Sept. 19, 1950 O. L. BEARDSLEY ET AL 2,522,497

BREECH OPERATING MECHANISM

Filed April 28, 1948 3 Sheets-Sheet 1

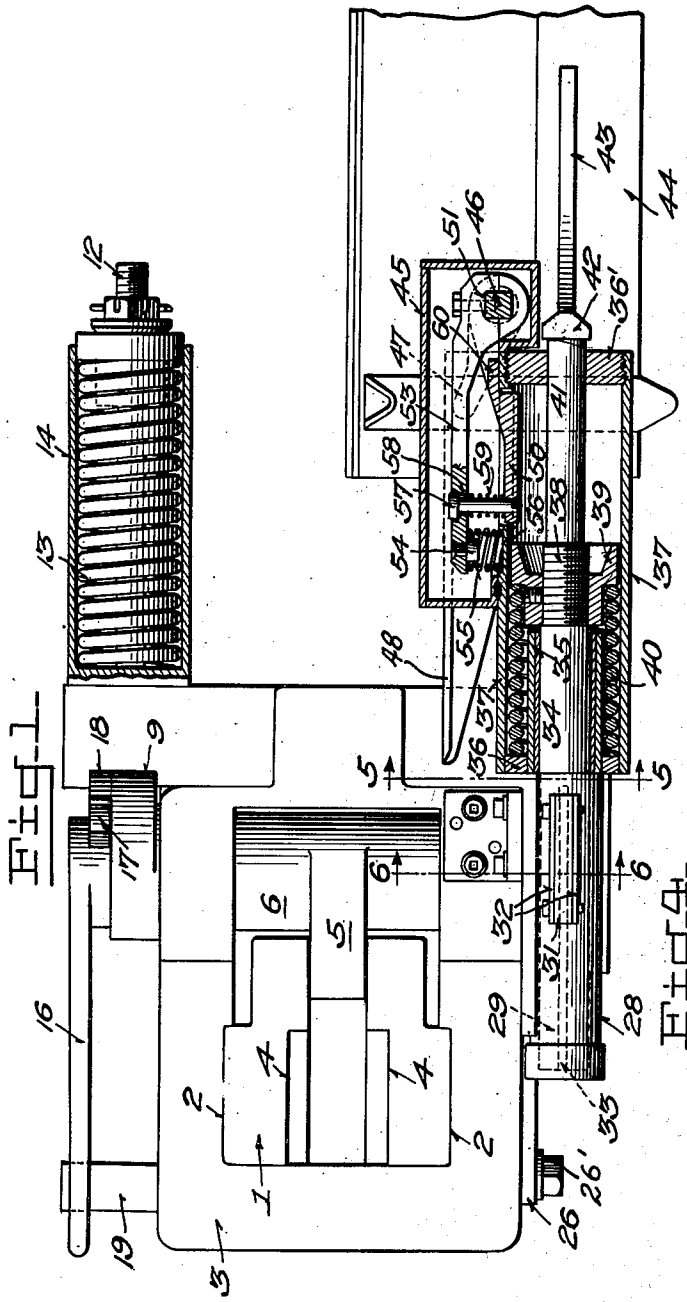


Fig. 1

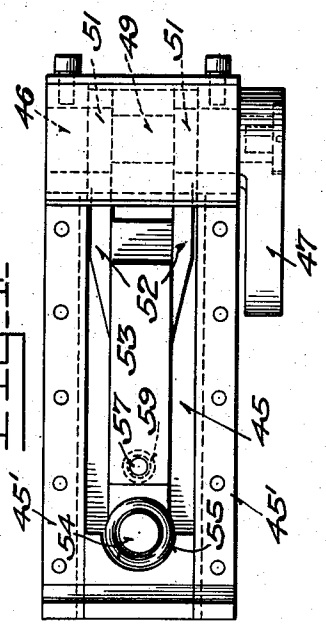


Fig. 4

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Fig. 5.

