(No Model.)

5 Sheets—Sheet 1.

F. M. GARLAND.

MACHINE GUN.

No. 430,206. Patented June 17, 1890.

Fig. 1

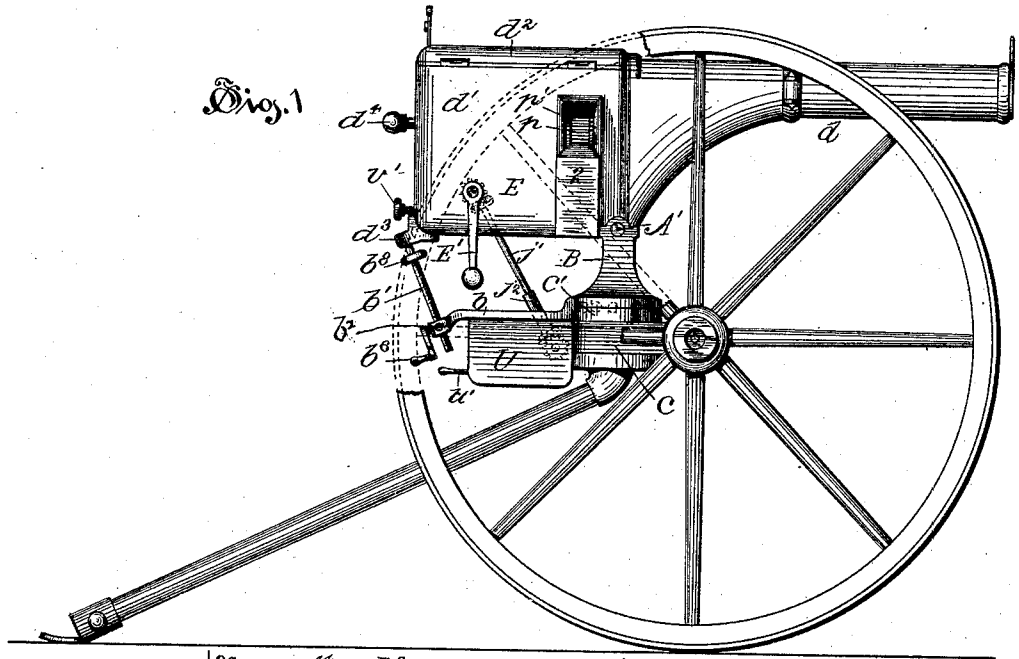
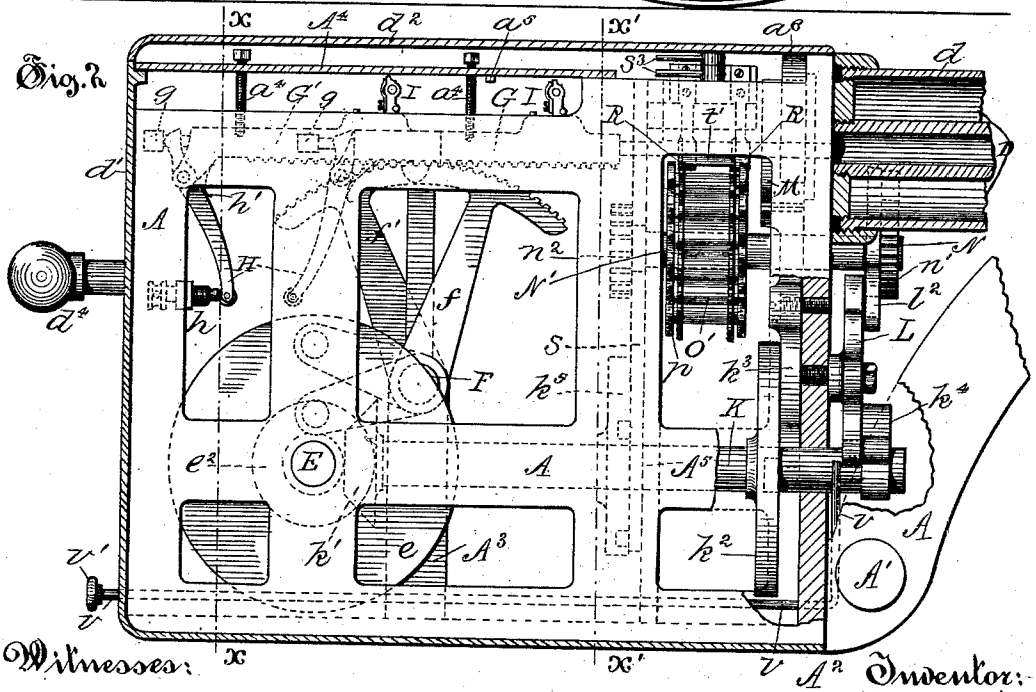


Fig. 2



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(No Model.) 5 Sheets—Sheet 2.

