No. 862,384. PATENTED AUG. 6, 1907.

M. L. BRISTOL.

AUTOMATIC GUN.

APPLICATION FILED NOV. 1, 1904.

4 SHEETS—SHEET 1.

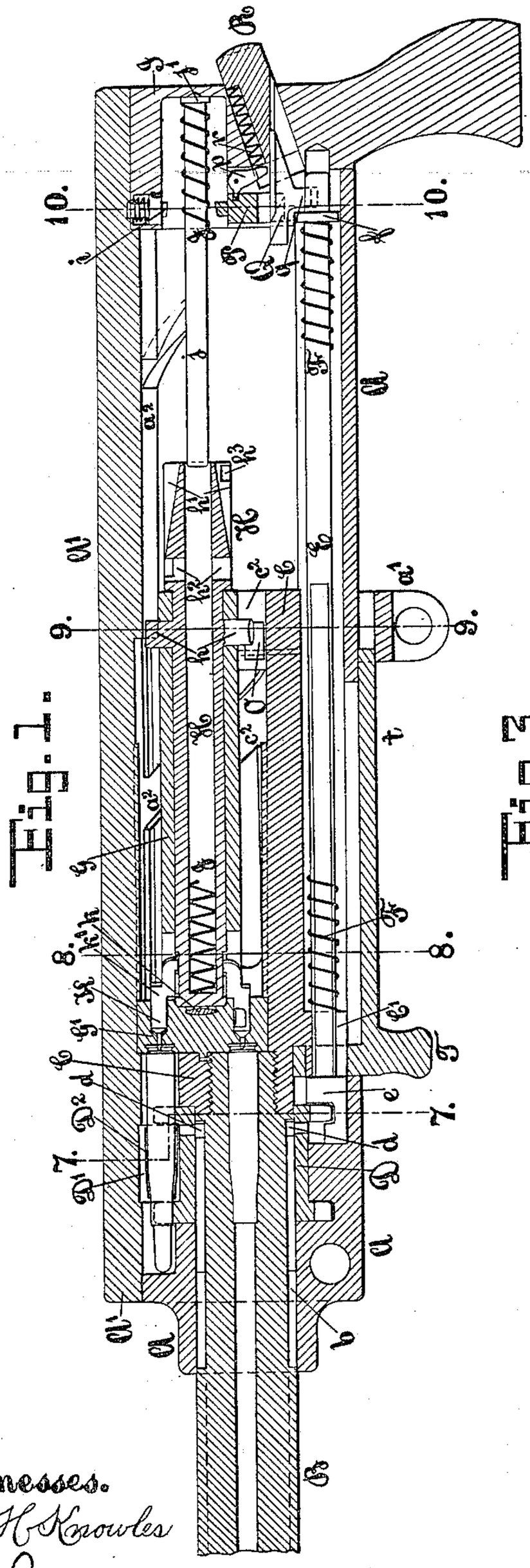

Fig. 1.

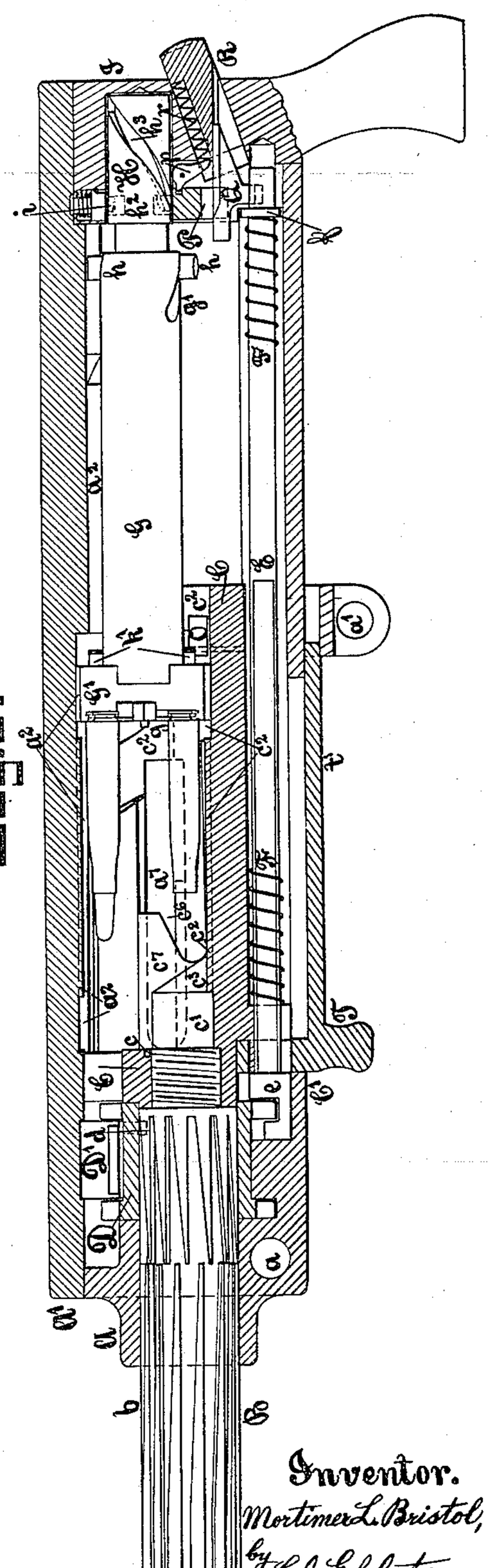

Fig. 2.

