the gun, or when removing it therefrom, the actuating-lever being broken off; and Fig. 67 is a side elevation of the same parts, of which some portions are shown broken away.

Similar characters designate like parts in all the figures.

For illustrating the application and mode of operation of my present improvements, I have shown the same applied to a rapid-fire gun of the well-known "Hotchkiss" type.

In the drawings, the usual barrel of the cannon or ordnance-piece is designated by B, and is shown formed integral with the enlarged breech-piece C. If preferred, however, the barrel may be made separate from the breech-piece and inserted within the usual forwardly-extending jacket, in a well-known manner. Said breech-piece C is shown vertically recessed or mortised, as at 3, to form the sides C′, C″, between which is located the vertically-movable breech-block D. On the inner faces of the sides C′, C″, respectively, of the breech, are formed the projecting guides or tongues 4 and 5, which enter the corresponding recesses 4′, 5′, respectively, in the outer side-faces of the breech-block D, which tongues and grooves form the guides for controlling the breech-block in its vertical movements. Said tongues and grooves are shown formed somewhat inclined to a vertical line, as clearly shown in Figs. 14, 47, 48 and 49, so that the block D, as it is moved downward from the position shown in Fig. 5 to that shown in Fig. 7, will be carried rearward a short distance, thus relieving the pressure against the head of the cartridge (not shown) in the gun-barrel. Said backward inclined vertical movements of the breech-block carry the forward face of said block away from the forward abutment face of the breech as the breech-block descends, the guides being so disposed as to effect such relief-movement on the first downward movement of the breech-mechanism. For this purpose the rear face 6 of the breech-block is formed slightly at an angle with relation to a line at right angles to the axis of the gun, said face being in parallelism with the aforesaid breech-block guides, whereas the front face of said breech-block, and the front abutment-face of the breech-piece C, are in parallel lines and substantially at right angles to the bore of the gun-barrel.

The rearward wall C^3 of the breech-piece which connects the side-walls C′ and C″ back of the breech-block mortise, is shown cut away for a portion of its width and from the upper side downward to a point below the line of the gun-barrel, to form an opening through which to insert the cartridges and remove the empty cartridge-shells in the usual manner; at each side of said cartridge-opening, a portion of the wall remains to form the shoulders 7 and 8 for supporting the rearward face of the breech-block when this is in its uppermost position ready for firing the gun.

The front face of the breech-block is recessed and provided with a recoil-plate, 10, which is removably secured in place by means of a spring-catch, designated in a general way by S, engaging in a recess, 13, in the inner face of one of the walls of said block, as will be hereinafter more fully described. This recoil-plate is bored and recessed, as shown at 14, in Fig. 10, to receive the forward end of the firing-pin. When the breech-block D is in its uppermost position, as shown in Figs. 2, 3, 4, 5, 9 and 10, the forward face of the recoil-plate 10 stands close to the channel 15 for the cartridge-head, and as said breech-block is gradually lowered, it is withdrawn rearwardly until (in the lowest position of the breech-block as shown in Fig. 7) said recoil-plate stands a short distance back from the line of said cartridge-head channel. While the rear face of the breech-block always moves in line with the inclined shoulders or faces 7 and 8, (owing to the guides 4 and 5 being parallel therewith,) its front face, which rests

snugly against the breech of the gun, only when said block is elevated, will, at the first descending movement of the breech-block, move backward away from the aforesaid position, thereby at once relieving the pressure of the cartridge-shell on the recoil-plate.

The vertical movements of the breech-block are accomplished by means of the hand-operated actuating-lever E, secured to a short shaft, 16, that is journaled in one of the walls, C'', of the breech-piece. This shaft carries on its inner end a crank, 17, capable of oscillation in a recess, 18, formed in the side of the breech-block, and is provided at its free end with a stud or crank-pin, 19, that enters and runs in a cam-groove, cut transversely in the side of said block. This cam-groove has a forward portion, 21, which is preferably concentric with the shaft 16 when the breech-block is in its uppermost position, (see Fig. 5,) and has a rearward oppositely-disposed portion, 22, which forms the cam proper. By this construction of cam, it will be seen that, as the actuating-lever is drawn rearward from the position shown in Fig. 2 to the position shown in Fig. 5, the stud or pin upon the crank will, for the entire length of the throw of the crank 17 between the two positions shown in the figures referred to, move idly in the cam-groove without moving the breech-block with relation to the breech of the gun. As soon, however, as the crank-pin 19, in its backward movement, passes the point or position it occupies in Fig. 5, it enters the rearward oppositely-curved portion, 22, of the cam-groove, and immediately coming in contact with the lower wall of said groove, thereby moves the breech-block quickly downward to the position shown in Fig. 7. When the movement of the actuating-lever is reversed, the breech-block will be quickly moved upward to its closed position, the reverse of its movement in the operation of opening the gun previously described.

The range both upward and downward of the vertical movements of the breech-block is positively limited by a stop-pin, 24, which passes through one side of the breech-piece and enters a recess, 25, in the left-hand side of the breech-block, as clearly shown in Figs. 1, 3, 4, 19, 20 and 66. As a means for removably securing this stop-pin in the breech-piece, the said stop is shown provided with the detent-catch 26, which, as shown in Figs. 19, 64 and 65, is let-in to the side of the shank, 24', of the stop and has a fixed bearing in a hole in the head of said stop. The inner free end, 26', of the detent-catch is provided with a projection adapted for engagement with catches or notches, 27, formed in the walls of the recess or bore 28, Figs. 19, 20 and 47, in which the shank of the stop is seated; said detent-catch 26 is in the nature of a "spring-catch" and operates to normally hold said stop against accidental displacement. In the drawings, I have shown two annular catch-grooves formed in the seat of, and concentric with relation to, the shank of the stop, the distance between the stop-grooves being substantially the distance of travel of said stop from an inoperative to an operative position. The projection upon the detent-catch will, preferably, be semi-spherical in shape, and the cross-sectional shape of the catch-grooves will (as shown in the drawings) coincide therewith, so that, when it is desired to withdraw the stop from engagement with the breech-block, as in Fig. 9, to the position shown in Fig. 20, for permitting the breech-block to be removed from the breech-piece of the gun, a sudden pull upon the head of the stop is all that is required, the detent-catch projection 26'', owing to its shape, being readily withdrawn from the inner catch-groove to the outer one.

