

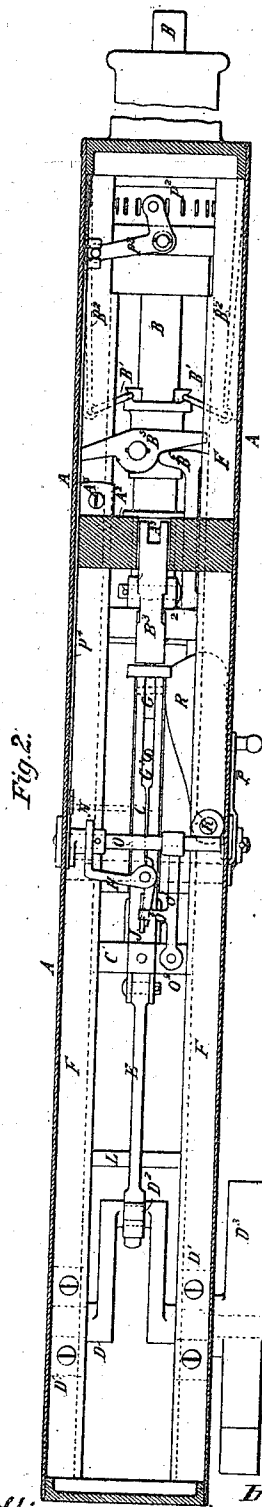
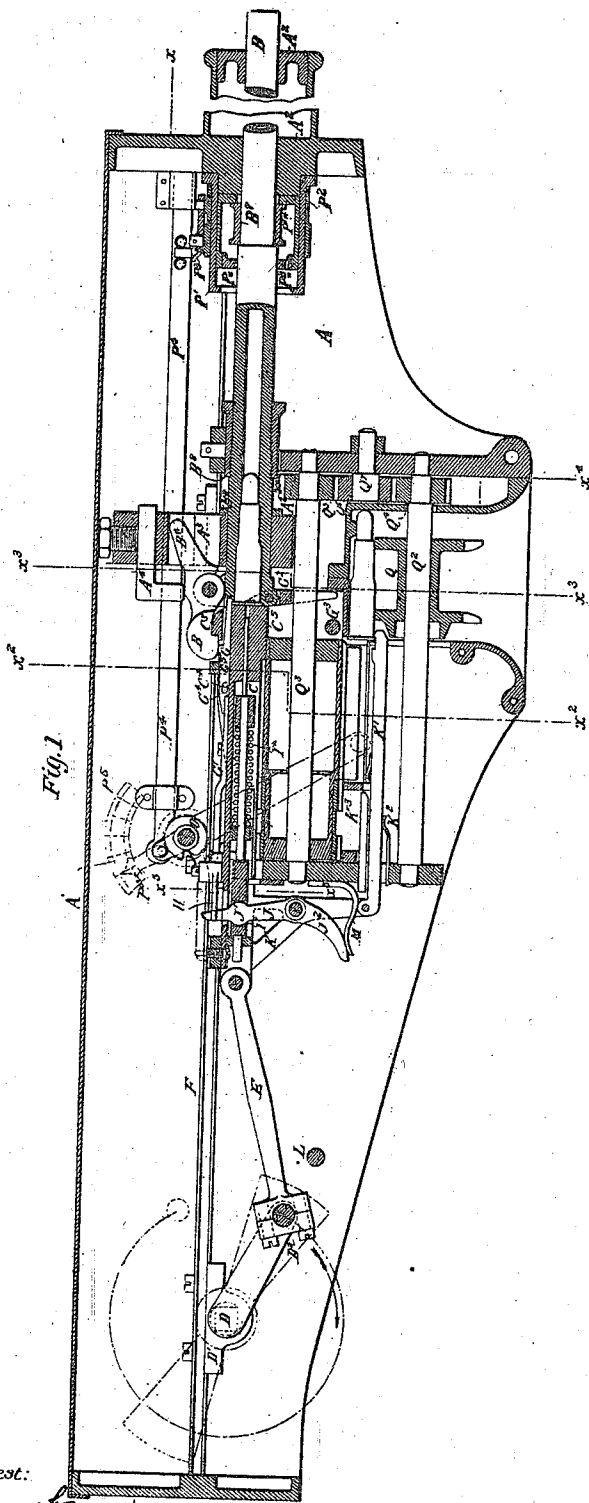
(No Model.)

H. S. MAXIM.
MACHINE GUN.

4 Sheets—Sheet 1.

No. 321,513.

Patented July 7, 1885.



Attest:

Raymond A. Barnes,
W. Frisbe

Inventor:

