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J. M. BROWNING

FIRING MECHANISM FOR GUNS

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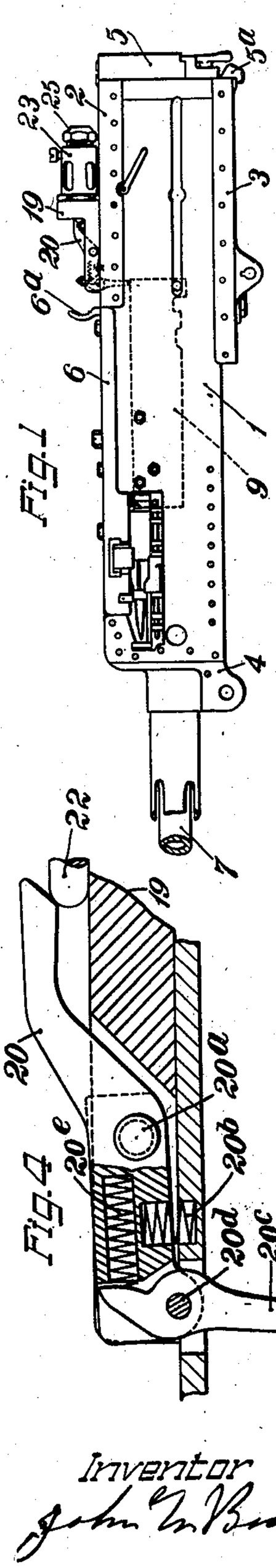

