C. W. LANG.

FIRING MECHANISM FOR FIREARMS.

APPLICATION FILED JUNE 18, 1917.

1,359,609.

Patented Nov. 23, 1920.

2 SHEETS—SHEET 1.

Fig. 1.

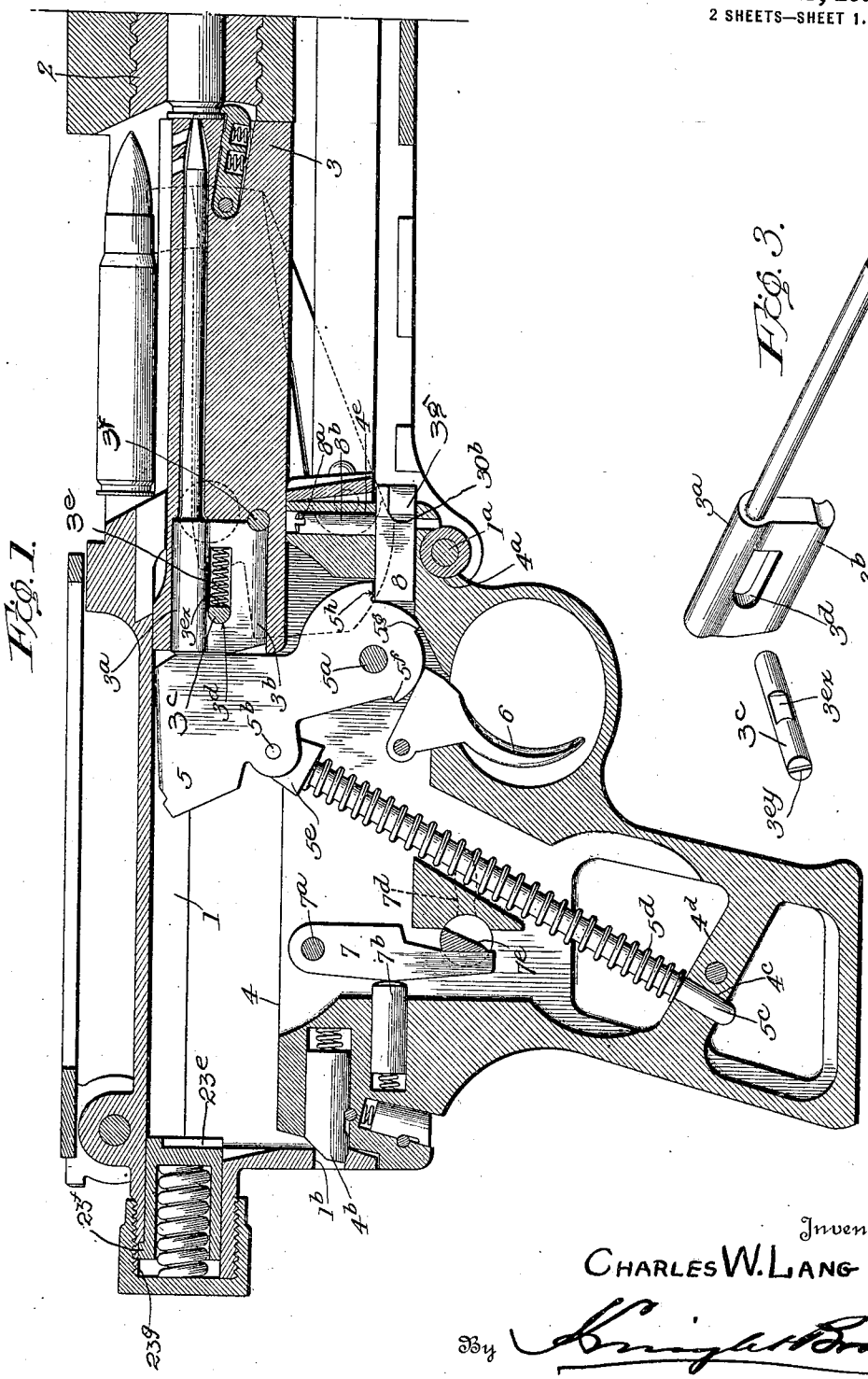


Fig. 3.