Hiram S. Maxim
By Parker W. Page atty

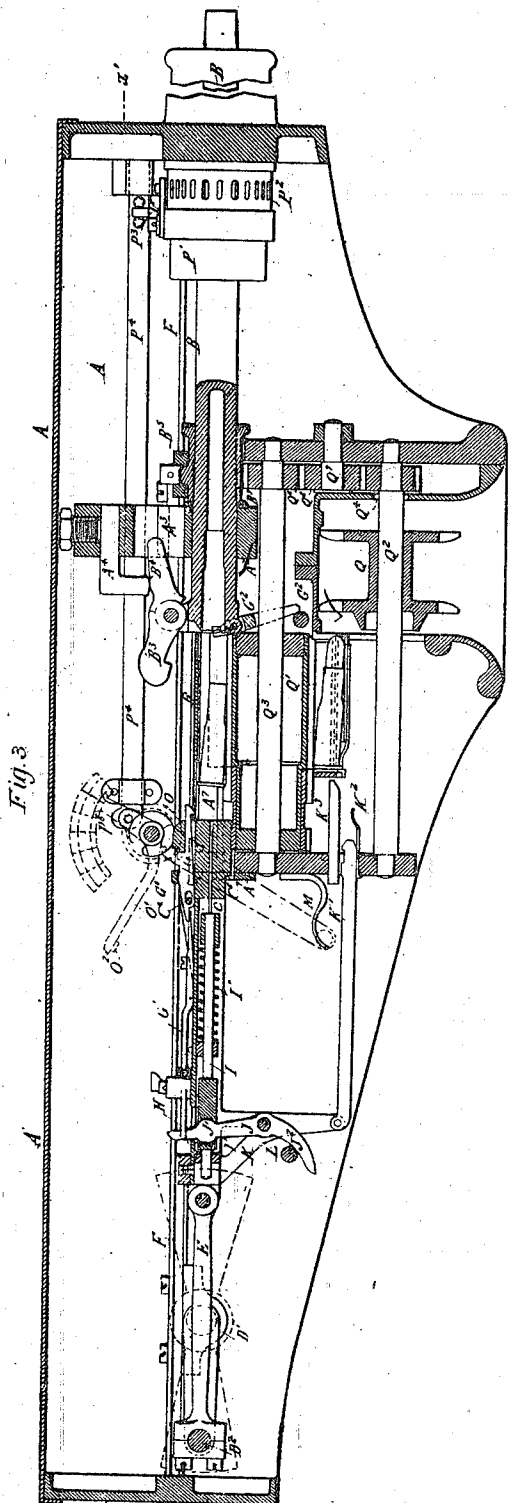
(No Model.)

4 Sheets—Sheet 2.

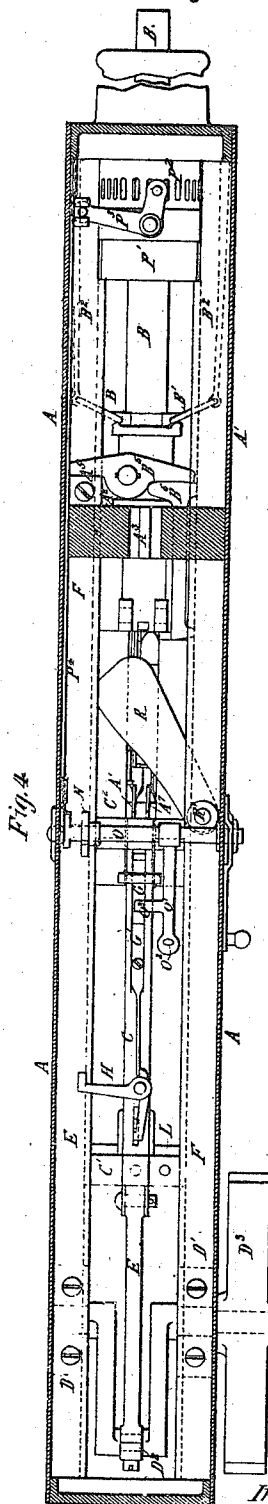
H. S. MAXIM.
MACHINE GUN.

No. 321,513

Patented July 7, 1885.



Attest.
Raymond A. Barnes
W. F. Foster



Inventor.
Hiram S. Maxim
by Parker W. Page atty.

(No Model.)

4 Sheets—Sheet 4.

H. S. MAXIM.
MACHINE GUN.

No. 321,513.

Patented July 7, 1885.

Fig. 7.

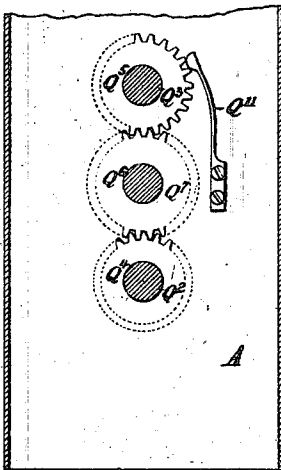


Fig. 10.

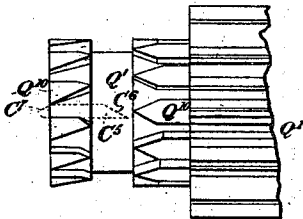


Fig. 11.