For the purpose of removably securing the crank-shaft in the breech-piece, and as a means for securing the crank-actuating lever so that it will, during a portion of its oscillation, inoperatively, and in the balance of its oscillation, operatively, engage the crank-shaft, (the purpose of which will be hereinafter fully explained,) I provide a short shaft, 16, with the crank 17, preferably formed integral therewith, and insert said shaft in its bearing in the breech-piece through the vertical mortise 3 in said breech-piece, said shaft being of sufficient length to project a short distance beyond the outer face of said breech-piece. Said shaft is shown reduced in diameter at its outer end, as indicated at 16', to form a journal for the actuating-lever E, which, in assembling the parts, is slipped on over the end of said shaft and is fitted to closely engage, but freely move upon, said journal. The extreme outer end of the shaft 16 is squared or flattened on one or more sides thereof, which squared end is adapted to receive a coupling or locking-device, designated in a general way by F, which coupling, as will be hereinafter more fully described, is locked into engagement with the shaft and has a projection, 30, to engage and limit the extent of free movement of the actuating-lever upon and with relation to the shaft. In the present instance, the shaft 16 has the extension, 16^2, of the lever-bearing 16' or extreme outer end of the shaft, flattened on three sides, designated by 31, 31', and 31^2, respectively; the fourth side, designated by 32, is shown forming a continuation of the cylindrical outer surface of the shaft; and in this side (which is preferably left full as shown, and not cut away) is formed a transverse shaft-lock notch, 33, for receiving the working-end or key of the coupling or shaft-lock F, as hereinafter more fully described. The shaft-lock or coupling, designated in a general way by F, consists of a plate, 34, having a transverse bearing-opening, 34', to correspond with and fit the squared portion of the crank-shaft 16, and has a transversely-projecting lug, 30, radially disposed with relation to the axis of the shaft when said locking-plate is in posi-

tion thereon; which lug, when the parts of the crank-shaft are assembled, extends between the ears 35, 35′ upon the actuating-lever; these ears are radially disposed with relation to the bearing-axis of said lever, and form abutting faces to engage the faces of the lug or projection 30 upon the hub 34, during the movement of the said actuating-lever. As will be seen by the drawings, the lug 30 upon the crank-lock hub 34 is of a V-shaped form, its sides being about radial to the axis of its bearing; and the space between the ears 35, 35′ of said lever is correspondingly V-shaped and of greater width. This construction allows a limited free movement of the actuating-lever with relation to said lug 30, so that, during the first movement of the lever, it meets with no resistance, but after traversing a given arc, the abutment-face 35′ (owing to the momentum attained by the lever in its unobstructed swinging movement) strikes the lug 30 with a sudden and considerable force, thereby quickly starting the breech-block from its impinged closed position.

The crank-lock hub 34 is recessed centrally at its upper outer edge, as shown at 36, to form ears between which is pivoted a locking-plate, 37, which has a curved resilient projection or arm, 37′, extending underneath and impinging on the hub when this is secured in position upon the shaft 16, as shown in Fig. 2. The recess 36, which forms the seat for the locking-plate 37, communicates with the bearing-opening, 34′, in said hub, the purpose of which feature will be obvious. The locking-arm 37, in its preferred form, as most clearly shown in Figs. 58 and 60, has on the inner side thereof the lock-catch or bolt-end 38, adapted for engaging in the aforesaid transverse slot or lock-notch 33 in the shaft 16. In assembling the crank-shaft and said accessory parts, assuming the crank to be in position in its bearing in the breech-piece and the actuating-lever in proper position upon the journal 16′, the locking-hub, with its locking-plate in an inoperative position, is slipped upon the squared end of the shaft with its lug 30 projecting between the ears 35, 35′, of the actuating-lever, after which the locking-arm is depressed so that the lock-catch 38 thereof extends into the notch 33 in the shaft; the curved arm 37′ of the locking-arm, during this movement, coming under and tightly impinging the lower face of the locking-plate, thus preventing lateral displacement of the locking-arm and at the same time securing the locking-device F and the actuating-lever E against longitudinal movement upon the shaft 16. The outward movement of the locking-plate from the closed position shown in Fig. 16 to the open position shown in Fig. 18, is limited by the projecting end or stop-arm 39, which engages against the stop-face 40 of the locking-plate 34, as shown in Fig. 18. When the locking-plate is in its closed or working-position shown in Fig. 16, the outer end, 41, of the yielding lever-arm 37′ thereof extends beyond a central line, x—x, drawn through the fulcrum of the locking-arm and axis of the locking-plate, and yieldingly grasps the outer side of said locking-plate in opposition to the pivotal bearing of said locking-arm, thereby holding said locking-arm in place with a considerable degree of force, dependent, of course, upon the elasticity of the lever-arm 37′ and the distance its point 41 extends beyond said line x—x of the axis of the shaft and locking-plate pivot.

The operation of the described actuating-lever attachment will be readily understood from the drawings in connection with the description immediately preceding. The actuating-lever being locked in place upon the shaft as shown in Figs. 1 and 16, the operator may quickly withdraw the same by throwing the locking-arm 37 out of engagement with its locking-notch in the shaft, which will allow both the locking-device F and the lever to be withdrawn and replaced practically by one operation, without the necessity of releasing the grasp upon either of the pieces so removed or replaced. By means of the construction and mode of assembling thus described of the several parts, it is practicable to have these so fitted as to be freely assembled and disassembled by hand without having any objectionable play of one part upon the other; also, the use of small separable details, such as the normally-loose pins or screws heretofore largely used in this class of devices, is entirely avoided, the device herein shown having only one pin, the pivot-pin for the locking-arm; and this, being firmly driven into the locking-plate, is, therefore, normally non-separable.