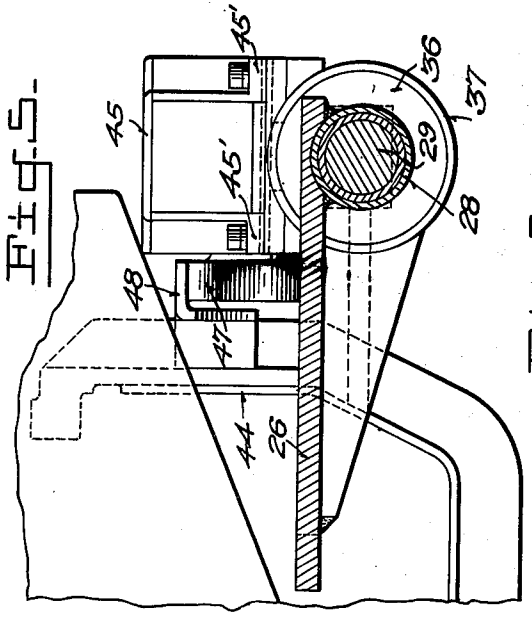


Fig. 6.

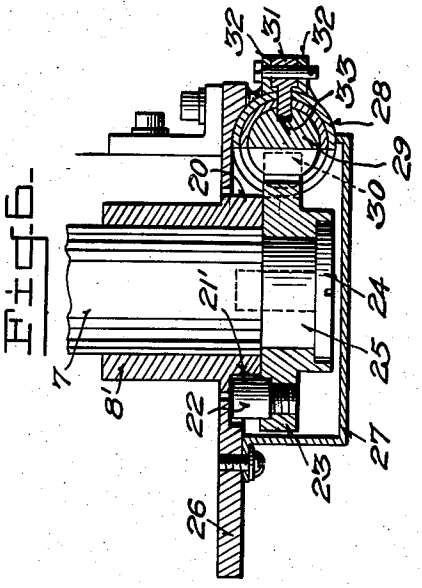
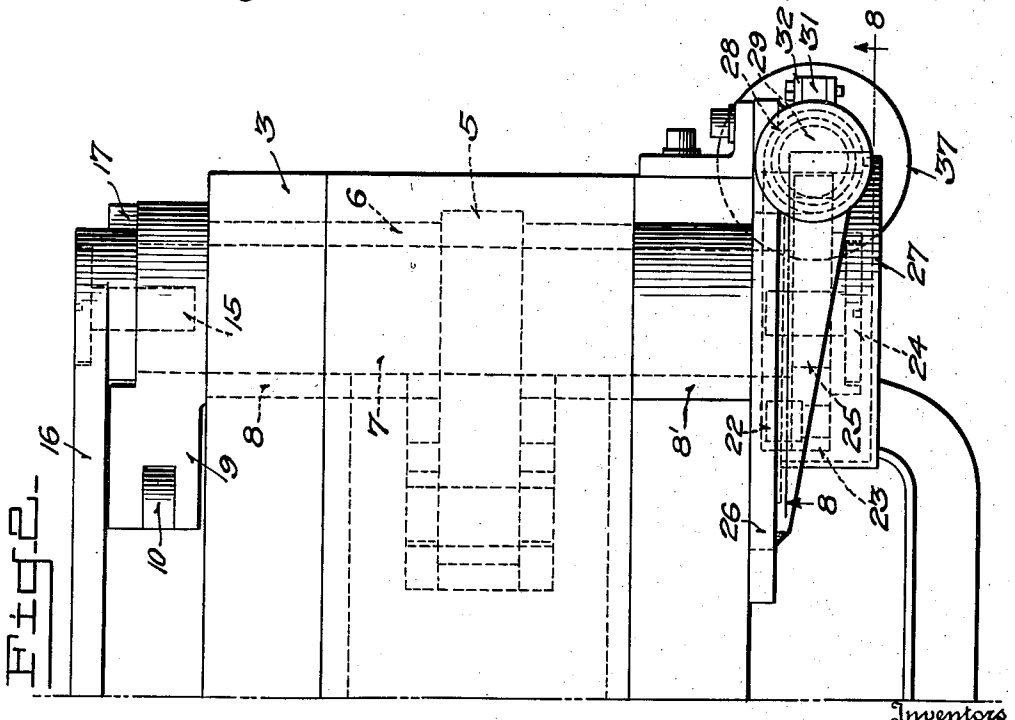


Fig. 2.