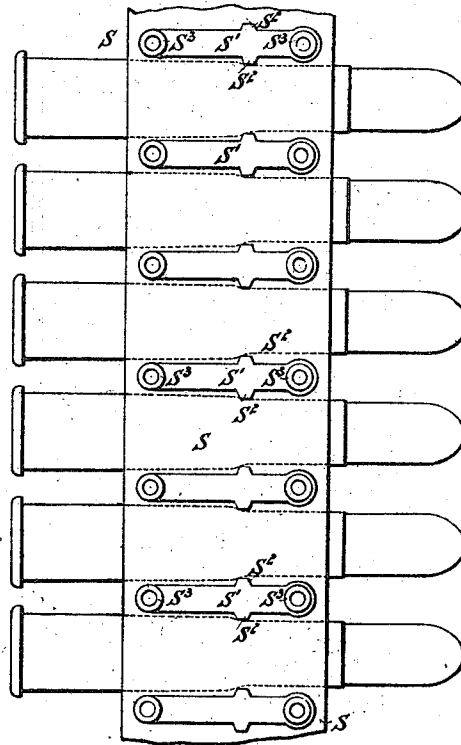
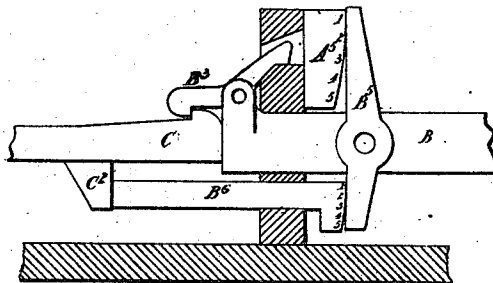


Fig. 12.



Witnesses:

E. H. Rich
J. Hall & Blandford

Inventor:

Hiram S. Maxim
By Parker W. Page atty.

UNITED STATES PATENT OFFICE.

HIRAM STEVENS MAXIM, OF LONDON, ENGLAND, ASSIGNOR TO ALBERT VICKERS AND ROBERT R. SYMON, BOTH OF SAME PLACE.

MACHINE-GUN.

SPECIFICATION forming part of Letters Patent No. 321,513, dated July 7, 1885.

Application filed May 2, 1884. (No model.) Patented in England February 23, 1884, No. 3,844; in France June 13, 1884, No. 162,735, and in Belgium September 16, 1884, No. 66,321.

To all whom it may concern:

Be it known that I, HIRAM STEVENS MAXIM, a citizen of the United States of America, residing at London, England, mechanical engineer, have invented new and useful Improvements in Machine or Battery Guns, (for which I have applied for provisional protection in Great Britain on the 23d day of February, 1884, No. 3,844,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to machine or battery guns; and its main object is to produce a gun which shall be entirely automatic in its action, and continue, when once set into operation, to discharge at predetermined intervals so long as it has a supply of cartridges.

In carrying out my invention I employ certain novel mechanisms, the nature of which will be more fully hereinafter set forth, and these I combine in new and co-operative relations, whereby each is caused to perform its allotted functions in proper order and with perfect precision. The automatic operation of the gun is dependent upon the recoil or force of the explosion of the cartridges. In availing myself of this force as the motive power for operating or setting in action the parts that effect the necessary operations of loading and reloading, I make use of a barrel that is capable of a certain movement with reference to its stationary frame or support, which movement is produced by the recoil following the explosion of a cartridge. With this I combine a device for feeding or supplying loaded cartridges, and mechanism for placing the cartridges in the barrel, exploding the same, and extracting and ejecting the empty shells, the said mechanism being constructed and arranged to be operated or set into operation by the force of the recoil. In this system are involved certain essential and novel features. Among these is the employment of a crank or bell-crank lever, the pin of which is connected by a rod to the breech-block, the crank-shaft carrying a fly-wheel or equivalent device, to which momentum is imparted at each discharge by the recoil of the breech-block and parts connected therewith, so that after the crank has passed its dead-center the

momentum of the said fly-wheel or other device will be utilized for closing the breech and firing the gun. This arrangement is productive of the most useful results, as will be seen upon consideration of the nature of the operation of the gun. If the explosion and backward movement of the cartridge be utilized for developing the energy that is subsequently to effect the extraction and ejection of the exploded shell and the insertion of a loaded cartridge, in the manner herein described, it is important that the shell is not withdrawn from the barrel too quickly. It is necessary, therefore, to so arrange the moving parts constituting and connected with the breech-lock that some portion of it must move at a greater speed than the shell itself. The reasons for this are, first, that the shell must not be withdrawn too soon, for if it travels too far back before the pressure subsides in the barrel it will burst; second, the breech-block, if made heavy enough to prevent this, would be too heavy and large for practical purposes; and, third, the requisite momentum for effecting the operations of reloading subsequent to the ejection of the exploded shell would not be easily obtained, unless the cartridge moved back too quickly. The desired object is attained, however, by so constructing the breech-bolt and appurtenances that one part will move faster than the rest. For this reason I connect the breech-block to the crank of a fly-wheel or its equivalent, obtaining thereby, in a manner well understood, a movement of the rim or weights twenty or more times as great as that of the cartridge. By this means energy is stored that is amply sufficient for performing the necessary operations that follow the recoil and precede the next discharge.

In addition to the features of novelty above alluded to, my invention also involves many novel details and combinations, which may be best explained by reference to the accompanying drawings, in which I have shown the most practicable manner of which I am aware in which the invention is or may be carried into effect.