Inventor

CHARLES W. LANG

By Knight Bros

Attorney

C. W. LANG.

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2 SHEETS—SHEET 2.

FIG. 2.

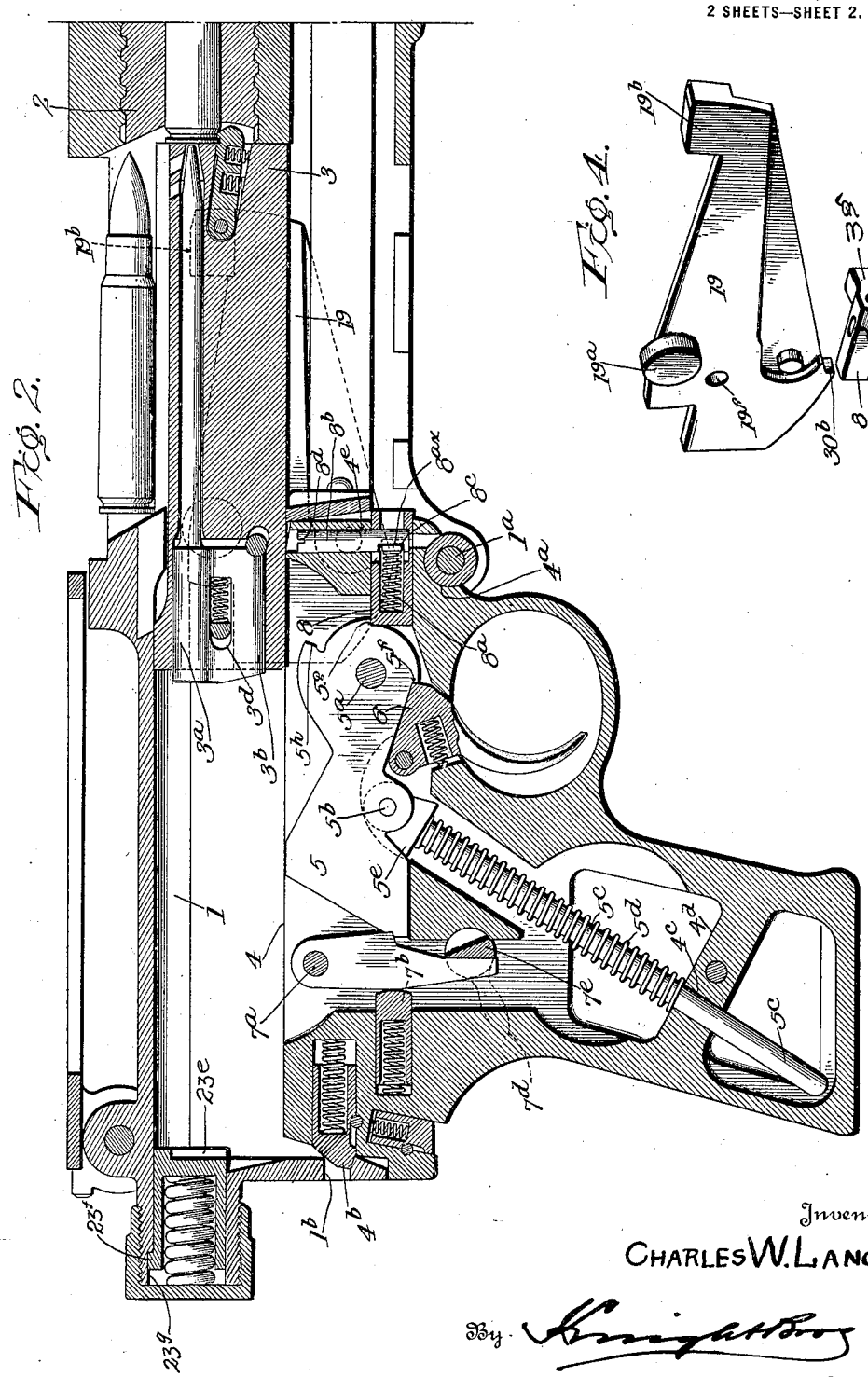


FIG. 4.