Witnesses.
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Atty.

No. 862,384. PATENTED AUG. 6, 1907.

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4 SHEETS—SHEET 2.

Fig. 8.

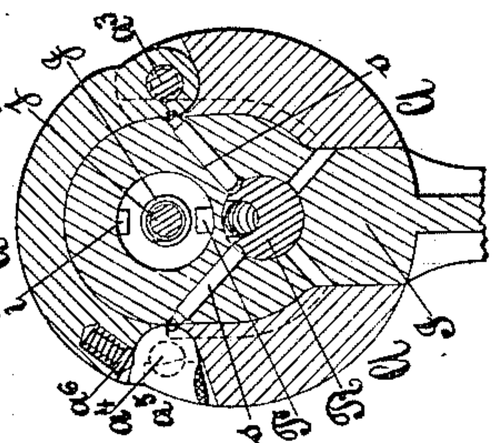


Fig. 7.

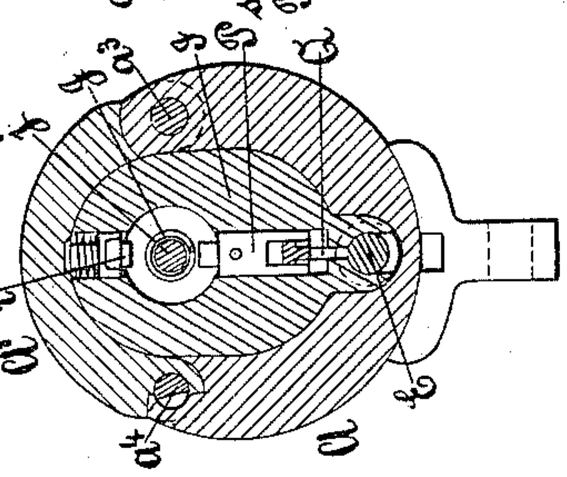


Fig. 6.

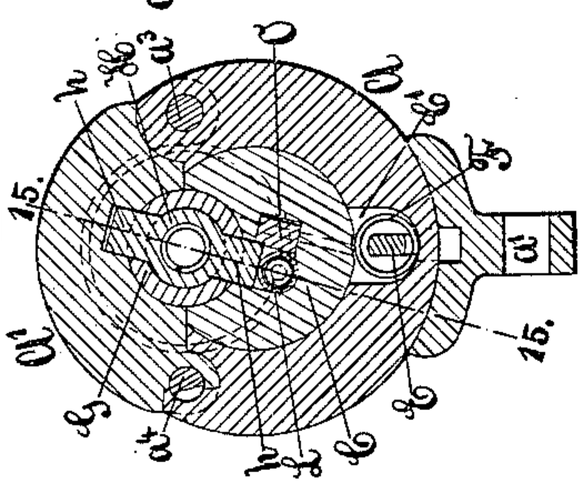


Fig. 5.

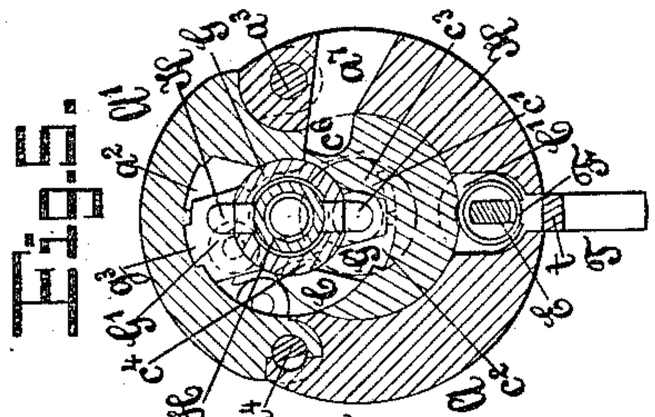


Fig. 4.