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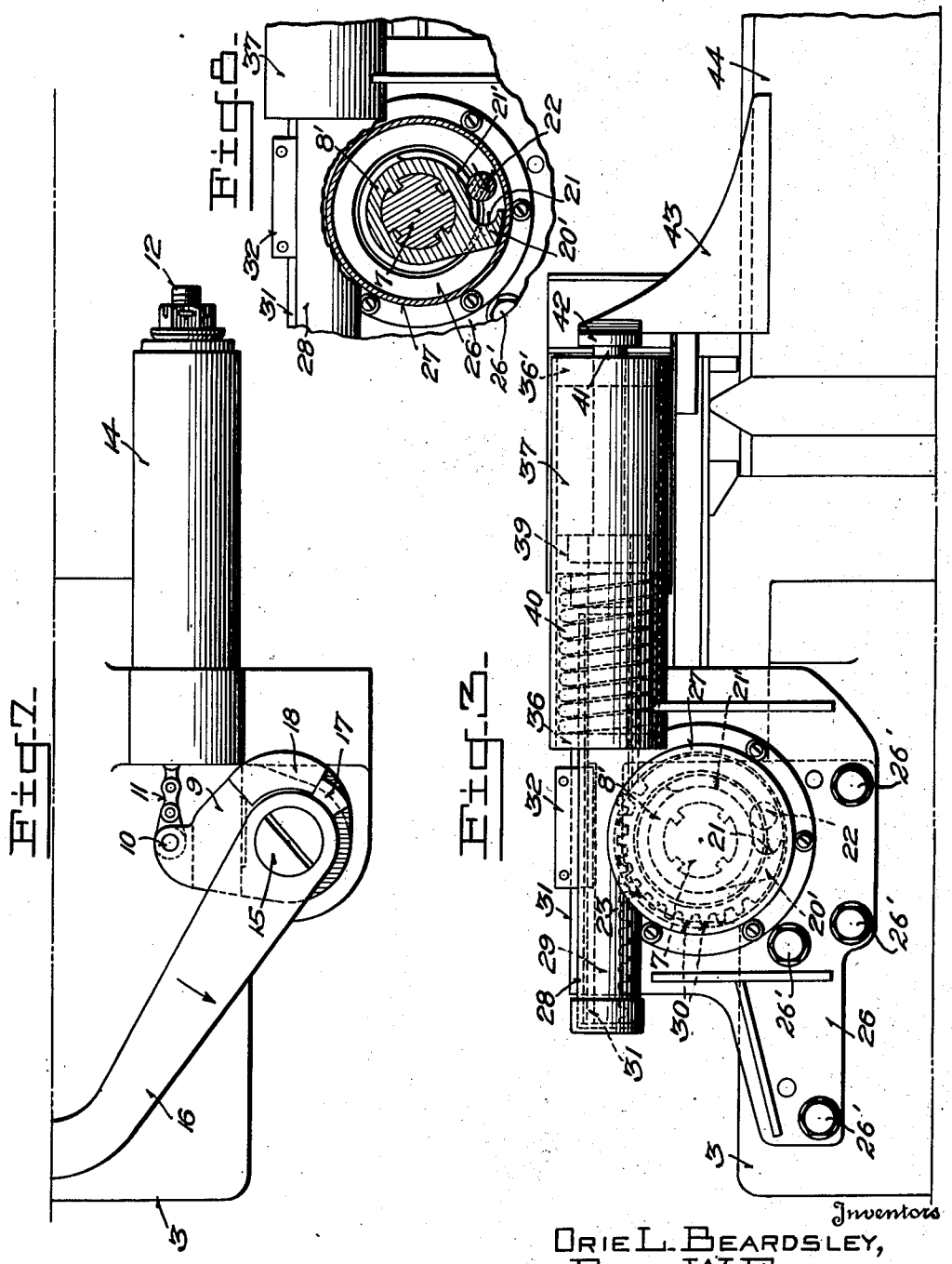


Fig. 2.