Figure 1 is a central longitudinal section of my improved gun, showing the parts in the

positions they occupy when the gun is ready for firing. Fig. 2 is a section on the line $x x$, Fig. 1. Fig. 3 is a central longitudinal section of the said gun, showing the parts in the positions they occupy when the crank has reached its dead-center after the recoil of the breech-block and parts connected therewith. Fig. 4 is a section on the line $x' x'$, Fig. 3, with some of the parts removed. Fig. 5 is a section on the line $x^2 x^2$, Fig. 1, looking toward the muzzle of the gun, with some of the parts removed. Fig. 6 is a section on the line $x^3 x^3$, Fig. 1, looking toward the rear of the gun, with some of the parts removed. Fig. 7 is a section on the line $x^4 x^4$, Fig. 1, looking toward the muzzle of the gun. Fig. 8 is a section on the line $x^5 x^5$, Fig. 1, looking in the same direction, with some of the parts removed. Fig. 9 is a side elevation showing part of the breech-block and means for disengaging the extractor from the cartridge-cases. Fig. 10 is a plan of part of one of the feed-wheels, hereinafter described. Figs. 5 to 10 are drawn to an enlarged scale. Fig. 11 is a plan, drawn to a still further enlarged scale, showing part of a belt or band which I employ in my improved gun for supplying cartridges thereto. Fig. 12 is a plan view of the mechanism for accelerating the movement of the barrel.

30 A is a strong metal frame, which is provided with a lid or cover, A' , and which may be mounted on any suitable stand or carriage.

B is the barrel, and C the breech-block.

D is a crank-shaft, which is carried in bearings D' at the rear part of the frame A.

E is a connecting-rod, one end of which is coupled to the crank-pin D^2 , and the other end of which is coupled to the breech-block C. This connecting-rod is made of such length that when the breech is closed the crank will be either slightly above or below its forward dead-center, so that the recoil of the breech-block will cause the rotation of the crank-shaft in one direction or the other. In Figs. 1 and 2 it is shown below the said center, its position above the said center being indicated by a dotted circle.

D^3 is a weighted lever, serving the purpose of a fly-wheel.

50 The breech-block C is carried by two cross-heads, C' C^2 , arranged to slide between suitable guides, F, projecting from the sides of the frame A. The extractor G and the sear H are mounted on the breech-block C, and are acted upon by the double spring G' , which is also fixed to the breech-block. The firing-pin I passes through the said breech-block, and is acted upon by a spring, I^* , which tends to push it forward. The cock or hammer J is pivoted to a bracket or arm, K, extending downward from the breech-block C, and is made with a circular part, J' , which enters a slot, I' , in the firing-pin I. The said hammer has, moreover, a curved extension, J^2 , which, when the breech-block recoils, is acted upon by a pin or rod, L, fixed in the frame A, so that the said hammer is cocked. At the termi-

nation of the forward movement of the breech-block the extension J^2 is acted upon by a spring, M, also fixed to the said frame. The sear H is a bent lever pivoted to the breech-block and arranged to be acted upon by the cam N, fixed on the shaft O, which is capable of adjustment by a trigger-arm, P, to disengage the said sear from the hammer J and discharge the gun. The barrel B is arranged in guides A^2 , fixed to or forming part of the frame A, and is capable of a slight to-and-fro movement therein. In combination with the said barrel, I provide two toggle-arms, B' , acted upon by the springs B^2 in such a manner that the said springs tend to force the barrel into either of its extreme positions. These springs are fixed to the sides of the frame A. A hooked lever, B^3 , is pivoted to the breech end of the barrel, and the rear end or hook of the said lever is adapted to engage with a shoulder or projection, C^3 , on the breech-block, to lock the latter or secure it to the barrel when the breech is closed and until the barrel has partially participated in the recoil. The rear guide, A^2 , for the barrel B is fitted with a piece, A^3 , of steel or other suitable material, which forms a shoulder. This shoulder fits into a recess in the front arm of the hooked lever B^3 , as shown in dotted lines in Fig. 1, and holds the same in the locked position until the barrel has moved backward a certain distance. The front arm of the said hooked lever is slotted or bifurcated at its extremity, so that when the barrel has recoiled to the desired extent the said arm can be depressed to unlock the breech-block, the two parts of the bifurcated end passing down at the sides of the shoulder A^3 . The unlocking of the breech-block is automatically effected at the proper time by means of an adjustable arm, A^4 , fixed in the frame A above the guide A^2 . In the rearward movement of the barrel the inclined face B^4 of the hooked lever B^3 comes in contact with the arm A^4 , and the said hooked lever is thus disengaged from the projection C^3 on the breech-block.

In order that the remainder of the rearward movement of the barrel after the breech-block is unlocked may serve to impart additional momentum to the breech-block in its recoil, and in order that the forward movement of the barrel may commence before the breech is closed, and thus prevent too sudden impact of the breech-block against the barrel, I provide the following devices, viz: A lever, B^5 , is pivoted to the barrel B near its rear end. One arm of this lever is arranged to come in contact with a shoulder or projection, A^5 , on the frame A during the rearward movement of the barrel at the moment when the breech-block is unlocked. The other arm of the said lever is then forced by the barrel during the remainder of its rearward movement against one end of the rod B^6 , which is capable of sliding to and fro in the guides A^2 and F. The other end of the rod B^6 bears against the forward cross-head, C^2 , of the breech-block C.