Fig. 1

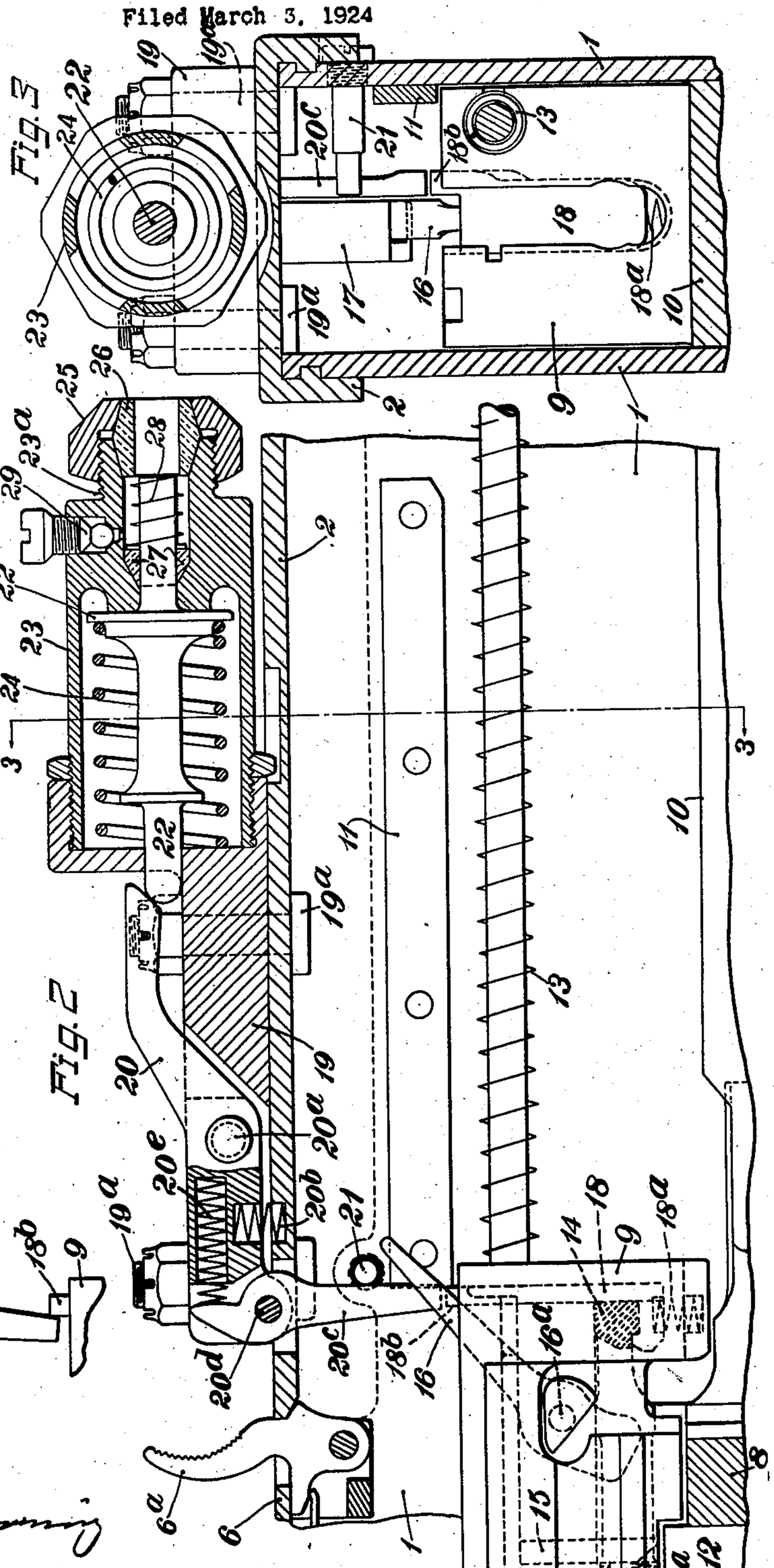

Fig. 3

Fig. 4

Fig. 2

Inventor

John M. Browning

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JOHN M. BROWNING, OF OGDEN, UTAH.

FIRING MECHANISM FOR GUNS.

Application filed March 3, 1924. Serial No. 696,528.

To all whom it may concern:

Be it known that I, JOHN M. BROWNING, a citizen of the United States, residing in Ogden, in the county of Weber and State of Utah, have invented certain new and useful Improvements in Firing Mechanism for Guns, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

The invention relates generally to firing mechanisms for automatic guns and more particularly to such mechanisms which are applicable to automatic machine guns adapted to be fixedly mounted on an airplane and pointed to fire through the field swept by the propeller blades and which are adapted to be operated from a distance by impulses generated in synchronism with the propeller driving means.

It is an object of the invention to provide a firing mechanism of the class described which is simple in construction, reliable in operation, durable, easy of manufacture, and which is readily applicable to existing types of machine guns.

With this and other objects in view, the invention also consists in certain devices, arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

In the accompanying drawings:

Fig. 1 is a left-hand side elevation, on a greatly reduced scale, of an automatic machine gun of a known type adapted for aircraft use showing the invention applied thereto.

Fig. 2 is a partial central vertical longitudinal section through said gun, parts of the mechanism being shown in section, parts in elevation, and parts being broken away.

Fig. 3 is a partial vertical transverse section through the gun on the line 3—3 of Fig. 2, as seen from the rear.

Fig. 4 is a fragmentary central vertical longitudinal section showing parts of the firing mechanism in different positions from the position of these parts as shown in Fig. 2.

The machine gun to which the invention has been shown applied comprises a breech casing having side plates 1, a fixed top plate 2 and a fixed bottom plate 3 all rigidly and strongly interconnected to form a hollow steel beam of great strength. At the front, the casing is closed by the front block 4 secured to the forward portions of the side plates. The rear end of the casing is closed by the upwardly removable rear plate 5 kept in its lower operative position by a latch 5^a; the forward portion of the top of the casing is closed by the hinged top cover 6 locked in closed position by the latch 6^a.

The barrel 7, see Fig. 1, and the barrel extension 8, see Fig. 2, are mounted for longitudinal reciprocating movement in said breech casing and the breech block 9 has longitudinal reciprocating movement in the barrel extension, being guided in such movement by the usual rib and groove connection with said barrel extension and also by the plane top surface of the breech block guide 10 located in the lower portion of the rear end of the casing and by a guide strip 11 secured to the right-hand side of the casing just above the path of the breech block, see Figs. 2 and 3.