Inventor

CHARLES W. LANG

By Knight Bros

Attorney

UNITED STATES PATENT OFFICE.

CHARLES WELLINGTON LANG, OF EAST ORANGE, NEW JERSEY.

FIRING MECHANISM FOR FIREARMS.

1,359,609. Specification of Letters Patent. Patented Nov. 23, 1920.

Application filed June 18, 1917. Serial No. 175,494.

To all whom it may concern:

Be it known that I, CHARLES W. LANG, a citizen of the United States, and resident of East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Firing Mechanism for Firearms, of which the following is a specification.

This invention relates to firing mechanism for firearms, and more particularly to a type of mechanism in which a pivoted hammer is employed for igniting fixed ammunition and which will be particularly adapted for use in machine guns.

One object of the invention is to provide a firing pin especially adapted for coöperation with a striker in the form of a hammer, by giving the firing pin a considerable mass; one collateral object, in this connection, being to cause the buffer, that receives the breech block at its rearward limit of movement, to deliver its impact to the breech block itself and not encounter the firing pin; and another collateral object, in this connection, being to automatically restrain the firing pin from reaching the primer in the closing movement of the breech block, but permit it to move forward to a position within reach of the primer after its momentum has been wholly arrested and as the breech bolt becomes locked, the firing pin being preferably moved to such position by a light spring which is permitted to act at the time stated, in order to prevent any slack or lost motion at the instant the hammer strikes.

Another object of the invention is to provide a hammer-control which, in addition to the finger trigger sear, will embody a so-called full automatic sear that arrests the hammer in cocked position until after the breech block is closed, and will be tripped off by the movement of the breech locking mechanism to locked position, preferably the latter part of such movement; a subordinate object in this connection being to provide readily releasable self-retaining means for holding the full automatic sear in place.

Another object is to secure the hammer against movement beyond striking position with consequent injury to the parts when the grip frame carrying the hammer mechanism is disassembled and particularly to adapt the full automatic sear to arrest the hammer near its forward limit or sufficiently beyond the same to avoid interference with the normal functioning of the hammer.

A further object is to provide a safety sear for engaging the hammer in cocked position and making it impossible to release the hammer by manipulation of the trigger until the safety sear is withdrawn by separate manipulation of the safety sear lever.

Further objects relate to the details of construction of the hammer-projecting means whereby an efficient mechanism of very simple construction is provided.

To the ends above enumerated, one feature of the invention consists in providing a firing pin having a limited longitudinal movement in the breech block and with an enlarged head or mass of metal at its rear end, which protrudes behind the rear face of the breech block and receives the impact of the hammer to be transmitted to the firing pin; one collateral feature in this connection consisting in providing, in the rear wall of the receiver, a spring buffer that receives the rearward impact of the breech block, recessed upon its forward end to admit the protruding portion of the firing-pin head without impact, while fashioned around its recess to receive the rear face of the breech block, and having a spline connection with the receiver that prevents rotary displacement, and keeps its recess in proper relation to the firing-pin head; another collateral feature in this connection consisting in the provision of a transverse pin carried by the breech locking means and receiving a limited retracting movement by the unlocking movement which holds the firing pin out of reach of the cartridge until after the closing movement of the breech block is arrested and the locking means moves to locking position, a positioning spring mounted in the enlarged head of the firing pin being provided to place the firing pin against the cartridge ready for transmission of firing impact, as soon as the locking movement is completed.