F. M. GARLAND.

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Fig. 3

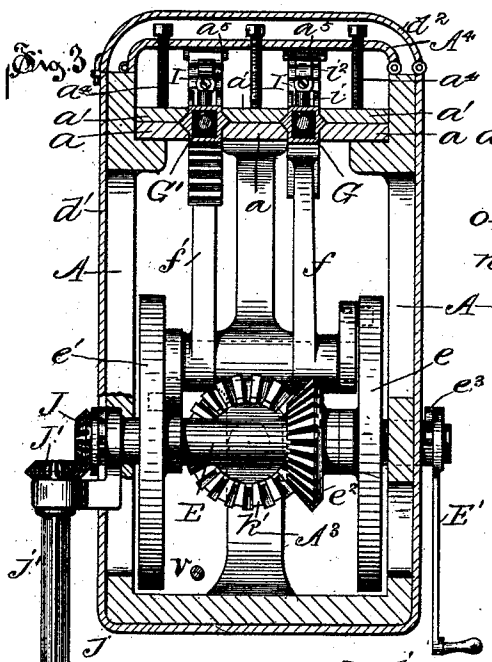


Fig. 4

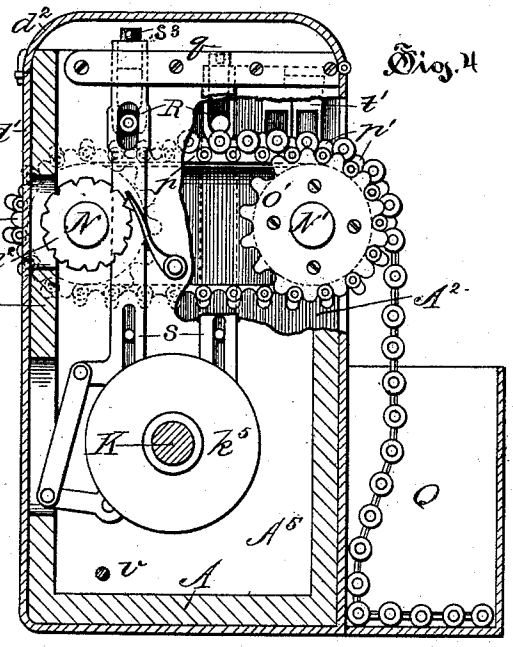
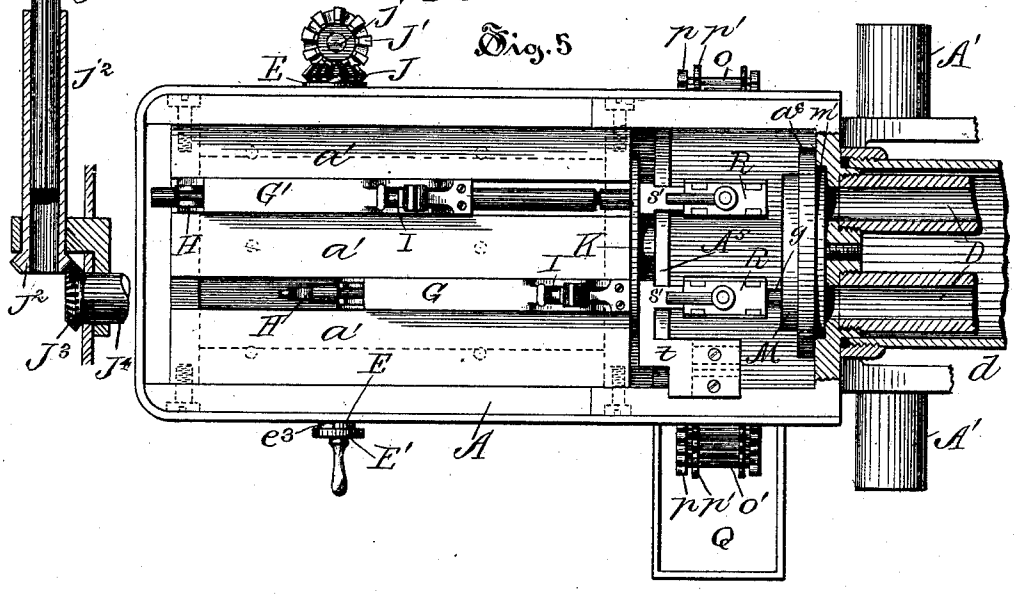


Fig. 5



Witnesses:

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(No Model.)

5 Sheets—Sheet 3.

F. M. GARLAND.

MACHINE GUN.