The crank-attachment here described constitutes the subject-matter of a separate application, Serial No. 481,479, filed July 26, 1893.

Formed upon the hub of the breech-block-actuating lever, as clearly shown in Fig. 55, is a cam or projection, 35^2, adapted for engagement with a cam lever, 43, upon the firing-pin shaft, when the said actuating-lever is moved to open the breech to thereby partially rotate the firing-pin shaft to cock the gun during the descent of the breech-block, substantially as hereinafter more fully set forth.

The firing-pin shaft, designated in a general way by G, is journaled at its ends in transverse bearings formed in the side-walls, d—d', of the breech-block D, one of said journal-bearings being formed in a tubular projection, 42, which may be formed integral with and extending beyond the outer face of the side-wall d', said tubular bearing supporting one end of the said shaft nearly its entire length. Secured to, or formed integral with, this end of the shaft G, is a cam-lever, 43, which cam-lever, when the parts are assembled, lies in the plane of movement of the cam 35^2 upon the breech-block-actuating lever, and is adapted to be actuated thereby during the opening movement of said lever for partially rotating the said shaft G to re-

tract the firing-pin-arm, as will be hereinafter more fully described; this cocking operation takes place, of course, during the descent or opening movement of the breech-block. The firing-pin shaft G is shown reduced at its left-hand end, as shown at 44, to form a shoulder, 45, adapted to abut against the inner face of the side-wall *d* of the breech-block to prevent longitudinal movement of said shaft in one direction; said reduced end 44 forming the journal for this end of the shaft, and being of sufficient length to extend a short distance beyond the outer face of said side-wall *d*, as clearly shown in Fig. 12. Formed longitudinally in one side of the journaled end, 44, of the shaft G, is a recess, 46, in which is secured a resilient detent-catch, 47, that is secured at its inner end in the recess 46 by means of a pin, 48, extending into a transverse hole in said shaft; said detent-catch has, at its extreme outer free end, a laterally-projecting catch, or hook, 49, which, when the shaft is extended into its bearings in the side-wall of the breech-block, will spring upward and engage with the outer face of the side-wall *d*, and thus secure the shaft against longitudinal movement. A portion of the central part of the shaft G will be cut away at its sides, as shown at 50, preferably on that portion adjacent to the bearing-end, 44, to form a squared or hexagonal journal adapted to engage in the corresponding bore, 51, of the hub, 52, of the firing-pin arm H; which arm carries the firing-pin I.

The firing-pin arm, designated in a general way by H, consists of the hub 52, which, in practice, is made of a length equal to the distance between, and has a bearing at its ends against, the inner faces of the side-walls, *d*—*d'*, of the breech-block; which bearing prevents movement of said arm longitudinally of its shaft. Said hub 52 is suitably bored longitudinally for non-rotative engagement with its actuating-shaft G, the construction being such as to permit these parts to be readily assembled. Formed upon the hub 52, at one side of the firing-pin arm, is a cam-lever or curved projection, 55, which, as will be hereinafter described, is adapted for engagement with the firing-spring-actuated slide K during the rotary or turning movement of the firing-arm shaft G to compress said spring preparatory to firing. Formed upon the said hub 52, at the opposite side of said arm, is a sear-catch, or projection, 56, adapted to be engaged by the catch, 57, of the sear L, for holding the shaft G, with its firing-pin arm and firing-pin, in a retracted position ready to fire the gun.

As shown most clearly in Fig. 15, the breech-block is vertically recessed at its lower end, as shown at 58, 59 and 60, to form vertical walls or partitions; between which walls the sear L, the catch 56 upon the hub of the firing-pin arm, the firing-pin arm and its cam 55, respectively, are located and move during the rotation of the shaft G. The breech-block, as shown at 61 in Fig. 31, is vertically bored at its under side, near its rear end, in a line with the slide-retracting cam 55 upon the firing-pin shaft, to receive, and form a bearing for a vertically-reciprocating firing-pin-actuating slide K.

The firing-pin-actuating devices consist, essentially, of the firing-spring M, the supporting-stud or pin, M', therefor, and the reciprocating slide K. This slide K is, preferably, tubular in shape, for forming a casing for the firing-spring, and at its upper end bears upon said spring, as shown in dotted lines in Fig. 40. This slide is fitted to have free vertical movement in the bearing 61, before referred to, and has, at its lower end, an outwardly-projecting arm, 62, adapted for engagement with the cam-face, 55, of said firing-pin arm. The firing-spring is supported at its lower end upon an elongated bearing-plate or head, 63, on the lower end of the spring-supporting pin or guide M'. As a means for securing the firing-spring slide and supporting-pin in place, the bore or recess 61 is enlarged diametrically at the lower end, where it extends through the bottom-plate of the breech-block, as clearly shown in Fig. 27, to form an annular recess in the bottom wall of the breech-block between its inner and outer edges, as shown in Fig. 25, to form annular flanges, 64, 64', for supporting the said bearing-plate 63. This annular recess is, practically, of a diameter equal to the greatest diameter of the bearing-plate 63, and the elongated opening in the bottom wall of the breech-block corresponds substantially to the shape of said bearing-plate.

The elongated opening, 61, in the bottom plate of the breech-block has a continuation, or extension, 67, at one side, of sufficient length to permit the projecting arm 62 upon the slide K to be inserted therethrough, said arm 62 being of less width than the diameter of the slide, which slide is of a diameter approximately equal to the width of the opening 61 aforesaid. By this construction and arrangement, it will be seen that the slide K, firing-spring M and spring-supporting pin may be inserted as one piece through the opening 61 and secured in proper position in the breech-block, it simply being necessary, after the said parts are inserted and the bearing-plate 63 of the spring-supporting pin is in alignment with the annular recess above the flanges 64, 64', to turn the bearing-plate 63 one-quarter of a revolution, to the position shown in Fig. 28, the ends of said bearing-plate, in this position, overlying the flanges 64, 64', and being held thereby in position.