Another feature consists in pivoting the hammer in the grip-frame, which is preferably made removable in accordance with my co-pending application Serial No. 97,886, of May 16th, 1916; the location of the pivot being such that the hammer moves upwardly and forwardly, and the hammer being provided with a plurality of sear notches that receive the several controlling

sears as well as a notch on its free end, to receive a safety sear; the trigger sear being preferably made integral with the trigger and remaining out of action and leaving the gun to automatically continue firing as long as the trigger is held retracted; and the safety sear, when properly set, being available to prevent release of the hammer even though the trigger be pulled, and being adapted, even, to take the place of the finger trigger sear in case the latter becomes disabled, at least so far as concerns starting and arresting the purpose for which the gun is mainly intended, namely, full automatic firing.

Another feature consists in providing a full automatic sear preferably in the form of a longitudinally movable spring bolt, which is adapted to engage one of the notches upon the hub of the hammer for the purpose of arresting the hammer in cocked position until the breech is closed, and constituting, when employed in connection with the safety sear and the finger trigger sear, a triple sear-control; said full-automatic sear having a projection intersecting the path of the breech locking mechanism at a point where it will be encountered by said mechanism only in the locking movement, and preferably in the latter part of such movement—say after 80% of its complete locking throw has taken place; a subordinate feature in this connection residing in a retaining pin inserted in a socket in the frame, extending through a slot in the full automatic sear to prevent removal of the same and forming the abutment for the spring which presses said sear to its duty; the retaining pin being formed with a notch in which the spring seats, to adapt the spring to resist displacement of the pin, and the pin being rotatable to bring its smooth side against the end of the spring and its notch away from the spring when it is desired to remove the pin and release the full automatic sear.

Another feature consists in providing a limiting notch on the hub of the hammer which adapts the latter to again encounter the full automatic sear in case the hammer should be released when the frame is removed from the gun, and thus arrest the hammer at its forward limit and prevent injury or disarrangement of the parts which might otherwise occur.

Another feature consists in projecting the hammer through means of a thrust-rod connected through a knuckle joint to an intermediate point on the hammer, and extending downward through a guide opening in the frame, with the spring surrounding the intervening portion between the hammer and the frame and abutting against the frame in a manner to store up power from the cocking of the hammer and thus put the hammer under tension. The safety sear is preferably in the form of a pendent dog having a shoulder through which it may engage the hammer when the safety sear is freed to the action of its seating spring, but which may be withdrawn from hammer-engaging position by means of a cam controlled by a finger lever.

The invention will be fully understood upon reference to the accompanying drawings illustrating an embodiment of the firing mechanism appropriate to a machine gun and mounted in a frame of the character substantially as described in my application Serial No. 97,886, filed May 16th, 1916.

In said drawings:—

Figure 1 is a longitudinal sectional view of the rear portion of a machine gun showing the receiver, the breech bolt that reciprocates therein, and a removable frame in which the mechanism forming the subject matter of the present invention is mainly mounted; the breech block being closed, the locking wings swung upward into locking position, the safety sear being locked off and the hammer being in projected position;

Fig. 2 is a similar view with the hammer in cocked position, the safety and trigger sears both in engagement therewith, and the breech block closed, but the locking wings not yet swung upward to locking position, and the full automatic sear, therefore, not yet disengaged from the hammer;

Fig. 3 is a detail view of the firing pin and its accessory parts;

Fig. 4 is a detail perspective view of the full automatic sear and one of the coöperating breech-bolt locking wings that release said sear by their locking movement.

1 represents the receiver, 2 the barrel, 3 the breech block reciprocating in the receiver, and 4 a frame in the open under side of the receiver. These parts are preferably constructed in accordance with corresponding parts in my aforesaid application Serial No. 97,886, of May 16th, 1916; that is to say, the frame is supported at its forward end upon a transverse pin 1^a extending across the opening of the receiver and receiving the convex seat 4^a of the frame upon which the frame may swing into and out of position, and which permits the frame to be disengaged from the pin when the frame is swung downward at a suitable angle. At its rear end, the frame is supported by the latch 4^b which snaps into the recess 1^b of the receiver and from which it may be dislodged by any suitable instrument such for instance as the point of a cartridge, when it is desired to remove the frame.