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Fig. 7

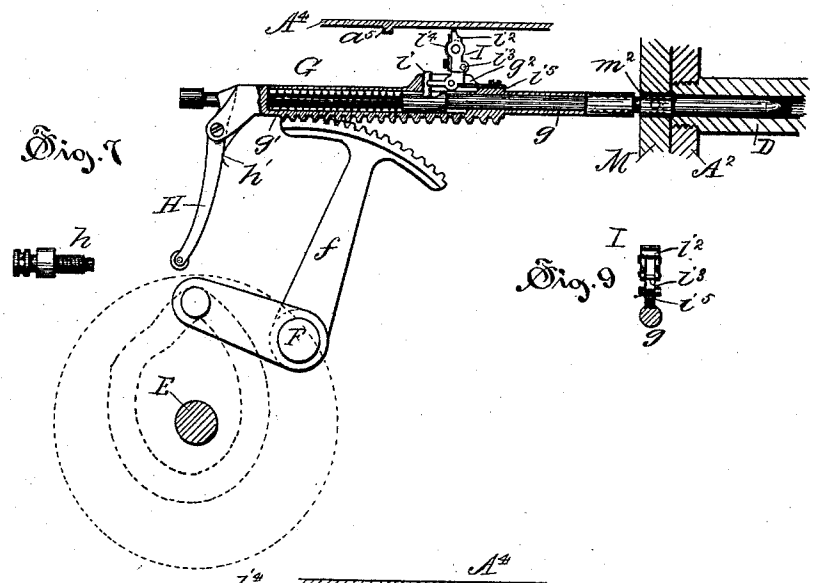


Fig. 9

Fig. 8

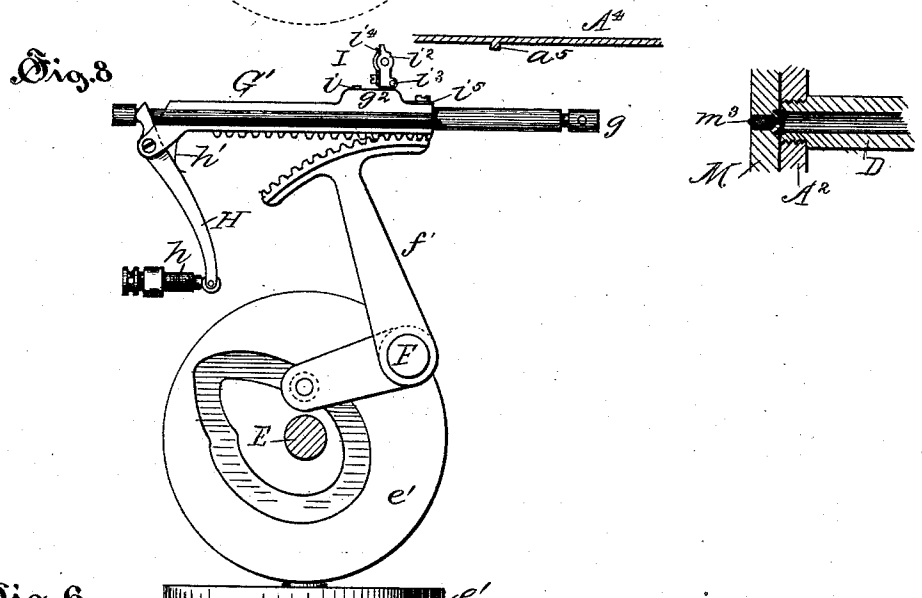
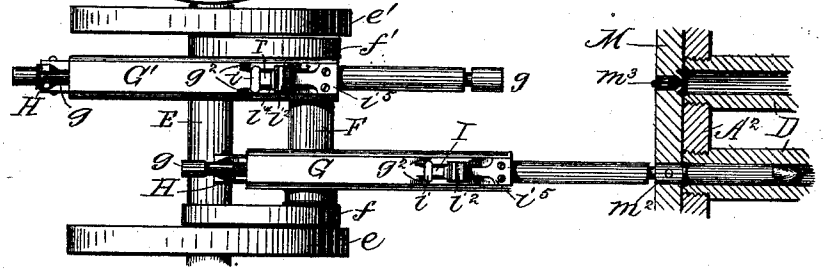


Fig. 6



Witnesses:

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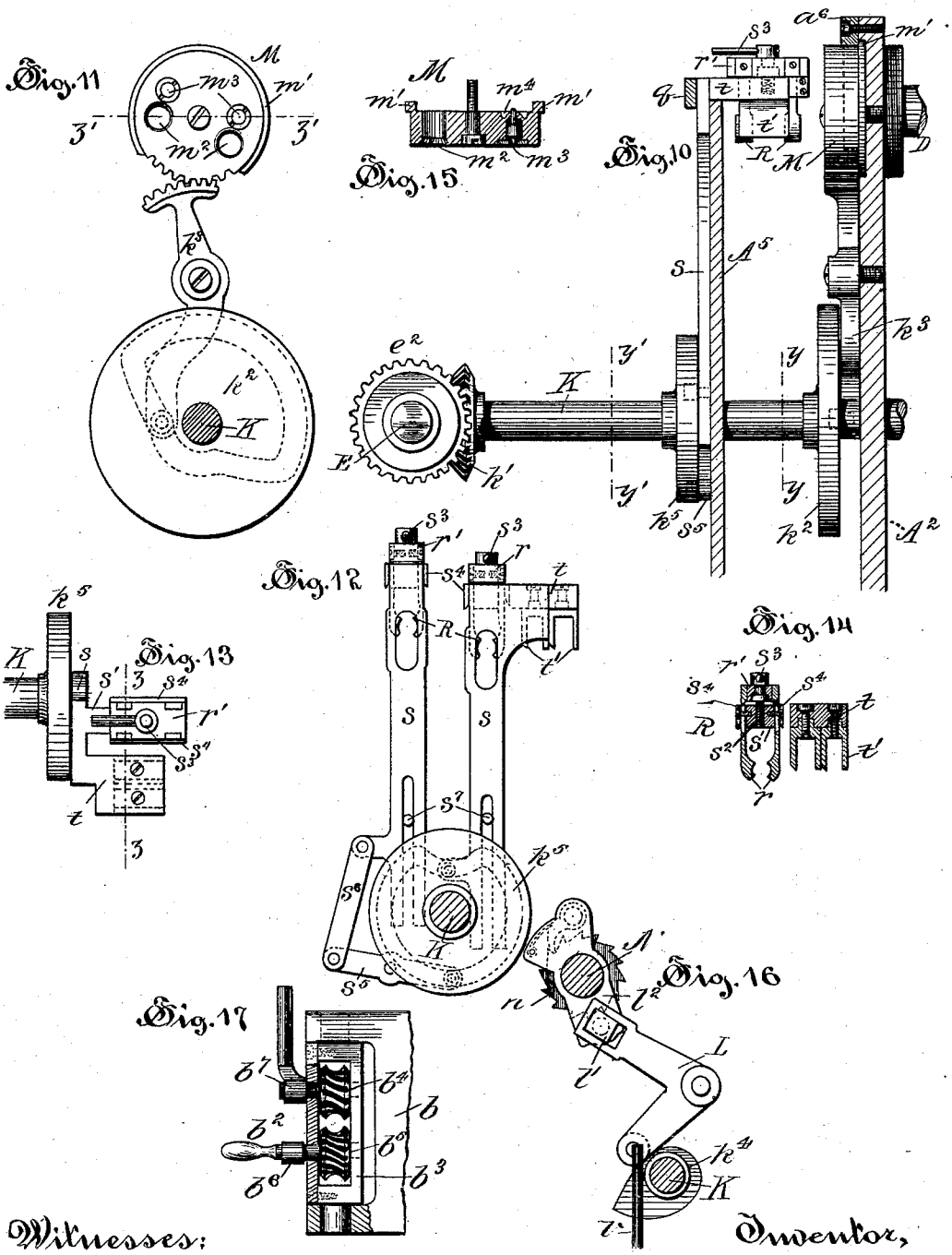
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(No Model.) 5 Sheets—Sheet 4.