As a means for preventing accidental turning of the spring-supporting pin and connected parts, the bearing-plate 63 has an angular axial projection, 68, at its outer face, herein shown as square, which projection is of a size to closely fit between the adjacent edges of the flanges 64, 64' when the parts are assembled and the bearing-plate is in the

position shown in Fig. 38. For convenience in turning said bearing-plate and spring-supporting pin to disassemble the parts, the projection 68 of said bearing-plate is preferably knurled or corrugated on its outer face to form a head capable of being turned by the finger of the gunner by frictional engagement. By this construction and arrangement of the firing-pin-actuating devices just described, the said parts may be quickly removed in an assembled condition, as one piece, for the purpose of cleaning or for the replacement of defective parts, and quickly replaced in operative position, it simply being necessary, when removing the said parts, to turn the bearing-plate 63 one-quarter of a revolution in its seat, when said parts will drop out; and after inserting the same, as before described, a reverse movement of the bearing-plate will secure the parts against accidental displacement.

As a means for holding the firing-pin lever and firing-pin in a retracted or cocked position, or in the position shown in Fig. 10, the hub 52 of the firing-pin lever has, as before stated, a catch, 56, adapted to engage with a notch or catch, 57, formed on the forward side of the sear L, which sear is pivotally secured to the breech-block in the vertical recess 58, above the said catch 56, by a journal-pin, 65. The pivotal point, 65, of the sear is above and slightly in advance of the axis of the shaft G, and the sear has a depending curved arm, 66, which extends below said shaft and has a loop or eye adapted to be engaged by a hook or other suitable device, or by the finger of the gunner, to retract said sear for disengaging its catch 57 from the firing-pin lever. As a means for normally depressing said sear and retaining it in locked engagement with the hub of the firing-pin lever, a sear-spring, 78, is provided, as shown in Fig. 11; which spring is seated in a suitable recess at 79, Fig. 11, in the breech-block, and at its lower end bears against the upper face of the sear; an annular recess being preferably formed, at 79′, in the upper face of the sear, to provide a seat for the sear-spring and prevent lateral movement thereof.

The head of the firing-pin lever (which is shown slightly enlarged) is transversely bored as shown at 70 in Fig. 24, to receive the firing-pin I. Located within the bore, 70, of the head of the firing-pin lever, is a transverse wall or partition, 71, divided or recessed centrally, as at 72, to form side-flanges for preventing longitudinal movement of the firing-pin. The firing-pin I consists of a main cylindrical body, 73, having a conical flanged head, 73′, at its forward end, and having a central firing-point, 74, for striking the cap of the cartridge. The body-portion of the firing-pin is transversely and longitudinally recessed or centrally divided, as shown at 75, and has, near its rear end, at opposite sides, two outwardly-projecting flanges, 76, adapted to engage the rear face of the flanges formed by the wall 71 when the pin is secured in position. The bore 70 in the rear of the wall 71 is irregular in form, to provide cam-faces, at 77 and 77′, between which the flanges, 76, of the firing-pin will be normally held (when said firing-pin is in place) against rotary movement. In securing the firing-pin in position in the head of the firing-pin lever, the rear flanged end of said firing-pin is first inserted within the bore 70 of the said firing-pin lever with its flanges in a vertical plane, as shown in Figs. 23 and 24, and moved backward until the flanges 76 pass through the central opening in the wall 71; in this position, the flanged head 73 will bear against the forward face of the head of the firing-pin lever, and the forward faces of the flange 76 will be slightly in the rear of the rear face of the wall 71. Next, the firing-pin will be turned, either to the right or left, a quarter of a revolution from the position shown in Fig. 23 to that shown in Fig. 21, which turning of the firing-pin will, in consequence of the cam-faces 77, 77′, slightly compress the rear end of the firing-pin, as shown in Fig. 22, allowing the flanges to ride past the cam-projection, and, after passing said projection, immediately expand and be seated in the cam-shaped recesses, as shown in Fig. 21, thus locking the firing-pin against accidental rotation and securely locking the same in position longitudinally. To remove the firing-pin, it is only necessary to turn the same from the position shown in Fig. 21 to that shown in Fig. 23, by a quarter-revolution, and then withdraw it by a forward longitudinal pull.

Formed in the outer face of the left-hand wall of the breech-lock, near its front end, is the vertically-located extractor-cam-groove 80, which begins at the upper outer edge of the breech-block, extends downward for a short distance in parallelism with said guiding-groove 4′, is thence forwardly curved, as shown at 81 in Fig. 14, to form the extractor-cam, and below that again continues downward in parallelism with said guiding-groove to its terminus approximately midway of the length of said block. The engagement of the extractor P with the extractor-cam is effected by means of a stud or projection, 82, formed on the outer side of the extractor, which stud fits in said cam-groove to slide therein after the usual manner of this class of devices. The extractor, designated in a general way by P, and shown in detail in Figs. 62 and 63, consists of a tongued plate, 83, fitted to slide in a corresponding groove or channel, 84, formed in the inner face of the left-hand wall C′ of the breech-piece C, as clearly shown in Fig. 48 of the drawings. At its forward end the extractor is provided with an inwardly-projecting hook, 85, which on the forward movement of the same enters into a recess, 86, in the bore of the gun-barrel, which recess is a continuation of a channel 84 formed in the breech-piece. When the extractor is in its forward position, the point of its hook

stands just forward of the rim of the cartridge, as shown in dotted lines in Fig. 47. On the first downward movement of the breech-block, (the ways of this being inclined downwardly and backwardly as hereinbefore described,) the face-plate, or recoil-plate, 10, is withdrawn with the breech-block slightly from the head of the cartridge-shell, and as the breech-block mechanism continues its downward movement, the aforesaid stud 82 travels in the cam-groove from its lowest position, shown at *r* in Fig. 2, at the lower end of the cam-groove 80, and first strikes the forward face of the cam 81 (at the point marked *s* in Figs. 2 and 14), and as said cam-face is there but slightly inclined from the vertical, the extractor is subjected to a powerful backward throw, thereby forcibly "starting" the cartridge-shell from its seat in the firing-chamber or bore of the gun-barrel. As the downward movement of the breech-block mechanism continues, the increasing inclination of the extractor-cam rapidly accelerates the rearward movement of the extractor, thereby imparting a rapidly increasing velocity to the rearwardly-moving cartridge-shell, so that when the upper end of the breech-block passes below said cartridge-shell, the shell has already acquired such momentum as to pass over the block and to a considerable distance rearwardly of the gun, being thus finally disposed of.