Fig. 3.

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BREECH OPERATING MECHANISM

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Application April 28, 1948, Serial No. 23,744

6 Claims. (Cl. 89—24)

(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 us of any royalty thereon.

The present invention relates to a breech operating mechanism for heavy caliber artillery weapons, particularly to a mechanism for utilizing the forces of recoil and counterrecoil for obtaining the automatic opening of a breechblock and the ejection of a spent round of ammunition.

An object of the invention is to utilize the movement of a breech mechanism during counterrecoil to condition a breechblock opening device so that automatic actuation of the same to open a breechblock occurs during completion of the recoil movement of the breech mechanism.

A further object is to compress a spring device during counterrecoil movement of the weapon barrel and to release the potential energy of such compressed spring device during the completion of the recoil movement to open the breechblock.

A still further object is to provide for manual actuation of the breechblock independently of the automatic breechblock opening device.

The exact nature of this invention as well as additional objects and advantages thereof will become apparent upon reference to the following specification and accompanying drawings in which:

Figure 1 is a side elevational view of the invention, partially in section, applied to an artillery weapon, the latter being shown in battery position preparatory to firing;

Figure 2 is an end elevational view of Figure 1;

Figure 3 is a partial bottom view of Figure 1;

Figure 4 is a bottom view of a latch housing forming part of the invention and shown detached from the weapon of Figure 1;

Figure 5 is a sectional view through line 5—5 of Figure 1;

Figure 6 is a sectional view through line 6—6 of Figure 1;

Figure 7 is a partial view of Figure 1, showing a hand lever for optionally opening the breechblock and a breech closing spring assembly for automatically closing the breechblock upon chambering of a cartridge case in the gun chamber; and

Figure 8 is a sectional view through line 8—8 of Figure 2.

A breechblock 1 is slidable in horizontal guides 2 of a breech ring 3 of an artillery piece. The breechblock 1 is of the horizontal sliding type, that is, the breechblock 1 is movable toward and away from an observer viewing Figure 1. This type of breechblock forms no part of the present invention other than to illustrate its adaptability to a gun, the present invention being equally adapted for use with a gun having a breechblock reciprocable in directions other than horizontal.

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The breechblock 1 is slid to either a closed or opened position in a conventional manner through a crosshead, not shown, slidable in a T-shaped slot 4 and attached to a breechblock crank 5. The crank 5 is integrally formed with a tubular shaft 6 keyed to a main shaft 7.

The ends of the main shaft 7 are keyed within bushings 8 and 8' rotatably supported within the breech ring 3. The upper end of the main shaft 7 is provided with a crank arm 9. A pintle pin 10 connects the crank arm 9 to a link chain 11 pivotally attached to a piston rod 12 for compressing a closing spring 13 within a spring cylinder 14.

In a manner well known to the art, the compression spring 13, through the link chain 11 connected to crank 9 on the shaft 7, will turn the same to slide the breechblock 1 to a closing position in the breech ring 3. When a round of ammunition is rammed into the gun chamber, not shown, the rim of the cartridge case will trip the extractors, not shown, to release the breechblock for movement by the spring 13 to the closing position.

To the upper end of the shaft 7 is secured a headed pivot pin 15 on which is pivoted a hand lever 16. The hand lever 16 has a lateral projection 17 adapted to strike a segmental lug 18 integral with the crank arm 9. The segmental lug 18 is made sufficiently large in order that it may also function to counterbalance the shaft 7.