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MACHINE GUN.

No. 430,206. Patented June 17, 1890.



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(No Model.)

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F. M. GARLAND.

MACHINE GUN.

No. 430,206. Patented June 17, 1890.

Fig. 18

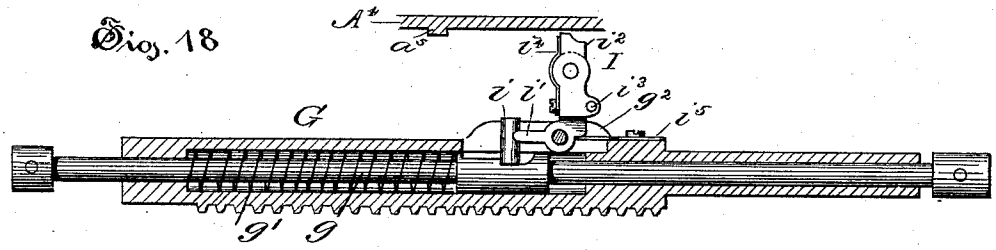


Fig. 19

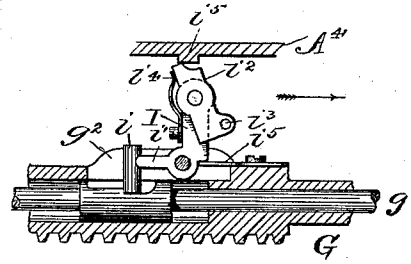


Fig. 20

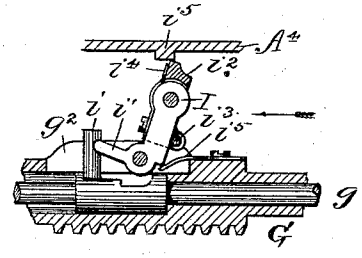
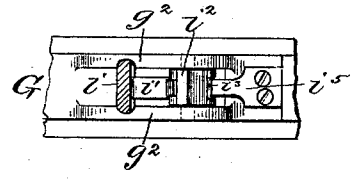


Fig. 21



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UNITED STATES PATENT OFFICE.

FRANK M. GARLAND, OF NEW HAVEN, CONNECTICUT, ASSIGNOR OF TWO-THIRDS TO EBENEZER B. BEECHER, WILLIAM A. FOSKETT, AND FREDERICK P. NEWTON, ALL OF SAME PLACE, AND THOMAS H. SHERMAN, OF WASHINGTON, DISTRICT OF COLUMBIA.

MACHINE-GUN.

SPECIFICATION forming part of Letters Patent No. 430,206, dated June 17, 1890.

Application filed August 9, 1889. Serial No. 320,202. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. GARLAND, of New Haven, Connecticut, have invented certain new and useful Improvements in Machine-Guns, of which the following is a specification.

The invention relates to the class of positive-feeding automatic magazine or machine guns having stationary barrels, and the object is to construct a gun of this class in which the operations of loading and firing are automatically performed with great rapidity without danger of clogging the mechanism with a cartridge or disabling the gun by the sticking of a shell in the breech, and to arrange the mechanism so as to prevent it becoming foul from firing, and so that the balls will have as great velocity and penetration whether the cartridges are exploded rapidly or slowly; also, to provide means which can be conveniently operated so that cartridges may be fed into both or either of the barrels.

The invention consists in a gun provided with certain novel mechanisms arranged to feed into the barrels and explode cartridges the shells of which are not required to be extracted from the breech, such a cartridge being shown in my application for patent of Serial No. 312,206.