It will therefore be readily understood that the motion of the barrel B and the action of the springs B² upon the toggle-arms B' tend, after the breech-block is unlocked, to impart additional momentum thereto. Moreover, before the breech-block in its forward movement comes into contact with the breech end of the barrel, it will force the sliding rod B⁶ against the lever B⁵, and thereby impart motion to the barrel B. The shoulder or projection A⁵ and the forward end of the rod B⁶ are slightly rounded, and the said parts are so arranged, in combination with the lever B⁵, that when the barrel B moves backward the said lever first comes in contact with the projection A⁵ and rod B⁶ at the points 1, as shown in the diagram, Fig. 12, and then successively at the points 2 3 4 5, so that the leverage is gradually decreased as the barrel continues its rearward movement. A lever, G², is pivoted to the under side of the barrel B at its rear end, and one arm of the said lever is arranged to form part of the seating for the flange of a cartridge when inserted in the barrel. The other arm of the lever G² extends downward, so that during the recoil of the barrel the said lever will come in contact with a pin or rod, G³, fixed in the frame A, and will thus be turned on its pivot so as to start the cartridge-case from the barrel.

In order to avoid any undue strain upon the extractor, I provide the same with a slot, G⁴, through which passes a pin or bolt, C⁴, fixed in the breech-block C, so that when the said breech-block moves away from the barrel the pin or bolt C⁴ will travel freely in the said slot, and the extractor G will not be moved with the breech-block until the lever G² has started the cartridge from the barrel. The extractor G is provided with two inclined projections, G⁵, which, when the breech-block has recoiled nearly to its rearmost position, ride up a projection or projections, A⁶, on the frame A, as shown in Fig. 9, and thereby disengage the hook of the extractor G from the cartridge-case.

In order to arrest the rearward movement of the cartridge-case as soon as it is in its proper position in the groove of the feed-wheel, hereinafter described, I provide two fingers, A⁷, which are fixed to the frame A and fit into slots in the breech-block, as shown in Fig. 8. These fingers are so arranged that as the cartridge-case is moved backward with the breech-block its movement will be arrested by the said fingers after the extractor has been disengaged from its flange.

Q Q' are two feed-wheels, which are so arranged that a cartridge drawn from the uppermost groove of the wheel Q will enter the lowermost groove of the wheel Q'. These wheels are carried by the shafts Q² Q³, and are provided with the toothed wheels Q⁴ Q⁵, which are geared with each other by means of the intermediate wheel, Q⁶, carried by a stud, Q⁷, fixed in the frame A. A hooked rod, K', is pivoted to the lower end of the bracket K,

and when the breech is closed engages with the flange of the cartridge in the uppermost groove of the wheel Q, as shown in Fig. 1. During the recoil of the breech-block and its adjuncts this hooked rod transfers the said cartridge from the wheel Q to the wheel Q'. The said rod K' is supported by a spring, K², and is arranged to be acted upon by a fixed arm, K³, having an inclined face which comes in contact with a correspondingly-inclined face on the said rod and depresses the same, and thus disengages it from the cartridge at the proper time.

Q⁸ is a spring, one end of which projects through an aperture in the casing Q⁹ of the feed-wheel Q', so as to hold the cartridge firmly in the groove of the said feed-wheel.

The following means are provided for intermittently rotating the feed-wheels Q Q'—that is to say, a projection, C⁵, having two inclined faces, C⁶ C⁷, as shown in dotted lines in Fig. 10, is formed or fixed on the under side of the breech-block C. The feed-wheel Q' is provided with two series of teeth, Q¹⁰, having correspondingly-inclined faces. When the breech-block recoils, the rear end of the projection C⁵ acts upon one of the teeth of the rear series, and causes the feed-wheel Q' to turn one-third of the distance requisite to bring a fresh cartridge in line with the barrel. In the first part of the forward movement of the breech-block the projection C⁵ acts upon one of the teeth of the forward series, and turns the said feed-wheel the remainder of such distance. The intermittent rotation of the feed-wheel Q in a similar manner is effected by means of the gear-wheels Q⁴ Q⁵ Q⁶.

I also provide means, as shown in Fig. 7, for preventing the feed-wheels Q Q' from turning backward when not acted upon by the projection C⁵—that is to say, I fix a spring-pawl, Q¹¹, to the frame A in such a manner that it will engage with the toothed wheel Q⁵; but I may provide other suitable means for effecting this object.

To permit the number of shots fired per minute to be regulated, I fit upon the barrel B a piston, P*, in which the barrel is capable of moving to and fro to a slight extent, a collar, B', being fixed upon the said barrel within the said piston. This piston fits into a cylinder, P', which is open at one end and closed at the other end, and the said piston is provided with an aperture, P*, and with one or more apertures, P², through which air can pass to the closed end of the cylinder when the piston is moving backward. The said cylinder is formed with a series of perforations or apertures around its circumference. These apertures can be opened or closed or the amount of their opening regulated by means of a ring or annular piece, P², having apertures corresponding with those in the cylinder. This annular piece is fitted accurately upon the cylinder, and is arranged to be partially rotated thereon in either direction by means of a bent lever, P³, pivoted to the said

cylinder. One arm of this lever is suitably connected with the said annular piece, and to the other arm of the said lever is coupled one end of a connecting-rod, P⁴. The other end of the said rod is coupled to the trigger-arm P, so that by adjusting the said trigger-arm the aforesaid apertures in the cylinder can be either closed or opened, or the extent of their opening can be regulated. In some cases I combine with the said trigger-arm a graduated plate or quadrant, P⁵, marked with the different speeds of firing, and I then extend the trigger-arm upward in the form of a pointer, P⁶, as shown in dotted lines in Fig. 1. When the barrel B moves backward, the collar B¹ leaves the aperture P* open, and, coming against the rear end of the piston P, moves the said piston backward, thereby drawing air into the cylinder through the apertures P* as well as through the apertures in its circumference; but when the barrel moves forward, the collar B¹ closes the aperture P*, and air can only escape from the cylinder by the apertures in its circumference. It will therefore be understood that the barrel can move freely backward; but its forward movement will be controlled by the extent of opening of the said apertures. The shaft O, carrying the said trigger-arm, is sometimes provided with another arm, O', having a pin or stud, O², projecting downward from its extremity, so that it will enter a recess in the rear cross-head, C', of the breech-block C, and thereby lock the same firmly in position and prevent the discharge of the gun before the trigger arm P is pulled. This locking-arm is moreover provided with a projection, O³, which, when the arm O is down, lies in front of the hammer J and prevents it from actuating the firing-pin I.