The hand lever 16 is employed for manually rotating the shaft 7, independently of the automatic breech opening mechanism, in the event the occasion arises for such operation. Rotation of the hand lever 16 in a counterclockwise direction (see Figure 7) will cause its projection 17 to strike the lug 18 to rotate the tubular shaft 7 to open the breechblock 1. However, the tubular shaft 7 is free to be rotated in a counterclockwise manner by the automatic breech opening mechanism in a manner to be later described. When not in use, the hand lever 16 is locked in inoperative position by a catch 19.

The lower sleeve 8' is provided with an annular flange 20 having a radially extending crank portion 20' having a semi-circular notch 21. The width of the annular flange 20 is decreased for a portion of its periphery, as indicated by 21', to provide clearance for movement of a driving pin 22 carried by a circular plate 23 rotatably retained by a flanged bolt 24 on a reduced portion 25 of the shaft 7.

The substantially semi-circular notch 21 is adapted to be engaged by the pin 22 for turning the sleeve 8' and consequently the splined shaft 7 to open the breechblock 1 and simultaneously compress the closing spring 13.

Attached to a bottom plate 26 secured to the breech ring 3 through bolts 26', is a circular gear casing 27 enclosing the circular plate 23 and carrying a tubular rack casing 28 in which is slidable a reciprocable rack 29 meshing with teeth 30 formed in the periphery of the circular plate 23 for oscillating the same.

A key 31 is carried by a pair of flange members 32 secured to the rack casing 28 and depends into a longitudinal keyway 33 in the reciprocable rack 29 to guide and hold the same against rotation.

The rack 29 is provided with an extension 34 reciprocably supported by a lined stop sleeve 35 carried by a closing disk 36 for a spring cylinder 37 attached to the plate 26, as best seen in Figure 5.

The rack extension 34 has an intermediate threaded portion 38 to which is secured a piston 39 for compressing between it and the disk 36' a reset spring 40. The rack extension 34 also terminates in a reduced push rod portion 41 adapted to strike a stop button 42 fastened to a plate 43 rigidly atached to the main carriage frame 44 of the weapon for a purpose to appear.

Attached to the top of spring cylinder 37, see Figure 1, is a substantially rectangular latch housing 45, a bottom view of which is shown in Figure 4. In one end of the housing 45 is journaled a stub shaft 46 for oscillation by a cam follower 47 secured to said shaft 46 and adapted to slide against and off the underside of an L-shaped cam plate 48, in a manner to be described, rigidly secured to the main frame 44 of the weapon.

The stub shaft 46 has a central portion 49 of cylindrical cross section for rotatably supporting a sear 50. Intermediate the bearing portions of the shaft 46 and the cylindrical portion 49 the shaft 46 is provided with portions 51 of square cross section to which are secured the bifurcated ends 52 of a lever 53 which straddles the sear 50. The free end of the lever 53 is provided with a centering pin 54 for locating a compression spring 55 seated in a notch 56 on the cylinder 37. The spring 55 biases the lever 53 in a clockwise direction to maintain the cam follower 47 against the cam plate 48.

A headed pin 57 loosely depends through a lever opening 58 in lever 53 and is securely anchored to the sear 50. A spring 59 tends to maintain the lever 53 and sear 50 angularly separated. The sear 50 is adapted to project within the cylinder 37 and into the path of the piston 39 for a purpose to be explained. Movement of the sear 50 into the cylinder 37 is limited by a ledge 60 on the sear 50 abutting the cylinder 37.

The length of the extension 34 is so chosen that upon completion of the counterrecoil movement by the breech ring 3, the piston 39 will be carried rearwardly a sufficient distance to overrun the rearward end of the sear 50 so that it may be dropped into cocking position by the spring 59 with a minimum of effort.

Operation

The weapon is shown in Figure 1 in battery position preparatory to firing. Upon firing the breech mechanism including breech ring 3 will move to the rear (to the left in Figure 1) in recoil carrying with it the casings 27 and 28, spring cylinder 37 and latch housing 45, as well as the mechanism enclosed by these devices, and including the cam follower 48 which rides along the cam plate 47 and held thereagainst by the spring 55 acting through the lever 53.