Referring to the accompanying drawings, Figure 1 is a side view of a gun embodying my improvements. Fig. 2 is a side view, scale enlarged, of the breech with the casing removed and part of the frame broken away. Fig. 3 is a transverse section of the breech on plane denoted by line X X of Fig. 2. Fig. 4 is a similar view on plane denoted by line X′ X′ of Fig. 2. Fig. 5 is a top view of the breech. Fig. 6 is a detail plan view of the spindles which bear the loading and firing bolts and triggers. Fig. 7 is a side view, part in section, of the spindle at the forward limit of its play. Fig. 8 is a similar view of the spindle at its backward limit. Fig. 9 is a detail front view of the trigger. Fig. 10 is a side view of the breech-block and its oscillating mechanism, also of the cartridge separator and forceps with their reciprocating mechanism. Fig. 11 is a face view of the breech-block and its oscillating mechanism, looking from line $y\ y$ of Fig. 10. Fig. 12 is a face view of the cartridge forceps and separator with their operating mechanisms, looking from line $y'\ y'$ of Fig. 10. Fig. 13 is a top view of one pair of forceps and the cartridge separator. Fig. 14 is a sectional view on plane $z\ z$ of Fig. 13. Fig. 15 is a sectional view of the breech-block on plane $z'\ z'$ of Fig. 11. Fig. 16 is a face view of the feed-cam and ratchet. Fig. 17 is a detail top view of the end of the elevating-screw tail-piece. Figs. 18, 19, 20, and 21 show detached parts of Figs. 6, 7, and 8, on an enlarged scale, illustrating more fully the spindle and the parts connected therewith and the different positions of some of the parts.

In the drawings, the letter A denotes the frame, projecting laterally from the front of which are the trunnions A′, that are held in bearings in the walls of the mount B. The broadened base of the mount rests and rotates upon the plate C′, which is secured to any suitable carriage C, balls being placed between the base of the mount and the plate C′ to reduce the friction between the parts and facilitate the oscillation of the gun.

Two barrels D are secured to the front plate A^2 of the frame A, and near the rear of the frame and supported by its walls is a transverse shaft E, which bears two similar cam-wheels $e\ e'$ into the cam-grooves, in which project rollers that are attached to the lower ends of levers $f\ f'$, which oscillate upon a shaft F, supported by a standard A^3, that rises from the bottom near the center of the frame. The upper ends of these levers are segmental and are provided with gear-teeth which mesh with teeth cut on the bottom of the spindles G G′, that reciprocate in ways formed between plates $a\ a'$, the lower set a being supported by the frame and the standard A^3, while the upper set a' are removably held down by screws a^4, which pass through the cover A^4 that is hinged to the top of the frame. The cams which oscillate the levers $f\ f'$ are so timed with relation to each other

that when one spindle G is at the forward limit of its play the other G′ is at its backward limit. (See Figs. 6, 7, and 8.)

Passing longitudinally through each spindle is a loading and firing bolt g, which is thrust forward by a spiral spring g' within the spindle. Cocking-levers H are pivoted between downward and rearward projecting arms on the end of the spindles in such position that when the spindles are thrown backward the lower end of the levers strike an adjustable stop h, attached to the frame, which causes the forked upper end of the lever to pull back the bolt g, compressing the spring g'. When the bolt has been pulled back sufficiently, a pin i, connected to the trigger I, drops in front of a shoulder formed on the bolt and holds it with the spring g' tense.

The triggers I are pivoted between lugs g^2, rising from the top of the spindles, one part of the trigger projecting rearward and engaging the pin i, which moves freely up and down between the lugs g^2, while to the upper part is pivoted the pull i^2, which is adapted to bow backward when moving forward past the trip a^5, but is rigid with the trigger when coming in contact with the trip upon its backward movement, so as to pull the trigger and lift the pin i from the shoulder on the bolt and allow the spring to thrust the bolt forward and by means of the firing-pin explode a cartridge. A pin i^3, passing from side to side of the pull, by contact with the trigger, prevents the pull from bowing forward, while the spring i^4 holds the pull on the other side with a yielding pressure, allowing it to bow backward when desired. (See Figs. 7, 18, 19, 20, and 21.) A spring i^5, attached to the spindle and resting against the trigger, keeps the pin i down, and a spring h' holds the cocking-lever H forward to allow a free movement of the bolt when the trigger is pulled. The trip a^5 may be formed integral with the top A^4 of the frame or may be movably attached for purposes of adjustment.

A longitudinal shaft K, supported near its rear end by the standard A^3 and at the opposite end by the front plate of the frame, bears a bevel-gear k', that meshes with and is driven by a bevel-gear e^2 upon the shaft E. Inside of the frame this shaft K bears a cam-wheel k^2. The lower end of a lever k^3, which is pivoted to the inside of the frame, bears a roll that projects into the cam-groove in the wheel k^2, while the upper end of the lever is segmental and bears teeth, which mesh with teeth cut on the periphery of the breech-block M, that is also pivoted to the front plate of the frame behind the barrels, so that the rotation of the shaft and cam causes the oscillation of the lever and breech-block. This breech-block, which is a circular disk pivoted to the frame, has on its back a flange m', which sets in a corresponding groove in the front plate A^2, and a rim a^6, partly encircling the breech-block, is secured to the front plate over this flange to hold the block closely to the back of the barrels. The breech-block preferably has two loading-holes m^2 of a size to allow the passage of a cartridge into the barrels. It is also provided with two other perforations, in which are loosely held firing-pins m^3. These openings are so located in the block that when a loading-opening is opposite one barrel a firing-pin will be opposite the other, and when the block is oscillated to its other position a loading-opening is brought opposite the barrel where previously there was a firing-pin and a firing-pin brought behind the barrel where a loading-opening was—that is, when one barrel is ready for loading the other is ready to be fired. It is not necessary that there should be two loading-openings and firing-pins; but with two the oscillation of the block is much less than when there is but one set which alternate with each other behind the barrels.

The back of the breech-block around the firing-pin is provided with a convexed chamber m^4, into which the rim of the cartridge is blown to permit the passage of the shell through the barrel after the ball has been fired, as set forth in my application above referred to.