In order to prevent the cartridges from being thrown upward out of the feed-wheel Q' when the latter is partially rotated, I provide a plate or flat bar, R, fixed to a bolt or stud, R', carried by one of the guides F, and a lug, F', fixed to the frame A. A spring, R², surrounds this bolt or stud, and tends to hold the plate or bar R over the uppermost groove in the feed-wheel Q'. The said spring, however, will yield to permit the plate or bar to be thrust aside by the breech-block as it moves forward.

I arrange a roller, Q², in combination with the feed-wheel Q, to facilitate the movement of a band or chain of cartridges, S, hereinafter described, as the said band or chain is fed inward by the said wheel.

The band or belt S, for feeding the cartridges into the gun, is made as shown in Fig. 11—that is to say, two strips of canvas or other suitable material are united at intervals by two plates or flat pieces, S', of brass or other metal, nearly equal in length to the width of the said canvas strips, and having projections S². One of these plates is placed on each side of the double band or belt. The said plates are secured to each other, with the strips of canvas between them, by means of eyelets or

rivets S³. When a cartridge is inserted in the band or belt between two pairs of plates, S', the shoulder of the said cartridge comes against the projections S², and it is thus prevented from being thrust too far into the said band or belt. The said projections also act as springs and maintain a uniform pressure upon the cartridge. The spaces in the band or belt can therefore be of such size that the cartridges can be easily inserted therein. They also prevent the curling up of the sides of the band or belt.

I sometimes make the part of the band or belt that fits the thinner parts of the cartridges of greater thickness than the other part thereof, so that when the band or belt filled with cartridges is lying folded in the box or magazine, the forward ends of the cartridges will be kept out of contact with each other. I do not, however, confine myself to the use of this band or belt. The feed-wheel Q' may, if desired, be kept supplied by placing a box of cartridges above it, so that as the wheel rotates, the cartridges will fall into the grooves thereof.

The operation of this gun is as follows—that is to say: The feed-wheels Q Q' are either filled with cartridges or a band or belt of cartridges is placed on the wheel Q, as shown in Fig. 6. The breech mechanism is then operated by hand until a cartridge is fed into the barrel B. On pulling the trigger-arm P the gun will be discharged and the breech-block and parts connected therewith will recoil and cause the crank D to turn in the direction indicated by the arrow in Fig. 1. The barrel moves backward with the breech-block until the shoulder B⁸ comes against the collar B⁹. The breech-block is unlocked during this movement by the contact of the inclined face B¹ with the adjustable arm A⁴, and additional momentum is imparted thereto by the barrel B, springs B², and lever B³ through the rod B⁶. The lever G² then comes against the pin or rod G³, and is moved so as to start the empty cartridge-case from the barrel. The continued rearward movement of the breech-block draws back the extractor, and with it the said cartridge-case. The rearward movement of the said case is arrested by the fingers A⁷, so that it will be left in the uppermost groove of the feed-wheel Q', the extractor being disengaged from the said case by the inclined projections A⁶. The rearward movement of the breech-block also causes the arm K' to draw a cartridge from the uppermost groove in the feed-wheel Q into the lowermost groove of the feed-wheel Q', and during the last part of such rearward movement the projection C⁵ acts upon the wheel Q' and partially rotates the wheels Q Q', and the hammer J comes against the pin or rod L, and is thereby cocked. The momentum imparted to the crank and the fly-wheel or its equivalent then causes the said crank to pass its dead-center and move forward the breech-block. During the first part of the forward movement of the breech-block the projection C⁵

acts upon the wheel Q' and again partially rotates the wheels Q Q', so as to bring a fresh cartridge in line with the barrel, and also a fresh cartridge in the wheel Q in line with the lowermost groove of the wheel Q'. The breech-block then thrusts the said fresh cartridge into the barrel and moves forward the hooked rod K' to engage with a fresh cartridge in the wheel Q. In its forward movement the cross-head C² of the breech-block strikes the rod B⁶ and imparts motion to the barrel. The breech-block then comes in contact with the breech end of the barrel and is locked by the hooked lever B³. The gun is then either again discharged or remains ready for another discharge, according to the adjustment of the cam N. If this cam is adjusted so that the sear H will strike the same, the gun will continue firing until the supply of cartridges is exhausted or until the said cam is otherwise adjusted. The empty cartridge-cases are carried around by the feed-wheel Q' and fall through the opening A⁸ in the frame A.

It is obvious that although I have above described a gun having a single barrel, my invention may also be applied to guns having two or more barrels. Moreover, I can vary or modify the construction of my improved gun without departing from the nature of my said invention.