As a means for securing the recoil-plate pin in the front face of the breech-block, the recess in the breech-block for receiving the recoil-plate is shown of a dovetailed form, and the side-edges of the recoil-plate are beveled, as at 88, to fit the dovetailed recess of the breech-block, as shown in detail in Fig. 50. As shown in Fig. 51, the recoil-plate is bored transversely, and is counter-bored at the rear face concentric thereto to form a counter-sunk bearing for the fastening device S. Said counter-bored bearing for the fastening device S extends through the outer edge of the recoil-plate, as shown in Fig. 50, and is on one side slightly elongated, diametrically, to form a catch-notch, 12, with which a catch upon the fastening device engages to hold the catch against lateral displacement after the recoil-plate is secured in the breech-block. This fastening device, S, consists of a disk-shaped plate, 89, planed off at one side, as shown at 90, to correspond with, and lie in the plane of, the outer edge of the recoil-plate when inserting said plate preparatory to securing it in place in the breech-block, and has a cylindrical axial projection adapted to extend through the transverse bore or journal-bearing formed in the recoil-plate with its outer face substantially flush with the outer face of said recoil-plate. The disk-shaped fastening-plate 89 is made to fit the counter-bore in the recoil-plate and adapted to be turned therein (after the plate is inserted in the breech-block) by means of a screw-driver or other tool applied to a notch or nick in the front face of its journal 91. At one side of the journal 91, near the outer edge of the fastening-plate, this is notched, as shown at 91′, to form a detent-catch, 92, which will normally project slightly beyond the peripheral line of the fastening-plate. In assembling these parts, the fastening-plate will be inserted in its bearing in the recoil-plate with its plane side in alignment with the outer edge of said plate, after which the plate will be slid into place in the breech-block, and the fastening-plate will then be turned a quarter of a revolution, bringing its edge 93 outward beyond the edge of the recoil-plate, and into the recess, 13, shown in Fig. 25 in the inner edge of the outer wall of the breech-block; at this time the detent-catch 92 will be released from its compressed position and will enter the detent-notch formed in the counter-sunk bearing of the fastening-plate. This operation will lock the fastening-plate against accidental rotary displacement which might occur from constant vibration caused by concussion in firing. The construction and arrangement thus described of said fastening-device secures a simple and effective means for attaching the recoil-plate to the breech-block, and permits the parts to be quickly assembled and disassembled.

The general operation of the breech-loading ordnance is as follows: Assuming the gun to have been fired and the breech-mechanism to be in its closed position, as illustrated in Figs. 1 and 2, the gunner, seizing the handle of the breech-block actuator, draws the same upward and backward to draw the breech-block downward its full stroke to its extreme lower position. The first movement of the actuator-lever is to turn freely without effecting a movement of its shaft. After the actuator-lever, in its backward movement, has nearly reached the position shown in Fig. 5, the abutment-face 35′ thereof strikes the projection 30 of the locking-device F secured to the shaft 16, with considerable force, thereby immediately rotating said shaft, together with its crank 17; the projection 10 at the upper end of said crank traveling in the cam-groove 21 in the breech-block, strikes the cam-face 22, and starts the breech-block from its closed position, the continued rearward movement of the actuating-lever carrying said breech-block, by means of the crank-arm 17, to its lowest position. During said rearward movement of the actuating-lever, the cam 35^2 thereof strikes the firing-pin-shaft actuating-cam-arm, and carries the same downward in a radial plane, thereby rotating the firing-pin shaft G, retracting the firing-pin arm, and at the same time bringing the end of the cam 55 (upon the hub of the firing-pin arm) in engagement with the arm 62 at the lower end of the slide K, thus carrying the same downward and compressing the firing-spring M. When the said cam 55 has reached its requisite downward position, the catch 56, upon the hub of the firing-pin arm, comes into locked engage-

ment with the catch 67 upon the sear L, which holds said shaft against return movement and secures the firing-pin arm in a cocked position, as shown in Fig. 10, in which position the parts are retained until the breech-block is elevated by a reverse movement of the actuating-lever and is secured in a closed position ready for firing. After the breech-block has been closed (a cartridge having been inserted while the block is in its lowest position) and it is desired to discharge the gun, the lower end of the sear L is drawn backward, which releases its catch 57 from the catch 56, when the stress of the firing-spring will immediately force the slide upward, imparting a sudden rotary motion to the cam 55 together with the shaft G, and throwing the firing-pin from the position shown in Fig. 10 to that shown in Fig. 9, when the point thereof comes in contact with the cap and discharges the cartridge. During the downward movement of the breech-block, the cartridge-shell is extracted by the backward movement of the extractor P, as hereinbefore described.

By means of the construction of ordnance herein described, any and all of the parts may be quickly removed and replaced without the use of tools, thus permitting the gun to be quickly assembled and disassembled.

To insert the breech-block into the breech of the gun, the breech-mechanism being assembled therein, the breech-block-actuating lever will be thrown over to the position shown in Fig. 67, the stop 24, which limits the vertical movements of said breech-block, being held in the position shown in Fig. 66, after which the breech-block will be inserted a short distance from the under side of the breech into the recess 3, until the cam-groove 21 comes into line with the crank-pin, 19, of the crank-arm 17, when said crank-arm, through the medium of the actuating-lever, will be thrown backward until its projection 19 enters said cam-groove; after this, a continued upward movement of the actuating-lever will carry the breech-block into the position shown in Fig. 2, when the stop 24 will be pressed inward to engage in the stop-groove 25 in the breech-block, after which the gun is ready for operation.

