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WEAR PLATE FOR THE BREECH MECHANISM OF GUNS
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Fig. 1.

Fig. 2.

Fig. 3.

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This invention relates to breech mechanisms for guns and more particularly to breechblocks of the sliding wedge type.

The invention is illustrated herein as applied to a breechblock of the vertically sliding wedge type employed in guns of medium caliber such as the 3" 50 caliber navy gun. Such breechblocks are semi-automatic in that they are automatically closed upon loading a round into the gun and are automatically opened during counter-recoil of the gun following the firing operation. For closing the breechblock a heavy spring is employed which acts to rotate a crank shaft journalized in the breech ring and provided with a crank carrying block received in an upwardly and forwardly inclined T-shaped slot in the lower central portion of the breechblock. The crank shaft is provided with a crank arm which cooperates with a cam plate mounted on the gun carriage to rotate the crank shaft during the counter-recoil movement of the gun to move the breechblock downwardly against the force of the heavy spring aforementioned.

Carried by the breech ring of the gun at opposite sides of the breechblock is a pair of extractors having outwardly extending trunnions received in arcuate slots in the breech ring for supporting the extractors for rocking movements. The extractors have inwardly extending lugs received in cam slots. In opposite sides of the breechblock, the upper portions of which slots are inclined upwardly and forwardly so that during the final downward opening movement of the breechblock, the lower portions of the extractors are moved forwardly and the upper portions are rocked rearwardly to extract the empty shell case from the gun. The forward walls of the cam slots are slabbad off at their upper portions to form shoulders on which the inwardly extending lugs on the extractors rest when the breechblock is fully opened whereupon the extractors serve to lock the breechblock in open position at the conclusion of a firing operation. Springs act on the extractors to hold them in locking positions. Upon the introduction of a new round into the gun the rim of the shell case engages the extractors to rock them in directions to move the lugs off the shoulders whereupon the heavy spring, acting on the cam shaft, causes closure of the breechblock.

Breechblocks of guns of this type have considerable mass, weighing 100 lbs. or more. Consequently there is considerable inertia which must be overcome before the spring closes the breechblock and it is apparent that after the lugs of the extractors have moved off the shoulders the initial closing movement of the breechblock is delayed for the short period of time necessary for the spring to overcome the inertia thereof. The lugs carried by the extractors initially impinge on the shoulder enganged the rearward walls of the cam slots which are quite steep and unless the round is rammed with sufficient force the engagement of the lugs with the rearward walls of the cam slots will cause the round to be arrested in its forward movement momentarily until the breechblock starts to close. This closing movement of the breechblock moves the extractors into their proper positions but if the round has actually come to rest during this instant when the lugs on the extractors engage the rearward walls of the cam slot, the round may not be introduced sufficiently far into the gun to be engaged by the inclined wall of the breechblock and damage may result to the round.

For this reason it is necessary that the round be introduced with sufficient speed to insure its continued movement. If the round is rammed sufficiently fast the lugs on leaving the shoulders engage the rearward walls of the cam slots with enough force to start the upward movement of the breechblock before the springs become effective. Due to the fact that the upper portions of the cam slots are relatively steep, the blow exerted by the lugs on these walls is considerable and the reaction between the outwardly extending trunnions and the cam slots in the breech ring is also high. Consequently considerable wear takes place both on the lugs and in the rear walls of the cam slot and on the arcuate slots in the breech ring. This necessitates frequent replacement of the breech ring and the breechblock, particularly in guns of the type described if they are mechanically loaded at high speeds in which a very high ramming velocity is necessary to maintain a high firing rate of the guns.

It is an object of the present invention to overcome the excess wearing of the parts occasioned by the structure above described thus obviating the necessity of frequent replacement of these parts which require accurate machining and are consequently quite expensive. To this end, and in accordance with a feature of the invention, provision is made for eliminating the blow between the lugs on the extractors and the rearward walls of the cam slots during the loading operation. This is accomplished in accordance with the illustrated embodiment of the invention by forming the rearward walls of the cam slots of movable, vertically-disposed plates pivoted near
their central portions about horizontal axes. With the gun loaded and the breechblock closed, these plates are held by latches in operative positions so that the shape of the cam slots is similar to that employed in guns of this type.