According to the present invention, the striker consists of a hammer 5 pivoted at 5^a in the frame, and adapted to swing upward and strike the firing pin 3^a in the breech

block to explode the cartridge. The firing pin 3^a is of a peculiar construction, in that it has, at it rear end, an enlargement 3^b which embodies a considerable mass of metal that absorbs the shock of the hammer 5 and thus greatly relieves the firing pin 3^a.

The firing pin 3^a is preferably secured in the breech bolt with the necessary longitudinal play for functioning, by means of the transverse pin 3^c snugly fitted in the walls of the breech block and extended through the slot 3^d in the head of the firing pin, and serving as an abutment for the spring 3^e located between the pin and the forward end of the slot, and serving to place the firing pin against the primer previous to the delivery of the hammer blow. As shown in Fig. 3, the flat face 3^{ex}, against which the spring bears on the securing pin 3^e, is formed by a recess in the said pin, and this adapts the spring to lock the pin against withdrawal until the pin is rotated (as by screw driver in its slot 3^{ev}) to bring its smooth face against the spring.

To facilitate assembly of these parts, the spring 3^e may first be introduced into the slot 3^d with a short temporary pin that does not project beyond the sides of the firing pin head, and these three parts slid into place, after which pin 3^c is introduced, through the wall of the breech block, and through the slot 3^d, displacing the short, temporary pin as it goes.

To prevent the firing pin driving forward and igniting the primer under its own momentum as the breech block is arrested in closed position, a restraining pin 3^f is fitted in depressions such as 19^f (Fig. 4), extending part way through the wings 19 (described in my previous application Serial No. 97,886, for locking the breech block 3 in closed position), at a small radial distance from the turning fulcrum 19^a of said wings, which cross pin works in front of the forward face of the firing pin head 3^b, and holds the firing pin rearward and away from the primer until after the forward movement of the breech block has been arrested. As the upward locking movement of the wings takes place, the restraining pin 3^f retires from the firing pin and allows the latter to assume a position against the primer, under the influence of spring 3^e. This, however, is without shock, since the spring is light and the mass of the firing pin is large.

To avoid injury to the firing pin through its rearwardly protruding head, or to the restraining pin 3^f, when arresting the rearward movement of the breech block, the buffer 23 of my aforesaid application Serial No. 97,886, is modified in construction to provide a recess 23^e shaped to receive the rear end of the firing pin head without impact, while leaving ample metal surrounding the recess to provide an abutment for the rear face of the breech block; and said buffer has a spline 23^f working in a slot 23^g of its bearing, to prevent circumferential displacement that would take its recess out of registry with the rear end of the firing pin head.

To project the hammer 5, it is connected at 5^b with a thrust rod 5^c which extends downwardly in the frame and through a bearing 4^c that guides the lower end of the thrust rod; and a spring 5^d, guided upon the rod 5^c, is confined between the bearing bridge 4^d and a shoulder 5^e. The connection 5^b is in the form of a knuckle in which the thrust is transmitted, not through the pin, but through the concave head bearing against the cylindrical surfaces of the hammer.

6 represents the trigger sear which is adapted to engage the notch 5^f of the hammer 5 when the latter is in cocked position. This firing sear is manipulated through its trigger in the usual way for single shot firing or for automatic firing, being held back so long as it is desired to have the firing continue. In addition to the firing sear 6, the hammer is provided with a safety sear 7 pivoted at 7^a in the frame and provided with a spring plunger 7^b to press it to its duty and cause it to engage the hammer whenever it reaches cocked position, unless said safety sear is positively held out of engaging position. To so hold the safety sear out of engagement with the hammer, a tumbler 7^c is provided, comprising a transverse pin having two faces against which the safety sear is adapted to lie, and so positioned that by rotation through about 150° through suitable means, such for instance thumb lever 7^d, either face may be brought next to the detent; these faces being so positioned that the one will permit the detent to engage the hammer, as illustrated in Fig. 2. while the other holds it away from the hammer as illustrated in Fig. 1.