A cam k^4 is attached to the front end of the shaft K, and upon its periphery bears a roll that is attached to the end of the bent lever L, which is pivoted to the front of the frame, the upper end of this lever being loosely connected by a sliding pin l' to the lower end of a leaf l^2 that is journaled upon a shaft N. The upper end of the leaf is provided with a pawl which is held by a spring in contact with the ratchet n' fast to the shaft N, which is supported on one side of the frame by the front plate A^2 and partition A^5. A feed-wheel O′, provided with sprocket-teeth at each end, is borne on this shaft N, and parallel with the shaft N, and supported in a similar manner on the opposite side of the frame, is a shaft N′, which bears a feed-wheel O′. A sprocket-chain p passes around the rolls O O, so that motion imparted by the cam k^4, lever L, and ratchet n' to the shaft N causes the chain to feed around the wheels.

The cartridges used in this gun are joined in a continuous band by a flexible belt and packed in suitable cases Q, adapted to be attached to the gun adjacent to the feed-chain p, and to start feeding, the first cartridge of the strip is laid between the arms p' that project from the links of the chain p, and the cartridges are drawn by the chain into the breech behind the barrels, into which they are to be inserted. The can k^4 is so cut that at each revolution it feeds the ratchet two notches. This feeds the chain bearing the cartridges two spaces, so that every other cartridge passes the right barrel in order that it may be fired in the left. A rod v, passing longitudinally through the breech and terminating in the rear in a handle v', has its front end bent and so located with regard to the

lever L that when the lever is raised the end of the rod may be pushed forward under the end of the lever, so that the lever will drop back but half-way when the cam k^4 recedes and feed the ratchet one notch instead of two; then all the cartridges may be fired from one barrel.

A friction-ratchet n^2 is placed on the shaft N to determine the amount of movement of the feed-chain so the cartridges may be properly grasped by the forceps R. The forceps R consist of two pairs of spring-arms having curved grasping-jaws r, attached at their upper ends to a plate r', which is secured to the forward-projecting head s' of the bars s by a screw s^2, the upper end of which is provided with a handle s^3, so that by turning the handle the relative positions of the head s' and plate r' may be changed. Plates s^4 are attached to the sides of the head to properly hold the arms of the forceps. The bars s, to which the forceps are connected, are held in sliding contact with the partition A^5 at their upper end by a plate q, which is screwed to the frame, and at their lower end by the cam-wheel k^5 that is fast to the shaft K. A roll projects from one of the bars s into the cam-groove in this wheel k^5 above the shaft, and a roll on the end of a lever s^5 that is connected by a link s^6 to the other bar projects into the cam-groove below the shaft, so that the bars are alternately reciprocated. (See Fig. 12.) Pins s^7 projecting from the partition through a slot in the bars guide them in their vertical movement.

Projecting to one side from the head s' in the same plane is a head t, to the under side of which are secured the renewable cartridge-separators or belt-cutters t'. These separators reciprocate with one pair of forceps, and when they come down the knife-edges cut the fiber of the belt and release or separate two cartridges, so they may be picked up by the forceps when they come in line.

A crank E′ is secured, preferably, by a ratchet and pawl e^3 to one end of the shaft E, so that rotation of the crank drives the mechanism, while, if desired, the mechanism may be operated without turning the crank. A bevel-gear J, attached to the opposite end of the shaft E, meshes with a gear J′, which is fast to the upper end of shaft j, to the lower end of which is secured a bevel-gear J^2 that meshes with a gear J^3. The gear J^3 is attached to the end of a shaft J^4, which is rotated by means of a motor U, that is secured to the under side of the tail-plate b of the mount B, the energy in the motor being stored in springs, compressed air, or any desired form. The shaft j is telescopic, the part j' sliding through the part j^2, and the brackets supporting the shaft are hung on the shafts E and J^4 to permit the gun to be elevated or depressed without stopping the motor or disconnecting the gears. The gear J is connected to the shaft E by a ratchet-and-pawl clutch, so that the shaft may be rotated by the crank without operating the motor. The barrels D are inclosed by a casing d, which forms a chamber into which water is poured to keep down the temperature of the barrels, and the breech is protected by a casing d', which has a cover d^2 that may be easily opened to reach the mechanism. An elevating-screw b' is attached at one end by a ball-and-socket joint to a projection d^3 on the rear of the casing and passes through a swiveled nut b^2 in the tail-piece b. (See Figs. 1 and 17.) This nut b^2 consists of a frame b^3, trunnioned in the end of the tail-piece, the frame bearing two worm gear-wheels b^4 b^5, the shaft of the gear b^5 being provided with a crank b^6, so that the gear may be rotated while the end of the pivot of wheel b^4 is threaded and provided with clamp-nut b^7.

To quickly change the elevation of the gun, the gear b^4 being loose on its pivot, the crank b^6 is rotated, which causes the gear b^5 and screw b' to act as a rack and pinion, but when a fine adjustment is desired the gear b^4 is clamped between the faces of the frame b^3 and the screw rotated by the wheel b^8, the gears forming a nut. A handle d^4 extends across the back of the gun, whereby it may be oscillated horizontally.