The special construction of cartridge-belt herein shown is not claimed, the same being reserved as subject of another application..

What I claim is—

1. In a machine or battery gun, the combination, with the barrel, a reciprocating breech-block arranged to slide from and toward the breech, a fly-wheel or equivalent connected to the breech-block for causing the return of the same to the breech after a recoil, cartridge-feeding mechanism, cartridge-exploding mechanism, and shell extracting and ejecting mechanism, all connected with the breech-block and operated by the movement of the same, substantially as herein set forth.

2. In a machine or battery gun, the combination, with a longitudinally-movable barrel, of a reciprocating breech-block arranged to slide from and toward the breech and in line with the barrel, a fly-wheel or equivalent connected with the breech-block for causing the return of the same after a recoil, cartridge-feeding mechanism, cartridge-exploding mechanism, and shell extracting and ejecting mechanism, all connected with the breech-block and operated by the movement of the same, substantially as set forth.

3. In a machine or battery gun of the kind described, the combination, with the barrel, a reciprocating breech-block arranged to slide from and toward the breech and in line with the barrel, and a fly-wheel or equivalent connected with the breech-block for causing the return of the same to the breech after a recoil, a part of the said breech-block being capable of a limited movement relatively to the main

portion and adapted to engage with the rim of a shell in the breech, of cartridge-feeding mechanism and cartridge-exploding mechanism connected with and operated by the sliding breech-block, all as set forth.

4. In a machine or battery gun of the kind described, the combination, with a longitudinally-movable barrel, a reciprocating breech-block arranged to slide from and toward the breech, and a fly-wheel or equivalent connected with the breech-block for causing the return of the same to the breech after a recoil, a part of the said breech-block being capable of a limited movement relatively to the main portion and adapted to engage with the rim of a shell in the breech, of cartridge-feeding mechanism and cartridge-exploding mechanism connected with and operated by the sliding breech-block, all substantially as set forth.

5. In a machine-gun of the kind described, the combination of the barrel and sliding breech-block arranged to move in line with the barrel, a crank and fly-wheel or its equivalent connected with the breech-block in such manner that the movement imparted to the fly-wheel by the recoil of the breech-block causes the return of the same to the breech, and loading and firing mechanism connected with and operated by the sliding breech-block, substantially as set forth.

6. In a machine or battery gun of the kind described, the combination, with the barrel, of a reciprocating breech-block arranged to slide from and toward the breech and in line with the barrel, cartridge-exploding devices in or on the breech-block, a fly-wheel, and a crank connecting the same with the reciprocating breech-block, whereby the recoil of the breech-block sets the fly-wheel in motion and effects the return of the breech-block to the breech, as set forth.

7. In an automatic machine or battery gun of the kind described, the combination of a reciprocating breech-block arranged to slide from and toward the breech and in line with the barrel, a hammer, sear, and firing-pin carried by the breech-block, a stop or device attached to the frame of the gun and extending into the path of movement of the hammer for cocking the same on the backward movement of the breech-block, and a fly-wheel and crank or equivalent connected to the breech-block for causing the return of the same to the breech after a recoil, as set forth.

8. In an automatic machine-gun of the kind described, the combination of a sliding breech-block, a hammer and sear carried thereby, a pin or stop in the path of movement of the hammer for cocking the same on the backward movement of the breech-block, and the adjustable cam N, mounted on the stationary frame of the gun in the path of the sear, as and for the purpose set forth.

9. In a machine-gun, the combination, with a sliding barrel and a sliding breech-block that is free to be moved away from the breech by the explosive force of a discharge, of the

toggle-arms B', connected with the barrel, and springs B², acting upon said arms in a manner to force the barrel into either of its extreme positions, substantially as set forth.

10. In an automatic machine-gun, the combination, with a sliding barrel and breech-block, of the hooked lever B³, pivoted to the barrel and adapted to engage with the breech-block, and the adjustable arm A⁴, secured to the stationary frame and extending into the path of movement of the lever B³, in such manner that as the barrel is moved it is automatically secured to the breech-block by the engagement of the lever therewith, or released from the same by the action of the arm A⁴ upon the lever, as and for the purpose set forth.

11. In an automatic machine-gun, the combination, with a sliding barrel and breech-block, of the lever B³, pivoted to the barrel, the rod B⁶, arranged to slide in ways or guides in the frame between the breech-block and one end of the lever B³, and the stop A⁵, secured to the stationary frame in the path of movement of the other end of the lever, as and for the purpose specified.

12. In an automatic machine-gun, the combination, with the sliding barrel, the breech-block, and the lever B³, pivoted to the barrel, of means for changing the leverage or action of lever B³, consisting of the rod B⁶ and stop or shoulder A⁵ in the path of movement of the arms of said lever, and having the parts that come in contact with the lever rounded, substantially as shown and described.

13. In an automatic machine-gun, the combination of the sliding barrel, the breech-block, the crank and fly-wheel or its equivalent connected with the breech-block, the lever B³, pivoted to the barrel, the stop A⁵ in the path of said lever, and fixed to the frame of the gun, and the rod B⁶, arranged to slide in ways or guides between the breech-block and the lever B³, as and for the purpose set forth.