In order to arrest the hammer in cocked position until after the breech block is closed during full automatic firing, the full automatic sear 8, in the form of a spring plunger, is mounted in the forward end of the frame in position to engage the notch 5^g of the hammer 5 when in cocked position, being pressed to such engagement by means of the spring 8^a housed within said sear. In order to hold the sear 8 in operative position, without the use of screws or other means liable to become loose under the vibration of firing, a pin 8^b is inserted in the socket 4^e of the frame 4, and extends transversely through the sear 8, which has an elongated slot to receive it, and this pin forms the abutment for the spring 8^a. The pin has a recess 8^c in which the plunger 8^{ax} that guides the end of the spring, engages to resist upward displacement of the pin. However, by rotating the pin, for instance through means of a screw driver in-

serted in the kerf 8^d until the straight side of the pin is opposite to the spring 8^a, the pin may readily be pushed upward by any convenient instrument inserted through the bottom opening 8^e, and the sear 8 with its contained spring, withdrawn and any of the parts replaced as may be required.

The full automatic sear 8 is retracted in the operation of the gun, by the wings 19, as suggested in Fig. 4. That is to say, by having the wings 19 engage the cross head 3^g in the locking movement of the wings which occurs at the end of the forward breech closing movement of the breech block. This is accomplished by having the rear faces of the cross head 3^g in such position that they lie immediately forward of the shoulders 30^b on the wings, at the completion of the closing movement of the wings, so that the ensuing locking movement of the wings 19 which swings their forward ends 19^b upward and gives to their shoulders 30^b a further forward movement (see Fig. 4), a retracting movement will be imparted to full automatic sear 8. If now the trigger 6 is being held rearward for automatic firing, the release of hammer 5 remains under control of the full automatic sear alone. If the trigger is released, such retraction of full automatic sear 8 does not free the gun, but leaves the hammer under arrest by trigger 6 and ready for resumption of firing by a mere pull of the trigger and continuance of firing so long as the trigger be held retracted.

Inasmuch as it is desirable to make the frame 4 removable with the parts mounted thereon, in the manner described in my previous application already identified, it is important to render it impossible to throw the hammer forward during its separation from the breech bolt. For this purpose, the full automatic sear 8 serves as a limiting detent for the hammer by coacting with the large notch 5^h on the hammer, so located as to meet the sear 8, in case the hammer should move beyond its forward limit.

I claim:—

1. A firing mechanism for firearms, comprising a hammer for igniting the charge, a firing pin for transmitting the hammer blow to the primer, said firing pin having an enlarged head, lending mass to the firing pin and protecting it from injury by the hammer, and means located in the enlarged head of the firing pin for preliminarily setting the firing pin toward the primer.

2. A firing mechanism for firearms, comprising a hammer for igniting the charge, a firing pin for transmitting the hammer stroke to a primer, said firing pin having an enlarged head, lending mass to the firing pin and protecting it from injury by the hammer, an elongated slot in the enlarged head, a retaining pin extending through said slot with play in the direction of the length of the pin, and a spring confined in the enlarged head between the retaining pin and the end of the elongated slot for preliminarily setting the firing pin toward the primer.

3. A firing mechanism comprising a striker, a plunger sear for said striker housing a spring, and a retaining pin extending through said plunger sear with play in the direction of the axis of the sear; said retaining pin forming a seat for the spring.

4. A firing mechanism as described in claim 3 in which the spring engages the retaining pin and prevents displacement thereof.

The foregoing specification signed at East Orange, New Jersey, this 15th day of June, 1917.

CHARLES WELLINGTON LANG.