When the gun is mounted, properly sighted, and a case of cartridges attached, the first cartridge being laid on the feed-chain, and the gunner pulls the handle u', the motor, through the connecting shaft and gear, rotates the shaft E. The rotation of this shaft starts the feed mechanism, which brings the belted cartridges up under the separator-knives, which descend and separate or cut off two cartridges. These are fed along until the first cartridge is beneath the right-hand barrel, when the right-hand forceps descend, grasp the cartridge, and raise it to the level of the barrel. Then the right-hand spindle G comes forward and the loading-rod pushes the cartridge from the forceps through the loading-opening in the breech-block into the barrel. This spindle then withdraws a short distance and the breech-block is oscillated to bring a firing-pin back to the cartridge and a loading-opening opposite the left-hand barrel. The spindle continues to withdraw, the trigger is pulled by the trip, and the bolt recocked by the cocking-lever. At the same time the spindle G is receding the spindle G′ approaches and forces a cartridge that has been picked up by the left-hand forceps into the left-hand barrel. When this barrel has been loaded and is being fired, another cartridge is being loaded into the right-hand barrel—that is, when one barrel is being loaded the other is being fired. The cam k^2 which oscillates the breech-block is so timed that the breech of the barrel which has been fired is fully covered until it is necessary to again load that barrel. The block does not have to be removed immediately to extract the shell, which operation has to be done so quickly in prior rapid-firing guns that much gas and soot escape from

the breech, reducing the velocity and accuracy of the ball and fouling the mechanism.

If it is desired to operate but one barrel the rod *v* is pushed forward so the ratchet will feed but one space, and the forceps which lift the cartridges to the silent barrel screwed up so they will not grasp a cartridge when they descend; then all of the cartridges will be fed into the other barrel.

To quickly disable the gun, the covers of the casing and frame are thrown open, the removable plates *a'* which hold the spindles in place lifted out, and the spindles removed.

The gun will automatically load and fire as long as ammunition is supplied and the motor drives the mechanism, and should the motor become exhausted the crank may be utilized to continue the firing. Shells cannot clog the mechanism, as they do not return through the breech after being exploded.

I claim as my invention—

1. In a machine-gun, and in combination, a barrel, a frame to which the barrel is connected, feeding mechanism, loading mechanism, and firing mechanism on said frame, a driving-shaft for said mechanisms, connections between said mechanisms and said driving-shaft, and a motor supported on the mount, and connections between said driving-shaft and the motor, all substantially as described.

2. In a machine-gun, and in combination, a barrel, a frame to which the barrel is connected, feeding mechanism, loading mechanism, and firing mechanism on said frame, a driving-shaft for said mechanisms, connections between said driving-shaft and said mechanisms, a motor supported on the mount, and an extensible shaft between the driving-shaft and the motor, all substantially as described.

3. In a machine-gun, the combination of the barrels, a frame bearing feeding, loading, and firing mechanisms supported upon a mount having a rearward-projecting tail-piece, a motor attached to the tail-piece, a telescopic shaft joining the motor and the driving-shaft of the feeding, loading, and firing mechanisms, and an elevating-screw joining the tail-piece of the mount with the frame, substantially as described.

4. In a machine-gun, and in combination, the barrels, a frame with which the barrels are connected, feeding mechanism, loading mechanism, and firing mechanism by which the cartridges are fed, loaded, and fired, said mechanism being mounted on the frame, an oscillating breech-block provided with a loading-opening and with a firing-pin, mechanism for oscillating the breech-block to bring the loading-opening and firing-pin into and out of line with the barrels alternately, substantially as described.

5. In a machine-gun, in combination with the barrels and the feeding, loading, and firing mechanisms, a breech-block having two loading-openings and firing-pins pivoted to the frame back of the barrels, and provided with gear-teeth that mesh with teeth on the end of an oscillating lever, substantially as described.

6. In a machine-gun, and in combination, the barrels and the reciprocating feeding and loading mechanisms carried upon the frame in line with the barrels, mechanism arranged to move a chain of cartridges in rear of the barrels and in a lower plane, vertically-reciprocating bars carrying forceps in line with the cartridges and arranged to grasp a cartridge from the feed-chain and to raise it into line with a barrel, and mechanism for alternately reciprocating said bars, substantially as described.

7. In a machine-gun, and in combination, the barrels and the reciprocating feeding and loading mechanisms carried upon the frame in line with the barrels, mechanism arranged to move a chain of cartridges in rear of the barrels and in a lower plane, vertically-reciprocating bars carrying spring-arm friction-forceps in line with the cartridges and arranged to grasp a cartridge from the feed-chain and to raise it into line with a barrel, and mechanism for alternately reciprocating said bars, substantially as described.

8. In a machine-gun, and in combination, the barrels and reciprocating feeding and loading mechanisms arranged in line with the barrels, mechanism arranged to move a chain of cartridges in rear of the barrels and in a lower plane, vertically-reciprocating bars bearing grasping-forceps which are made independently adjustable, whereby either may be rendered inoperative, said forceps being also arranged to grasp and raise a cartridge into line with the barrel, and mechanism for alternately reciprocating the bars, substantially as described.

9. In a machine-gun, and in combination with a pair of vertically-reciprocating bars bearing forceps, and mechanism for feeding a chain of cartridges into line with the said forceps, mechanism for reciprocating said bars alternately, and a cartridge-chain separator attached to one of the forceps in line with the said chain, substantially as described, whereby the chain is severed upon the reciprocations of the forceps.