The breech block is normally locked to the barrel in the usual manner by the vertically sliding locking block 12, a portion of which is shown in Fig. 2, and said breech block is returned to its forward position after recoil by the reaction spring 13.

The mechanism for unlocking the breech block from the barrel and barrel extension during the recoil of said parts and for moving said breech block rearward, after it has been so unlocked, at an accelerated rate of speed, for returning it and the barrel and barrel extension forward to the firing position, and for again locking said breech block to the barrel and barrel extension, has not been fully disclosed herein, because it forms no part of the present invention and is similar to that fully shown and described in my pending application for automatic machine gun, Serial No. 654,955, filed July 31, 1923.

The firing pin 14, the rear portion of which is shown in central vertical longitudinal section in Fig. 2, is carried in a usual manner in a longitudinal seat in the breech block 9 and is actuated by a spring 14^a bearing at its forward end (not shown) against an abutment on the firing pin and at its rear end against a vertical abutment pin 15 in the breech block. The firing pin is moved to the cocked position by the cocking lever 16 pivoted in the breech block by a transverse pin 16^a and having its lower arm in position to co-operate with the firing pin and its upper arm extending above the breech block for co-operation with a recess

in the bracket 17, not shown in Fig. 2 but shown in Fig. 3, depending from the top plate 2 of the casing, whereby the firing pin is cocked during the recoil of the breech block in a manner fully described in the application hereinbefore referred to.

The sear 18, which holds the firing pin cocked, as shown in Fig. 2, is mounted for sliding movement in a corresponding vertical central seat at the rear end of the breech block, see Fig. 3, and is moved upward to its operative position by a spring 18^a. On its right-hand side, the sear is widened laterally and provided to the right of and consequently out of the path of the cocking lever with an upward extension 18^b. Said extension is adapted to be engaged for actuating the sear to release the firing pin to fire a shot by the novel improved mechanism now to be described.

This mechanism is shown mounted on a plate or support 19 which is detachably secured to the fixed top plate 2 of the breech casing, by suitable means, such as the bolts 19^a. This arrangement on the top plate of the casing makes said sear actuating mechanism specially adapted for use with either right-hand fed guns or left-hand fed guns or with guns adapted for either right-hand or left-hand feed.

Said mechanism may comprise a sear actuator 20 carried by said support 19 and extending through a slot in the top plate of the casing downwardly to a position slightly above the upward extension 18^b of the sear 18, when the breech block 9 is in its forward position and the sear is holding the firing pin cocked, as shown in Fig. 2. In the embodiment of the invention selected for illustration, this sear actuator 20 comprises a two-armed lever, hereinafter called the actuator lever, pivoted in a vertical slot in the forward portion of the support 19 on the transverse pin 20^a, and is normally held in inoperative position with its forward arm raised, see Fig. 2, by a spring 20^b, which has its upper end seated in a recess in said arm of the lever and its lower end in a recess in the top plate of the breech casing. That part of the sear actuator 20 which directly engages the sear is arranged to yield in forward direction for a purpose to be later explained. To permit such yielding, said part has the form of a second lever 20^c, hereinafter called the connecting lever, which is pivoted in a vertical slot near the end of the forward arm of the actuator lever on the transverse pin 20^d. This connecting lever is kept in its normal operative position with its long lower arm in rearward position, as shown in Fig. 2, where it rests against a suitable stop, such as the pin 21, by the tension of a spring 20^e seated in a longitudinal recess in the forward arm of the actuator lever and bearing with its forward end against the upper short arm of said lever 20^c.