14. In an automatic machine-gun, the combination, with a sliding barrel, of the lever G², pivoted thereto, and arranged to form part of the seat for the cartridge when inserted in the barrel, and a fixed stop, G³, in the path of movement of lever G², whereby the same is operated by impingement with the stop for starting the shell or cartridge from the barrel, all as set forth.

15. In a machine-gun, the combination, with a sliding barrel and reciprocating breech-block, of two shell-extracting levers, one carried by the breech-block, the other pivoted to the barrel, and both adapted to engage with the rim of a shell in the breech, a fixed stop in the path of the lever pivoted to the barrel, by encountering which stop on the movement of the barrel the lever pivoted to the barrel is caused to start the shell, and a stop in the path of the lever carried by the breech-block for causing said lever at a given point in its path of movement to release the shell, as set forth.

16. In an automatic machine-gun, the combination, with a stationary frame and a slid-

ing barrel and breech-block, of the extractor-lever G, pivoted to the breech-block, and provided with inclined projections G⁵, the stationary projections A⁶, and the fingers A⁷ on the frame A, for arresting the movement of the shell when drawn back by the extractor, all substantially as set forth.

17. In an automatic machine-gun, the combination, with a sliding barrel and breech-block, of a feed-wheel and belt of cartridges, a delivery-wheel for bringing the cartridges into position to be forced into the barrel by the breech-block, and intermediate mechanism connected with and operated by the breech-block for transferring the cartridges from the feed-wheel to the delivery-wheel, all substantially as set forth.

18. In an automatic machine gun, the combination, with a longitudinally-movable barrel and reciprocating breech-block, of a fly-wheel and crank connected to the breech-block for causing its return to the breech after a recoil, a cartridge-feed wheel and a cartridge-delivery wheel, gearing for imparting an intermittent rotary movement to the same from the reciprocating breech-block, and a hooked rod or lever connected to the breech-block, and adapted to engage with the cartridges in the feed-wheel and transfer the same to the delivery-wheel, as set forth.

19. In an automatic machine-gun, the combination, with a longitudinally-movable barrel, a reciprocating breech-block arranged to slide in line with the barrel, and a fly-wheel and crank or equivalent connected to the breech-block, of a cartridge-feed wheel in gear with the breech-block, whereby it is intermittently rotated by the movement of the breech-block, a cartridge-delivery wheel geared with the feed-wheel, and mechanism, substantially as described, for transferring the cartridges from the feed to the delivery wheel, the said mechanism being connected with and operated by the reciprocating breech-block, as set forth.

20. In a machine-gun, the combination of a barrel, a sliding breech-block, a cartridge-feed wheel and a delivery-wheel, a device connected with the sliding breech-block for transferring the cartridges from the feed-wheel to the delivery-wheel, and means for rotating the feed and delivery wheels intermittently and in unison with the movement of the breech-block, as and for the purpose set forth.

21. In a machine-gun, the combination, with the barrel, the sliding breech-block, and a wheel for delivering the cartridges into proper position to be forced into the barrel by the breech-block, of projections C⁵ on the breech-block having inclined faces C⁶ C⁷, and the rows of teeth or ways Q¹⁰ on the delivery-wheel, arranged in such manner that the said wheel will be intermittently rotated by the reciprocation of the breech-block and action of the projection C⁵ upon the teeth Q¹⁰, as described.

22. In a machine or battery gun, the combination, with the barrel, the sliding breech-block, a delivery-wheel, and a feed-wheel, of an extractor for withdrawing the shells from the barrel, and an extractor for transferring the cartridges from the feed to the delivery wheel, both of said extractors being connected with the breech-block and arranged for simultaneous operation, all substantially as set forth.

23. In a machine-gun, the combination, with the barrel, the sliding breech-block, the delivery-wheel, and the feed-wheel, of the bracket K, extending from the breech-block, and the hooked lever K', pivoted thereto and adapted to engage with and transfer the cartridges from the feed to the delivery wheel, all as specified.

24. In a machine-gun, as a means of regulating the number of shots fired in a given time, the combination, with the sliding barrel, of a device such as an adjustable dash-pot and piston, one member of which is fixed, the other connected with and moved by the barrel, whereby the movement of the barrel is more or less related, as set forth.

25. In a machine or battery gun, as a means of regulating the number of shots fired in a given time, the combination, with the sliding barrel, of a perforated cylinder and a piston sliding therein, the cylinder and piston being concentric with the barrel, and secured, re-

spectively, to the frame and the barrel, and means for varying the apertures for the escape of air when compressed by the forward movement of the barrel and piston, whereby the intervals between the recoil of the barrel and the time when it reaches its firing position may be varied or controlled, all as set forth.

26. In an automatic machine-gun, the combination, with the breech-block having a recessed cross-head, C', the firing-pin, and hammer, of the shaft O, trigger-arm P, arm O', extending from shaft O, and pin or stud O' on the end of arm O', adapted to enter the recess in cross-head C', and thereby lock the same and prevent the discharge of the gun before the trigger P is pulled.

27. In a machine or battery gun of the kind described, the combination, with the sliding breech-block and wheel containing the cartridges, of a swinging plate, R, and spring F, acting upon the same, the said plate being adapted to cover the exposed cartridge and prevent the displacement of the same, substantially as and for the purpose specified.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

HIRAM STEVENS MAXIM.

Witnesses:

J. WATT,

W. J. NORWOOD,

Both of 17 Gracechurch Street, London.