Thus, following the firing operation and downward movement of the breechblock during counter-recoil of the gun, the cam slots act on the lugs carried by the extractors to move the upper portions of the extractors rearwardly and to remove the empty shell case from the gun in the usual manner. However, during the final portion of the opening movement of the breechblock the latches which hold the plates forming the rear walls of the cam slots are engaged by the extractor lugs whereupon springs carried by the lower portions of the plates urge the lower portions forwardly and the upper portions rearwardly. This action does not take place until the breechblock has descended sufficiently far for the lugs to clear the shoulders in the forward walls whereupon the springs acting on the extractors move them into locking positions. This movement of the cam plates widens the upper portion of the cam slots so that during the loading operation and the upward movement of the lugs the shoulders they will not engage the rearward walls of the cam slots before the heavy spring, acting on the breechblock, has time to initiate its upward movement. Thus there is nothing to prevent the round from entering the breechblock completely and wear on the parts, due to the heavy blow between the lugs and the rearward walls of the cam slots, is eliminated.

With this construction it is unnecessary to ram the rounds as hard into the gun as formerly. This also eliminates the need for crimping the projectile into the shell case as much as is necessary with the usual construction necessitated by fast ramming, to prevent the projectile from leaving the shell case when the round comes to rest.

The above and other features of the invention, including various novel details of construction and combinations of parts will now be more particularly described with reference to the accompanying drawings and pointed out in the claims.

In the drawings:

Fig. 1 is a side elevation of the breech end of a gun in which the present invention is embodied;

Fig. 2 is a section on the line II—II of Fig. 1;

Fig. 3 is a detail view in side elevation of a portion of the gun carriage carrying the cam plate by which opening movement is imparted to the breechblock during counter-recoil of the gun;

Fig. 4 is a section on the line IV—IV of Fig. 3;

Fig. 5 is a vertical longitudinal section through the breech end of the gun with the breechblock in open position and a round being loaded into the gun;

Fig. 6 is a similar view showing the positions of the parts immediately after the round is loaded in the gun but before the breechblock has closed;

Fig. 7 is a view similar to Figs. 5 and 6 but showing the parts in the positions assumed after the breechblock is closed;

Fig. 8 is a detail view partly in section of the latch mechanism for holding the plate forming the rearward wall of the cam track in operative position during opening movement of the breechblock, and

Fig. 9 is a section on the line IX—IX of Fig. 8.

The invention is illustrated as embodied in a gun having a breech ring 12 provided with a vertically slidable breechblock 14. The breechblock is provided in its opposite sides with flanges 16 received by grooves 18 in the breech ring, the grooves and flanges being inclined upwardly and forwardly so that as the breechblock is moved upwardly to close the breech it moves slightly forward and forces the round 20 into its seat.

The breechblock in the lower portion of the breechblock is a T-shaped slot 22 (Fig. 2) which is inclined upwardly toward the front face of the block and receives blocks 24 carried by a pin 25 on the end of an operating crank 26 carried by a crank shaft 28 journaled in the lower portion of the breech ring just forwardly of the breechblock. Carried by the outer end of the crankshaft is a crank arm 30 (Fig. 1) to which is secured a chain 32 which extends rearwardly of the gun and is connected to a rod 34 carrying at its rearward end a spring retainer 36 slidable in a cylinder 38. A heavy compression spring 40 acts between the spring retainer 36 and shoulders formed in the forward end of the cylinder to urge the rod 34 rearwardly and turn the crank shaft 28 in a clock-wise direction as viewed in Figs. 1 and 5 to raise the breechblock. Means to be described hereinafter to be described hereinafter to enable the breechblock in the position shown in Fig. 5, when the gun is not loaded, against the force exerted by the spring 40 but when this holding means is released, rotation of the crank shaft 28 in a clockwise direction by the spring causes the breechblock to move into the closed position shown in Fig. 7.

After firing of the gun and at the beginning of the counter-recoil movement the breechblock is again opened. For this purpose the crank shaft 28 on its left end carries a crank 42 (Figs. 2, 3 and 4) provided with a cam follower 44. Pivot 45 to the gun carriage is a cam plate 46 normally urged inwardly of the gun by a spring 48 into position to be engaged by the cam follower 44 during movements of the gun in recoil and counter-recoil. The forward face of the cam plate 46 is inclined at 50 (Fig. 4) so that during recoil of the gun the cam follower 44 rides along the surface 50 urging the cam plate 46 outwardly against the force of the spring 48, without causing any rotation of the crank shaft 28. At the completion of the recoil movement, the cam follower 44 passes beyond the end of the plate 46 whereupon the plate again assumes the position shown in Fig. 4. During the counter-recoil movement the cam follower 44 engages the cam surface 52 (Fig. 3) formed along the edge of the plate so that the crank 42 moves from the broken line position shown in Fig. 3 into the full line position thus causing turning of the crank shaft 28 in a counterclockwise direction as viewed in Fig. 5 so that the breechblock is moved downwardly into open position.