With the parts in the position shown in Fig. 2 and with a cartridge seated in the chamber of the barrel, if the rear arm of the actuator lever is raised the forward arm is thereby lowered and the lower end of the connecting lever 20^c engages the upward projection 18^b of the sear 18 and depresses the same to release the firing pin, thereby firing a shot. The gun will now be automatically reloaded, assuming that cartridges have been supplied to the feed mechanism, and the parts will again assume the position shown in Fig. 2 ready to fire the next shot, that is, if the actuator 20 is operated at the rate of speed at which the gun would fire automatically or at a slower rate.

Since, however, the impulses generated by the propeller driving means of an airplane are usually of a higher frequency than the firing rate of the gun when firing automatically, it may and does happen that the actuator 20, which is adapted to be operated in synchronism with such impulses, will sometimes be in the position shown in Fig. 4 when the recoiling parts of the gun are completing their forward movement to the firing position. In that event, no harm will result because of the yieldable mounting of the connecting lever 20^c, which permits its lower end, when engaged by the forward face of the upward extension 18^b of the sear, to be moved forwardly against the tension of the spring 20^e as shown in Fig. 4. The depression of the sear cannot occur until the next downward stroke of the forward arm of the actuator lever, when the connecting lever will have been returned to its operative position by the spring 20^e.

This construction of the sear actuator 20 also positively insures that the sear will be depressed to release the firing pin to fire a shot each time at the same angular position of the actuator lever when moving in one direction, which is an essential requisite to secure perfect synchronization.

Various devices can be used to move the sear actuator 20 in synchronism with the propeller driving means; certain parts of one form of such a device which are immediately associated with the gun, are shown in the drawings and will now be described.

This device may comprise a plunger 22 slidably supported at its considerably reduced and rounded forward end in a corresponding hole formed in the rear vertically enlarged portion of the support 19, which forms also the forward wall of a cylindrical casing produced by securing the screw-threaded open forward end of a cup-shaped member 23 within a correspondingly threaded annular flange projecting rearward from said vertically enlarged portion of the support 19; the similarly reduced rear end of

said plunger is slidably supported in a central bearing therefor in the integral rear wall of said member 23.

To keep the plunger 22 normally in its rearward inoperative position and to return it to such position after it has been moved forward, a strong helical spring 24 is provided, the forward end of which rests against the interior wall of the cylindrical casing and the rear end bears against a collar on the plunger 22.

The rear arm of the actuator lever inclines upward some distance and beyond this inclined portion it extends horizontally to a point near the forward wall of the cylindrical casing through which the forward end of the plunger 22 projects; the end of said lever arm is beveled to co-operate with the forward rounded end of the plunger 22. It is to be noted that said end of the plunger 22 is supported against downwardly yielding forward of the wall of the cylindrical casing by resting upon the top surface of the support 19.

By this construction, it will be evident that the reciprocating movement of the plunger 22 produces a rocking movement of the actuator lever.

The casing containing the plunger 22 is, in the embodiment of the invention selected for illustration, constructed and arranged for connection with a liquid impulse generator and has, therefore, a suitable chamber 30 in its rear portion into which the reduced rear end of the plunger extends.

To prevent leakage of liquid around said plunger in forward direction the forward end of said chamber is tapered inwardly and a suitable packing 27 surrounding the plunger is forced into engagement with said taper and, by the wedging action of the same, against the plunger by a spring 28, the forward end of which bears against a thin washer in rear of this packing and the rear end against another packing 26 fitted into the conical rear end of the chamber.

This rear packing 26 is provided to serve for the connection to the cylindrical casing 23 of the tube of a liquid impulse generator, and in order to make said connection tight against leakage the packing 26 is of conical shape at both ends; the forward end of said packing 26 fits the corresponding conical seat in the rear end of the chamber. The rear portion of the casing 23 forms on its outside a projecting boss 23^a which is screw-threaded and the threaded nut 25 is fitted upon said boss; the rear portion of the interior of said nut is conical and fits upon the conical rear portion of the packing 26. By this construction the packing 26 and its seats in the nut 25 and in the rear end of the chamber in the casing 23, co-operate to compress the packing upon the tube of the liquid impulse generator.