Having thus described my invention, I claim—

1. In breech-loading ordnance, in combination, a barrel having a vertically-recessed breech-piece, a vertically-sliding breech-block having a cam-shaped groove in one side thereof and having vertical recesses to receive the firing-pin-actuating mechanism, a breech-block-actuating shaft removably journaled in the breech-piece and having a breech-block-actuating crank in engagement with the cam-shaped groove in the breech-block, an actuating-lever loosely mounted upon the shaft and having a cam for engagement with the cocking-lever of the firing-pin-actuating shaft, a locking-device or coupling removably secured to said shaft and having a projection to engage with, and limit the free movement of the actuating-lever upon the shaft, a firing-pin-actuating shaft journaled in the breech-block and having a detent-catch at one end for engagement with the breech-block to prevent longitudinal movement of the shaft, and having a cocking-lever at the opposite end in position to be acted upon by the cam of the actuating-lever, a firing-pin arm removably carrying a firing-pin at its upper end, said arm being secured to said shaft in non-rotative engagement therewith and having contiguous thereto a spring-compressing cam and a catch for engagement with the sear to lock the shaft and arm in a retracted position, a spring-actuated slide in engagement with said cam adapted for operating the firing-pin arm to fire the gun, and a spring-actuated sear pivotally supported in the breech-block and having a catch adapted for engagement with the catch of the firing-pin arm to lock said arm in the retracted or cocked position, all co-acting substantially as and for the purpose described.

2. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, of a sliding breech-block having a cam-way formed in one side thereof, a crank-shaft having a crank-arm in engagement with said cam-way and having its outer end forming a bearing for an actuating-lever and having its extreme outer end squared or angularly-grooved transversely to receive a locking-device, an actuating-lever mounted upon said shaft adjacent to the breech-piece and capable of a limited free movement on said shaft, and a coupling or locking-device removably fitted to the squared or angular end of the said shaft and having a locking-arm capable of movement into and out of engagement with the transverse recess in said shaft to secure the parts together and prevent displacement, substantially as described.

3. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, and with the breech-block, of a crank-shaft journaled in said breech-piece and having a crank-arm at its inner end adapted to engage and reciprocate said breech-block and having its outer end cut away at its sides and recessed or notched transversely substantially as described, an actuating-lever journaled upon said shaft adjacent to the breech-piece and having abutment projections thereon, and a coupling or locking-device having an angular recess to non-rotatably engage the end of the crank-shaft and having a projection to extend between the abutment projections of the actuating-lever and having a pivoted locking-arm adapted for locking engagement with the transverse recess in said shaft, whereby the parts are locked against longitudinal displacement and the lateral movement of the actuating-arm with relation to the shaft is limited, substantially as described.

4. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a vertically-sliding breech-block, and with the vertically-sliding breech-block having a cam-groove in its outer face, of a crank-shaft journaled in one side of the breech-piece and having a crank-arm at its inner end in engagement with the cam-groove of the breech-block and having a squared or angular outer end with a transverse recess in one face thereof, a breech-block-actuating lever fitted to said shaft between the squared or angular end thereof and the breech-piece, and capable of a limited transverse movement thereon, an independent coupling or locking-device in non-rotative engagement with the angular end of the crank-shaft and having a projection adapted for engagement with the actuating lever to limit the transverse movement of said lever upon the shaft, and a locking-arm pivoted to said coupling and having a projection adapted for engagement with, and disengagement from the transverse notch in the angular end-portion of the shaft, whereby said parts may be readily assembled and locked against longitudinal movement with relation to the breech-piece, and may be readily dissembled and removed from said breech-piece, substantially as described.

5. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block and with the sliding breech-block, of a crank-shaft journaled in the breech-piece and having a crank-arm in engagement with the breech-block for raising and lowering the same, and having a cocking-lever and a cam to actuate the firing-pin mechanism, a firing-pin-actuating shaft removably journaled in the breech-block and having a cocking-lever at one end in position to be operated upon by said cam of the crank-shaft lever, a firing-pin arm carrying a firing-pin removably but non-rotatively secured to the firing-pin-actuating shaft and having a cam or projection to engage the firing-arm slide, a vertically-movable spring-actuated slide having a projection in engagement with the said cam, and a spring-actuated sear having a catch adapted for engagement with said firing-pin-arm to lock and hold the same in a retracted or cocked position, substantially as described.

6. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, and with the breech-block, of a crank-shaft and lever adapted for raising and lowering said breech-block with relation to the breech-piece and having a cam adapted to engage a cocking-lever carried by a shaft journaled in the breech-block, a firing-pin-actuating shaft carrying a firing-pin, a cocking-lever, and a cam or projection, on said shaft, a reciprocating slide located for longitudinal movement in the block, and engaging with a projecting arm on the firing-shaft, a firing-spring bearing against said slide to actuate the said firing-shaft, and means for locking the firing-spring in a compressed position and the firing-pin in a retracted, or a cocked position, substantially as and for the purpose described.

7. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a vertically-sliding breech-block and with the vertically-sliding breech-block, of a crank-shaft journaled in the breech-piece and carrying at its inner end a crank-arm in engagement with, and adapted for moving said breech-block vertically and carrying at its outer end a coupling-lug or projection having abutting faces in true radius to the axis of the shaft, and an actuating-lever having remotely disposed abutments for alternately engaging the abutment-faces of the said coupling projection as the actuating-lever is reciprocated, the space between the abutments of said lever being greater than the width of the abutment projection upon the shaft, whereby the actuating-lever may have a free limited movement upon the shaft, substantially as described and for the purpose set forth.

8. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, and with the vertically-sliding breech-block, of the breech-block-actuating shaft bearing a crank-arm at one end adapted for engaging and reciprocating the breech-block and having a cross-sectionally angular outer end with a transverse key-seat formed therein, an actuating-lever loosely mounted upon said shaft adjacent to the breech-piece and having a cam for actuating the breech-block mechanism and having remotely disposed radially-arranged abutments, a coupling-plate having a central transverse recess fitting the angular end of said shaft and having a V-shaped lug or projection at its inner face to extend between the radially-arranged abutments and limit the free movement of the actuating-lever, the said plate having a central recess formed in its periphery extending into its central shaft-engaging recess, and a locking-arm pivoted at one end in the circumferential recess of said coupling-plate and having an arm to extend underneath said plate when the same is locked to the shaft and having a projection or key to enter the key-seat in said shaft when said arm is thrown downward in a locked position, substantially as and for the purpose described.

9. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, and with the vertically-sliding breech-block, of a shaft transversely journaled in the breech-piece carrying a crank-arm at its inner end adapted for engaging and reciprocating the breech-block, a breech-block-actuating lever carrying a cam for actuating the breech-block mechanism, a coupling removably, but non-rotatively, engaging said shaft and loosely engaging the actuating-lever to permit the same to have a limited free lateral movement with relation to the shaft, a firing-pin shaft removably jour-

naled in the forward lower end of the breech-block and carrying a firing-pin, a firing-spring-depressing cam and a cocking-lever in position to be actuated by the shaft upon the breech-block-actuating lever, a spiral firing-spring seated in a longitudinal bore in the breech-block and carrying a slide in engagement with the cam upon the firing-pin shaft, and a spring-actuated sear held normally in locked engagement with the firing-pin shaft to lock the firing-pin in a retracted or cocked position, substantially as and for the purpose described.

10. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, and with the vertically-sliding breech-block, of a breech-block and firing-pin-actuating mechanism consisting, essentially, of a short horizontal shaft journaled in the lower forward end of the breech-piece carrying a crank-arm at its inner end in engagement with the breech-block for actuating the same and having an actuating-lever provided with a cocking-cam at its outer end, a firing-pin shaft journaled in the lower forward end of the breech-block in substantially vertical alignment with the breech-block-actuating shaft and having a cocking-lever at its outer end in position to be acted upon by the cocking-cam upon the actuating-lever and carrying a firing-pin arm with a removable firing-pin at its upper end and having at one side of said firing-pin arm, a firing-spring-depressing cam, a spiral firing-spring seated in the vertical recess in the breech-block in alignment with the cam upon the firing-spring shaft, a vertically-reciprocating slide supported at its upper end by said spring and having a projection at its lower end in engagement with said firing-pin-shaft cam, and a locking device therefor, consisting of a sear pivoted to the breech-block in position and having a catch to engage a catch upon the firing-pin shaft, and a sear-spring bearing against said sear and retaining it in normal locked engagement with the firing-pin shaft, substantially as and for the purpose described.

11. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, and with the vertically-sliding breech-block, of a crank-shaft having a crank in engagement with and reciprocating said sliding breech-block and having an actuating-lever removably secured thereto with a cam thereon to actuate the breech-block mechanism, of the firing-pin shaft G removably journaled in the side-walls of the breech-block and carrying the cocking-lever at its outer end, and having the cross-sectionally angular portion to receive the hub of the firing-pin and having the detent-spring catch to engage one wall of the breech-block to prevent longitudinal movement of the same, a firing-pin arm having a cross-sectionally angular axial recess in its hub and fitted upon the angular portion of the firing-pin shaft with the ends of its hub bearing against the inner faces of the side-walls of the breech-block, and a firing-spring to actuate said arm, and locking-mechanism to lock the firing-pin shaft and firing-pin in a retracted position, substantially as described and for the purpose set forth.

12. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, and with the vertically-sliding breech-block and mechanism for raising and lowering said breech-block with relation to the breech-piece, of a horizontal shaft removably journaled in the lower forward end of the breech-block at right-angles to the bore of the gun and having a cross-sectionally angular portion intermediate to the side-walls of the breech-block, a reduced longitudinally-recessed journal having a bearing against the inner face of the side-wall of said breech-block, a detent-catch seated in the longitudinal recess having a projection adapted for engagement with the outer face of said side-wall, a firing-pin arm having a hub with a cross-sectionally angular axial recess therein fitting the angular portion of said shaft and having a bearing at its ends against the inner faces of the side-walls of the breech-block, and mechanism to actuate said firing-pin arm and to lock the same in a retracted position, substantially as and for the purpose described.

13. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block of the vertically sliding breech-block sliding in said breech-piece and having a stop-groove formed in the outer face of its side wall, a crank-shaft journaled in the lower forward end of the breech-piece and having a crank in engagement with and reciprocating the breech-block, said shaft being provided at its outer end with an actuating-lever; a stop-pin seated in a shouldered recess in the side wall of the breech-piece and a resilient detent catch secured to said stop-pin and adapted for lateral movement with relation thereto and for engagement with the shouldered portion of the recess for preventing longitudinal displacement of the stop-pin, said stop-pin being adapted to extend into the breech-block to limit the vertical movement of the breech-block with relation to said breech, substantially as described.

14. In breech-loading ordnance, the combination of the breech-piece adapted for carrying a sliding breech-block and having a transverse stop-recess extending entirely through one of its side-walls to form a bearing for a stop, and having a series of remotely disposed catch-notches in said bearing, a breech-block having a stop-groove formed in one side thereof in alignment with the stop-bearing in the breech-piece, a longitudinally-recessed stop-pin extended through the bearing in the breech-piece and entering the stop-groove in the breech-block to limit the movement of the breech-block with relation to the breech, and

having a detent-catch seated in said recess and adapted for engagement with one or the other of said catch-notches in the stop-bearing to lock said stop-pin against longitudinal displacement, and mechanism substantially as described to raise and lower the breech-block with relation to the breech, substantially as and for the purpose set forth.

15. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a sliding breech-block, of a breech-block vertically movable in said breech-piece and having its front face adjacent to the bore of the gun, recessed to receive a recoil-plate, a recoil-plate removably secured in said recess and having a detent-catch movably engaging said detent-plate and breech-block and having a firing-pin recess as shown, and breech-block-actuating mechanism directly connected with the breech-piece and in engagement with the breech-block, whereby said breech-block may be raised and lowered, substantially as and for the purpose described.

16. In breech-loading ordnance, the combination with the breech-piece adapted for carrying the vertically-sliding breech-block, of the breech-block having the recoil-plate-receiving recess formed in the forward face with a detent-catch-notch, 94, formed in the inner face of one of its side-walls, a recoil-plate removably seated in said recess and having the counter-bored bearing for the locking-plate, which bearing extends through the side face of said recoil-plate and has an elongated portion to form a notch for a detent-catch, a locking-plate journaled in said bearing and adapted to engage the notch 94 in the breech-block and having a detent-catch to engage a notch in said bearing to secure the locking-plate against rotation, and means substantially as described to raise and lower said breech-block with relation to the breech-piece, substantially as and for the purpose described.

17. In breech-loading ordnance, the combination with the breech-piece adapted for carrying the vertically-sliding breech-block, of the breech-block having the recoil-plate-receiving recess formed in its forward face with a detent-catch-notch, 94, formed in the inner face of one of its side-walls, a disk-shaped locking-plate journaled in a transverse bearing formed through the recoil-plate and so disposed as to project beyond and into the notch 94 in the breech-block when in one position, and having one side cut away so as to come flush with the side-edge of the recoil-plate when the locking-plate is turned to its unlocked position and having a detent-catch to engage a notch in the bearing to prevent accidental turning of said locking-plate, and means, substantially as described, in engagement with the breech-piece and breech-block to raise and lower said breech-block with relation to the breech-piece, substantially as described.

18. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a vertically-sliding breech-block, and with the breech-block longitudinally bored to receive the firing-spring, and with mechanism for raising and lowering the same with relation to the breech-piece, of a firing-pin shaft journaled in the breech-block at its lower forward end carrying a cocking-lever, a firing-pin and a cam, a firing-spring seated in the longitudinal bore of the breech-block, a vertically-reciprocating slide supported by said spring in engagement with the cam of the firing-pin shaft, and a spring-supporting pin having a bearing-plate at its lower end removably secured in non-rotative engagement in said bore to secure the parts in position, substantially as and for the purpose described.

19. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a vertically-sliding breech-block, and with the breech-block longitudinally bored to receive the firing-spring and sear-spring, and with mechanism for raising and lowering the same with relation to the breech-piece, of a firing-pin shaft journaled in the breech-block at its lower forward end carrying a cocking-lever, a firing-pin and cam, a firing-spring seated in the firing-pin longitudinal bore of the breech-block, a vertically-reciprocating slide supported by said spring in engagement with the cam of the firing-pin shaft, and a spring-supporting pin having a bearing-plate at its lower end removably secured in non-rotative engagement in said bore to secure the firing-spring against displacement, a pivoted sear having a catch to engage the projection upon the firing-pin shaft, and a sear-spring seated in the longitudinal sear-spring-bore in the breech-block and having a bearing at its upper end against said breech-block and at its lower end against the sear to keep said sear normally in engagement with the firing-pin shaft, substantially as and for the purpose described.

20. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a vertically-sliding breech-block, and with the breech-block having a longitudinal bore to receive the firing-spring, and having inwardly-projecting flanges at the lower end of said bore, and mechanism for raising and lowering the same with relation to the breech-piece, of a firing-pin shaft journaled in the breech-block at its lower forward end and carrying a cocking-lever, a firing-pin and cam, a firing-spring seated in the longitudinal bore of the breech-block, a vertically-reciprocating slide supported by said spring in engagement with the cam of the firing-pin shaft, and a spring-supporting pin having an elongated bearing-plate at its lower end, which bearing-plate is adapted to extend into and overlie the flanges of the firing-spring bore to secure said spring and its slide against longitudinal displacement, substantially as described.

21. In a breech-loading gun, the combination with the breech-piece, of a sliding breech-block longitudinally bored, substantially as described, to receive the firing-spring mechanism, and having the lower end of said bore elongated diametrically and annularly-recessed at a point above the lower face of the breech-block to form supporting-flanges, and the firing-spring mechanism consisting of the spring-supporting pin having the elongated bearing-plate adapted to enter the elongated recess in the firing-spring bore and to overlie the flanges thereof and having an angular projection to seat between the adjacent edges of said flanges to prevent accidental turning of the spring-supporting pin, a spiral spring supported upon said bearing-plate and extending up into the said bore of the breech-block, and a vertically-reciprocating slide having its bearings in said bore and being supported upon the said spring at its upper end, and firing-pin mechanism, substantially as described, in connection therewith to compress said spring, substantially as and for the purpose described.

22. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a vertically-sliding breech-block, and with the breech-block sliding therein, and with the mechanism for raising and lowering said breech-block with relation to the breech-piece, of the firing-pin shaft journaled in the lower forward end of the breech-block, the firing-pin arm removably but non-rotatably secured to said shaft and having its upper end bored and internally flanged, substantially as described, and the firing-pin having a head to bear against the front end of the bored portion of the arm and having flanges to engage with the rear face of the internally-flanged portion thereof to prevent longitudinal movement of the firing-pin, substantially as described.

23. In breech-loading ordnance, the combination with the breech-piece adapted for carrying a vertically-sliding breech-block, and with the breech-block and firing-pin shaft journaled therein, of a firing-pin arm secured to said shaft bored transversely to the axis of said shaft at its upper end and having a slotted or divided wall transversely of said bore, and cam-like projections at the interior of said bore in the rear of the divided wall, and a longitudinally-divided firing-pin having flanges at its rear end adapted to extend through the divided portion of said wall and be compressed to engage the cam-projections or the notches formed thereby to prevent accidental turning of said pin when seated and having a flanged head to bear against the upper front end of said firing-pin arm to prevent longitudinal displacement of the firing-pin, all constructed and co-acting substantially as and for the purpose described.

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