During this movement in recoil the spring 40 will move the piston 39 forwardly (to the right in Figure 1) to take up the clearance between it and the depressed sear 50. This then results in the piston 39 likewise moving to the rear with the remainder of the mechanism.

Just prior to the termination of the recoil movement of the breech ring 3, the cam follower 48 will be carried past the cam plate 47, thereby freeing the cam follower 48, the stub shaft 46 and the lever 53 for clockwise movement by the spring 55.

Clockwise or upward movement of lever 53, see Figure 1, will drag the sear 50 therewith and out of engagement with the piston 39, whereupon the spring 40 will force the piston 39 and the extension 34 forwardly (to the right in Figure 1), causing the rack 29 to rotate the circular disk 23 in a clockwise direction which in turn causes the pin 22 to engage the notch 21 and rotate the shaft 7 in a clockwise direction, see Figure 3, to open the breechblock 1 and eject the fired cartridge case, the breechblock 1 being held in this open position by extractors, not shown but well known in the art. As the breechblock 1 opens, it will rotate the crank 5 in a counterclockwise direction, viewed in Figure 7, to compress the return spring 13, thereby conditioning the same to return the breechblock 1 to a closed position when the extractors are released, all in a manner well known to the art.

As the weapon barrel returns in counterrecoil to battery position, to the right when viewed in Figure 1, the extension 41 will strike the stop button 42 compressing the spring 40 to the position shown in Figure 1. This will allow the sear 50 to be dropped in front of the piston 39 by the cam follower 48 as shown in Figure 1, preparatory to opening the breechblock 1 after the next round is fired.

When a fresh round of ammunition is placed into the gun chamber, the extractors will be tripped unlocking the breechblock 1 for closing movement by the spring 13 through crank 9 and crank arm 5, thereby returning the notch 21 adjacent to but not touching the pin 25. The space between the notch 21 and the pin 22, as shown in Figure 3, is provided to insure the closing of the breechblock 1 unhindered by the pin 22.

We claim:

1. In a weapon having a gun carriage, a breech mechanism mounted thereon for movement rearwardly in recoil and forwardly in counterrecoil, a breechblock in said breech mechanism reciprocable therein between an open and a closed position, a driving shaft means oscillatable in said breech mechanism and operatively connected to said breechblock for reciprocating the same between said positions, a segmental gear oscillatable on and relative to said driving shaft means, said segmental gear having a crank pin, said driving shaft means having a substantially semi-circular notch adapted to be engaged by said crank pin, a housing structure carried by said breech mechanism movable therewith relative to said gun carriage, a rack reciprocable in said housing structure and meshing with said segmental gear for oscillating the same, an extension on said rack, a collar fixed to said rack extension, an expansion spring between said collar and housing structure for driving said rack extension in direction of counterrecoil of said breech mechanism whereby said crank pin will actuate said driving shaft means

to move the breechblock to the open position, a stub shaft journaled in said housing structure, a cam follower secured to said stub shaft for oscillating the same, a lever secured to said stub shaft, a sear rotatably mounted on said stub shaft and adapted to be depressed into the path of said collar to lock said rack in a cocking position, a cam means fixed on said gun carriage associated with said cam follower, a pin means slidably mounted in said lever and rigidly secured to said sear for limiting angular separation between said lever and sear, a compression spring encircling said pin means and abutting said lever and sear for yieldably holding said lever and sear separated, spring means between said housing structure and said lever biasing the same in a direction to cause withdrawal of the sear from the path of said collar and contact of said cam follower with said cam means, and a stop means on the gun carriage and in the path of said rack extension, said rack extension adapted to abut said stop means after a predetermined movement of said rack extension in the direction of counterrecoil of the breech mechanism to hold said rack extension in a cocked position.