This downward movement of the breechblock causes the empty shell case to be ejected from the gun. For this purpose a pair of extractors 54 are provided, these extractors having outwardly extending trunnions 56 (Fig. 2) received in curved slots 58 in the breech ring of the gun at opposite sides of the breechblock. The upper ends of the extractors have inwardly extending lips 59 arranged for engagement by the rim of the shell case. With the breechblock closed the extractors assume the positions shown in Fig. 7. During opening of the breechblock the extractors are rocked into the positions shown in Fig. 5 thus moving the shell case rearwardly; the extractors moving sufficiently fast to cause the shell case to be completely ejected from the breech of the gun. For thus moving the extractors, inwardly extending lugs 60 are received in cam.
grooves $62$ formed in the sides of the breechblock, the upper ends of the cam grooves extending forwardly whereupon the extractors are rocked in a counterclockwise direction toward the end of the opening movement of the breechblock. The forward walls of the cam slots are slanted off at their upper ends to form shoulders $64$ upon which rest the lugs $60$ carried by the extractors when the breechblock reaches the end of its downward movement. For thus moving the lugs onto the shoulders $64$, spring-pressed plungers $66$ are carried by the lugs of the breech ring at opposite sides of the breechblock. These springs also maintain the extractors $54$ in locking positions relatively to the breechblock as long as the gun remains unloaded. Upon loading the gun the rim of the shell case engages the lugs $59$ on the extractors thus moving the extractors in a clockwise direction against the forces exerted by the spring-pressed plungers $66$ to eliminate any slack. The lugs $60$ move off the shoulders $64$ permitting upward movement of the breechblock under the force exerted by the heavy spring $40$. To eliminate any slack between the shoulders $64$ and the cam slots $63$ with the rearward walls of the cam slots $62$ are formed as plates $70$ pivoted at $72$ to the breechblock and having curved upper end portions for completing the upper portion of the cam track when the plates are in the closed position shown in Fig. 7. The plates are held in these positions when the breechblock is in closed position and until the end of the opening movement thereof by latches $74$ pivoted at $76$ in recesses formed in the breechblock. The latches are normally urged into latching relationship with the upper ends of the plates $70$ by spring-pressed plungers $76$ (Fig. 8). The lower ends of which ride on surfaces $80$ formed on the plates. The lower ends of the latches $74$ carry leaf springs $82$ which act to move the latches toward the positions shown in Fig. 6 upon release of the latches $74$. The latches are released by the latches $66$ when the breechblock has moved downwardly sufficiently for the extractors to clear the shoulders $64$. Accordingly, when the breechblock is locked in its opening position, the latches $74$ have been released and the plates $70$ assume the positions shown in Fig. 8. Upon ramming the round into the gun the extractors are rocked in a clockwise direction against the forces of the spring-pressed plungers $66$ but at this time the upper end of the cam track is sufficiently wide because of the position of the plates $70$ so that the latches $66$ do not move into engagement with the rearward surfaces of the cam path with a heavy impact before the spring $40$ is effective to raise the breechblock.

As the breechblock moves upwardly into closed position the lower ends of the plates $70$, which are in the positions shown in Figs. 5 and 6, engage the lugs $60$ at this time thus causing the plates to move into their operative positions as shown in Fig. 7. With the plates in these positions they are locked by the latches $74$ so that after firing of the gun and downward movement of the breechblock during counter-recoil of the gun the cam tracks $62$ are completed, the plates $70$ and the extractors are properly moved toward the end of the downward movement of the breechblock to eject the empty shell case from the gun. At the end of this downward movement the latches $74$ are again released and the parts resume the positions shown in Fig. 5.

From the above it will be seen that by the use of the pivoted plates forming the rearward walls of the cam slots by which the extractors are opened, the extractors are free to move under the impact of a round during the loading operation to unlock the breechblock. The velocity of ramming may therefore be reduced and impact of the cam slots $60$ with the rearward walls of the cam slots is eliminated so that excessive wearing of the parts due thereto will be substantially reduced.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a gun of the type having a breech ring and extractors carried by the breech ring and having inwardly extending lugs, a vertically sliding wedge-type breechblock, vertical cam grooves forming the rearward walls of said breechblock open, cam grooves in the sides of the breechblock, and inwardly extending lugs carried by the extractors received in said cam grooves; that improvement which comprises movable plates forming the rearward walls of said cam grooves, and means for moving the upper ends of the plates rearwardly toward inoperative positions to widen the upper portions of the cam grooves when the extractors move to their rearward positions in response to opening of the breechblock.