An air relief valve 29 normally closes a port connecting the chamber 30 with the atmosphere. When the system is being filled with liquid, any air trapped in this chamber may, by opening the valve 29, be allowed to escape.

It is evident that various changes in the form and arrangement of the parts may be made without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. In an automatic machine gun, the combination of a breech casing, a barrel, a breech block mounted for longitudinal reciprocating movement in said casing to open and close the breech of the barrel, a transversely movable sear carried by said breech block, a support mounted on the outside of said casing, and a sear actuator pivoted in said support and extending into said casing for engagement with said sear to move the same in one direction.

2. In an automatic machine gun, the combination of a breech casing, a breech block mounted for longitudinal reciprocating movement in said casing, a transversely movable sear carried by said breech block, a support mounted on said casing, and a sear actuator pivoted in said support and having a portion thereof in position for engagement with said sear to move the same in one direction, said portion being adapted to yield forwardly, as and for the purpose specified.

3. In an automatic machine gun, the combination of a breech casing, a breech block mounted for longitudinal reciprocating movement in said casing, a transversely movable sear carried by said breech block, a support mounted on said casing, a lever pivoted on said support and carrying a member adapted to yield forwardly at its inner end which is normally arranged to engage and move the sear in one direction, and means constructed and arranged to be operated from a distance for imparting a rapid rocking movement to said lever.

4. In an automatic machine gun, the combination of a breech casing, a breech block mounted for longitudinal reciprocating movement in said casing, a transversely sliding sear carried by said breech block, a support mounted on a wall of said casing, a sear actuator movably supported in said support and extending into said casing for engagement with said sear to move the same in one direction, and means carried by said support and adapted to be operated from a distance for imparting rapid movement to said sear actuator.

5. In a synchronized firing mechanism for automatic machine guns, the combination of a casing, a breech block movable in said casing, a transversely movable sear

carried by said breech block, a sear actuator pivoted outside said casing, and having a portion extending into said casing for engagement with the sear to move the same in one direction, said inwardly extending portion being adapted to yield forwardly at its inner end, and means adapted to be operated from a distance for imparting to said sear actuator a rapid rocking movement.

6. In an automatic machine gun, the combination of a breech casing, a breech block mounted for longitudinal reciprocating movement in said casing, a vertically slidable sear carried by said breech block, a support mounted on the top of said casing, a lever pivoted in said support, a connector pivoted to said lever, said connector having its lower end normally in position for engagement with the sear when the same is in its forward firing position to move said sear in one direction, means permitting said end to yield forwardly if the connector happens to be depressed during the final forward movement of the sear, and means for imparting a rapid rocking movement to said lever, comprising a reciprocating plunger carried by said support and co-operating with a cam surface on said lever.

7. In a synchronized firing mechanism for automatic machine guns having a reciprocating breech block, a transversely movable sear carried by said block, a support removably mounted on the casing, a sear actuator movably mounted on said support and arranged to directly engage said sear to move it in one direction, and means carried by said support for imparting a rapid vibrating movement to said sear actuator.

8. In an automatic machine gun, the combination of a breech casing, a breech block mounted for longitudinal reciprocating movement in said casing, a transversely movable sear carried by said breech block, a support secured to said casing, an actuator movably mounted in said support and arranged to engage said sear to move the same in one direction, and means whereby the sear engaging portion of the actuator can yield in forward direction, as and for the purpose specified.

9. In an automatic machine gun, the combination of a breech casing, a breech block longitudinally movable in said casing, a sear carried by said breech block, a sear actuator movably mounted on said casing and arranged to engage said sear to move the same in one direction, means whereby the sear engaging portion of the actuator can yield in forward direction, and means adapted to be operated from a distance for moving said actuator.

This specification signed this 27th day of February, 1924.

JOHN M. BROWNING.