2. In a weapon having a gun carriage, a breech mechanism mounted thereon for movement rearwardly in recoil and forwardly in counterrecoil, a breechblock in said breech mechanism reciprocable therein between an open and a closed position, a driving shaft means oscillatable in said breech mechanism and operatively connected to said breechblock for reciprocating the same between said positions, a segmental gear oscillatable on and relative to said driving shaft means, said segmental gear having a crank pin, said driving shaft means having a substantially semi-circular notch adapted to be engaged by said crank pin, a housing structure carried by said breech mechanism and movable therewith relative to said gun carriage, reciprocable means in said housing structure for oscillating said gear, a sear mechanism mounted in said housing structure and adapted to be depressed into engagement with said reciprocable means to lock the same in a cocking position, a cam means between said gun carriage and said sear mechanism whereby predetermined movement of said sear mechanism with said breech mechanism in direction of recoil thereof will release said reciprocable means to open said breechblock.

3. In a weapon having a gun carriage, a breech mechanism mounted thereon for movement rearwardly in recoil and forwardly in counterrecoil, a breechblock in said breech mechanism reciprocable therein between an open and a closed position, a shaft means oscillatable in said breech mechanism and operatively connected to said breechblock for reciprocating the same between said positions, driving means associated with said shaft means for actuating the same in a direction to move said breechblock to the open position, means on said gun carriage for moving said driving means to a cocked position during movement of said breech mechanism in counterrecoil, latching means holding said driving means in a cocked position and cam means between said gun carriage and said latching means for releasing said driving means at a predetermined distance before termination of movement of said breech mechanism in recoil.

4. In a weapon having a gun carriage, a breech mechanism thereon for movement rearwardly in recoil and forwardly in counterrecoil, a breechblock in said breech mechanism reciprocable therein between an open and a closed position, a driving shaft means oscillatable in said breech mechanism and operatively connected to said breechblock for reciprocating the same between said positions, activating means associated with said driving shaft means for actuating the same in a direction to move said breechblock to the open position, means utilizing movement of said breech mechanism in counterrecoil for energizing said activating means, latching means associated with said activating means for holding the same when energized, cam means adjacent said latching means for rendering the same inoperative during movement of the breech mechanism in recoil to release said activating means to move said breechblock to the open position.

5. The combination of claim 3 wherein the driving means includes a segmental gear oscillatable on and relative to said shaft means, a crank pin on said segmental gear, a substantially semi-circular notch on said shaft means adapted to be engaged by said crank pin, a reciprocable rack meshing with said gear for oscillating the same, an extension on said rack, a collar fixed to said rack extension, and a spring for driving said collar in direction of counterrecoil of said breech mechanism whereby said crank pin will actuate said shaft means to move the breechblock to the open position.

6. In a weapon having a gun carriage, a breech mechanism mounted thereon for movement rearwardly in recoil and forwardly in counterrecoil, a breechblock in said breech mechanism reciprocable therein between an open and a closed position, a driving shaft means oscillatable in said breech mechanism and operatively connected to said breechblock for reciprocating the same between said positions, a segmental gear oscillatable on and relative to said driving shaft means, a crank pin on said segmental gear, means on said driving shaft means adapted to be engaged by said crank pin, a housing structure carried by said breech mechanism and movable therewith relative to said gun carriage, a rack means reciprocable in said housing structure and meshing with said gear for oscillating the same, spring means associated with said housing structure and said rack means for driving the same in direction of counterrecoil of said breech mechanism during recoil movement thereof whereby said crank pin will actuate said driving shaft means to move the breechblock to the open position, means in the path of movement of said rack means and adapted to move the same to a cocking position to compress said spring means during movement of the breech mechanism in counterrecoil, a cam follower means on said housing structure, a sear rotatably mounted on said cam follower means and adapted to be depressed thereby into the path of said rack means to lock the same in the cocking position, a cam means on said gun carriage associated with said cam follower means to cause withdrawal of the sear from the path of said rack means after a predetermined movement of said breech mechanism in recoil to release said rack means for actuation by the spring means to move said breechblock to the open position.

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No references cited.