2. In a gun of the type having a vertically sliding wedge-type breechblock, extractors for removing an empty shell case from the gun upon opening of the breechblock and for locking the opening of the breechblock open, cam grooves in the sides of the breechblock, and inwardly extending lugs carried by the extractors received in said cam grooves; that improvement which comprises movable plates forming the rearward walls of said cam grooves, and means for moving the upper ends of the plates rearwardly toward inoperative positions to widen the upper portions of the cam grooves in the sides of the breechblock.

3. In a gun of the type having a vertically sliding wedge-type breechblock, extractors for removing an empty shell case from the gun upon opening of the breechblock and for locking the opening of the breechblock open, cam grooves in the sides of the breechblock, and inwardly extending lugs carried by the extractors received in said cam grooves; that improvement which comprises movable plates forming the rearward walls of said cam grooves, and means for moving the upper ends of the plates rearwardly toward inoperative positions to widen the upper portions of the cam grooves in the sides of the breechblock.

4. In a gun of the type having a vertically sliding wedge-type breechblock, extractors for removing an empty shell case from the gun upon opening of the breechblock and for locking the opening of the breechblock open, cam grooves in the sides of the breechblock, and inwardly extending lugs carried by the extractors received in said cam grooves; that improvement which comprises movable plates forming the rearward walls of said cam grooves, and means for moving the upper ends of the plates rearwardly toward inoperative positions to widen the upper portions of the cam grooves in the sides of the breechblock;
grooves when the extractors move to their rearward positions in response to opening of the breechblock, said plates having portions engageable by said lugs for moving the upper ends of the plates forwardly into operative positions during closing movement of the breechblock, and retractor latches for locking the plates in operative positions.

5. In a gun of the type having a vertically slidable wedge-type breechblock, extractors for removing an empty shell case from the gun upon opening of the breechblock and for locking the breechblock open, cam grooves in the sides of the breechblock, and inwardly extending lugs carried by the extractors received in said cam grooves; that improvement which comprises plates having surfaces arranged to form the rearward walls of said cam grooves, means pivotally mounting said plates for movement into inoperative positions with the upper portions of the plates in widely spaced relation to the forward walls of the cam grooves, means holding said plates in operative positions, said holding means having portions arranged to be engaged by the inwardly extending lugs of the extractors upon opening of the breechblock to release said holding means, and means urging said plates toward said inoperative positions.

6. In a gun of the type having a vertically slidable wedge-type breechblock, extractors for removing an empty shell case from the gun upon opening of the breechblock and for locking the breechblock open, cam grooves in the sides of the breechblock, and inwardly extending lugs carried by the extractors received in said cam grooves; that improvement which comprises plates having surfaces arranged to form the rearward walls of said cam grooves, means pivotally mounting said plates for movement into inoperative positions with the upper portions of the plates in widely spaced relation to the forward walls of the cam grooves, means holding said plates in operative positions, said holding means having portions arranged to be engaged by the inwardly extending lugs of the extractors upon opening of the breechblock to release said holding means, and means urging said plates toward said inoperative positions.

7. A breech mechanism comprising a breech ring having a vertically slidable breechblock, means acting on said block to move it upwardly into closed position, extractors carried by the breech ring for rocking movements, said extractors having inwardly extending lugs, said breechblock being provided with cam grooves to receive said lugs, said cam grooves being arranged to cause rearward rocking movements of the extractors to eject a round from the breech in response to downward movement of the breechblock in open position, the upper portions of the forward walls of the cam grooves forming flat shoulders to receive the inwardly extending lugs which thereby lock the breechblock in its open position, pivoted plates forming the rearward walls of said cam grooves, means acting on said plates to move the upper portions rearwardly, and latches cooperating with said plates to hold them in operative positions in which they cause rearward movement of the extractors in response to downward movement of the breechblock, said latches being positioned to be released by the extractors at the conclusion of the opening movement of the breechblock, the lower portions of said plates being engageable by said lugs upon upward movement of the breechblock thereby to move said plates into operative positions.

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No references cited.