10. In a machine-gun, and in combination, the barrels, the feeding and loading mechanisms reciprocating in line with the barrels, mechanism for feeding a cartridge-chain in rear of the barrels and below the plane thereof, reciprocating forceps arranged to grasp and raise a cartridge alternately first to one barrel and then to another, and a pair of cartridge-separators consisting of cutters arranged to span and separate two cartridges from the band, substantially as described.

11. In a machine-gun, in combination with the barrels and the loading and firing mechanisms, feed mechanism consisting of a cam, a lever oscillated by the cam, a ratchet driven by the lever, a shaft rotated by the ratchet, a

pair of sprocket-wheels, one of which is on a shaft connected with the ratchet, and a feed-chain encircling the said wheels, substantially as described.

12. In a machine-gun, in combination with the barrels and the loading and firing mechanisms, feed mechanism consisting of a cam, a lever oscillated by the cam, a rod adapted to limit the oscillation of the lever, a ratchet driven by the lever, a shaft rotated by the ratchet, a pair of feed-wheels, one of which is on a shaft connected with the ratchet, and a feed-chain encircling the wheels, substantially as described.

13. In a machine-gun, in combination with the barrels and the loading and firing mechanisms, feed mechanism consisting of a cam, a lever oscillated by the cam, the ratchet driven by the lever on the shaft bearing a feed-wheel and retard-ratchet on one side of the gun, a feed-wheel on the opposite side, and a chain with outwardly-projecting arms encircling both of the said feed-wheels, the upper surface of said chain being below the level of the barrels, substantially as specified.

14. In a machine-gun, and in combination a barrel and mechanism to feed the cartridges into line with said barrel alternately, a reciprocating spindle having a bolt in line with the barrel and arranged to thrust a cartridge into the barrel in its forward movement, the firing-pin, mechanism operated by the backward movement of the plunger to retract the firing-pin, means for forcing forward the firing pin, and trigger mechanism operated by the movement of the plunger, all substantially as described.

15. In a machine-gun, and in combination with the barrels, a feeding mechanism therefor, whereby the cartridges are brought into line with the barrels, a pair of spindles arranged to reciprocate alternately, independently-movable bolts in said spindles, a spring adapted to thrust the bolts forward, mechanism for drawing back the bolts and compressing the spring near the limit of the backward movement of the spindles, and a trigger arranged to release the bolt at the beginning of the backward movement of the spindle, substantially as described.

16. In a machine-gun, and in combination with the barrels, a feeding mechanism therefor, whereby the cartridges are brought into line with the barrels, a pair of spindles arranged to reciprocate alternately, independently-movable bolts in said spindles, a spring adapted to thrust the bolts forward, mechanism for drawing back the bolts and compressing the spring near the limit of the backward movement of the spindles, and a trigger arranged to release the bolt at the beginning of the backward movement of the spindle and to pass over its trip when the spindle moves forward, substantially as described.

17. In a machine-gun, and in combination with the barrels and the feeding mechanism therefor, a loading and firing mechanism consisting of a pair of spindles, loading and firing bolts in said spindles operated in one direction by a spring, mechanism for retracting the bolts at the backward movement of the spindles, trigger mechanisms operated by the movement of the spindles, a pair of oscillating levers having segmental heads in gear with the spindles, and mechanism for oscillating the levers, all substantially as described.

18. In a machine-gun, and in combination with the barrels and feeding mechanism for the cartridges, alternately reciprocating spindles, each bearing a loading and firing bolt and a trigger pivoted between the lugs on the spindle, one end of the trigger being in contact with a sliding pin adapted to engage a shoulder on the bolt, and the other end having a pivoted pull held upright on one side by a pin and on the other side by a spring, substantially as specified.

19. In a machine-gun, and in combination with the barrels and mechanism to feed the cartridges, spindles arranged to reciprocate alternately in line with the barrels, loading and firing bolts in said spindles, a trigger and cocking-lever pivoted to projections on the spindles, a bolt to lock the firing-bolts, and a stop on the frame in line with the trigger, said bolt being operated by the cocking-lever, and said cocking-lever having an upper forked end arranged to come in contact with the stop on the frame, substantially as described.

20. In a machine-gun, and in combination with the barrels, and feeding mechanism for the cartridges, alternately-reciprocating spindles bearing loading and firing bolts, mechanism operating said spindles and bolts, a lower and a removable upper plate, said spindles being held in ways between said plates, the upper plate being removable when the cover of the frame is opened, whereby the spindles may be readily lifted out and removed, substantially as described.

21. In combination with the breech of a machine-gun, an elevating-screw provided with a hand-wheel pivoted to the breech, and passing through a nut on the mount formed of two gear-wheels, the shaft of one being provided with a crank and the shaft of the other with a clamp-nut, whereby the screw may be fed rapidly or slowly, substantially as specified.

22. In a machine-gun, and in combination, two barrels united to a frame which carries feeding, loading, and firing mechanisms, an oscillating breech-block having two loading-openings and firing-pins, said block being arranged to oscillate to bring alternately a loading-opening and a firing-pin opposite the breech of the barrel, and mechanism for oscillating the breech-block, substantially as and for the purpose set forth.

23. In a machine-gun, and in combination, a pair of barrels fixed to the frame, a pair of

loading and firing bolts arranged to reciprocate one in line with each barrel, a shaft, as E, and connections between said shaft, and the said bolts arranged to operate forward and backward alternately, feeding mechanism having a pair of forceps arranged to operate alternately to bring the cartridges into line with the barrel, and connections between said feeding mechanism and the shaft E, all substantially as described.

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Witnesses:
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