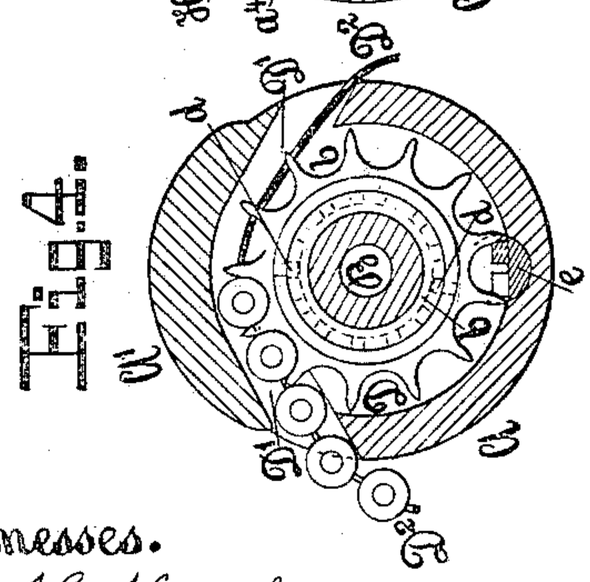
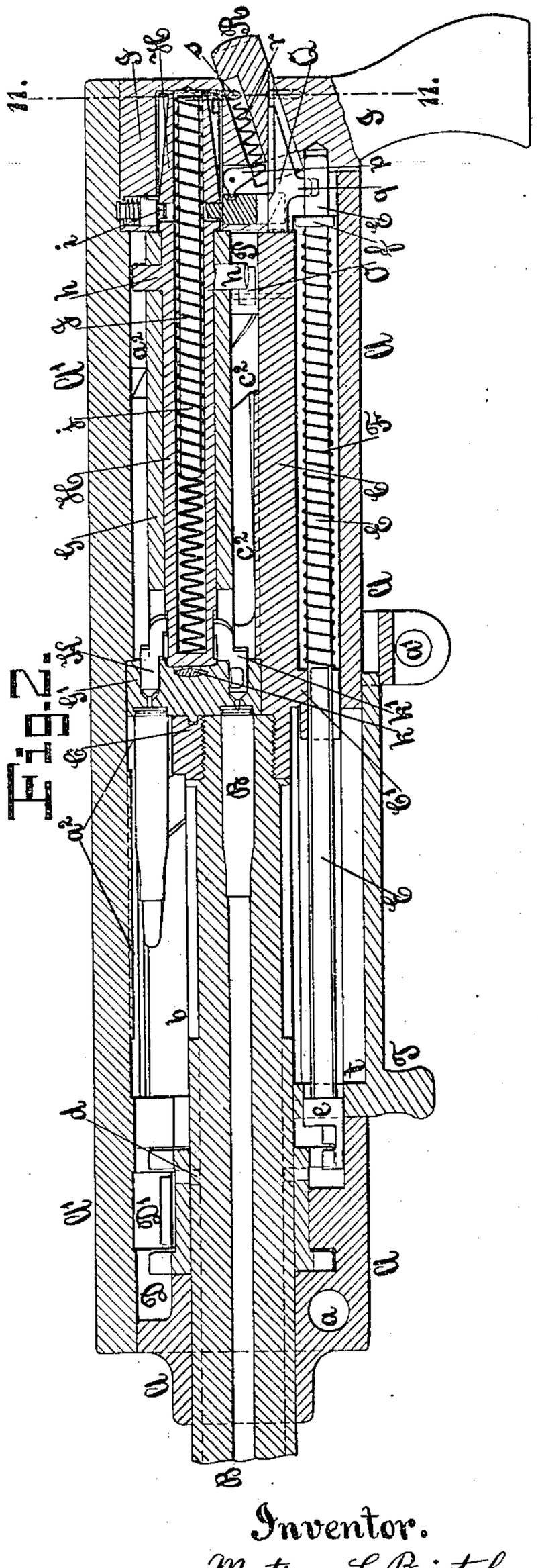


Fig. 2.



Witnesses.
Wm. H. C. Knowles.
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No. 862,384. PATENTED AUG. 6, 1907.

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4 SHEETS—SHEET 3.

Fig. 4b.

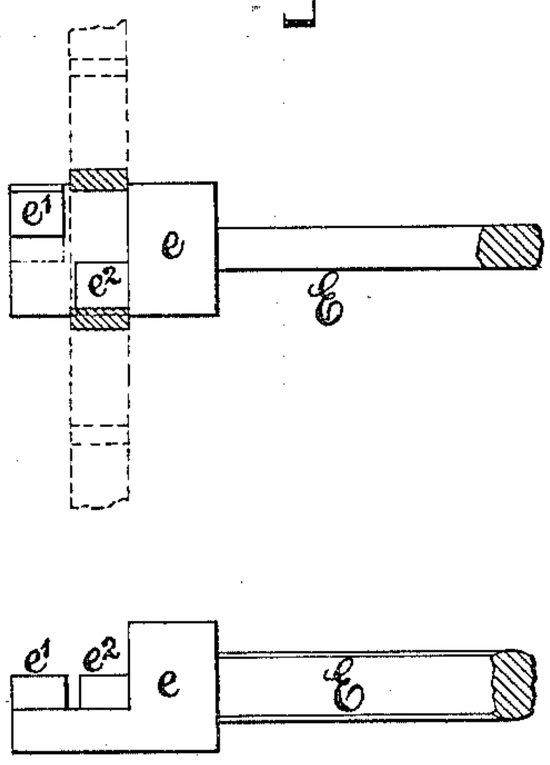


Fig. 4a.

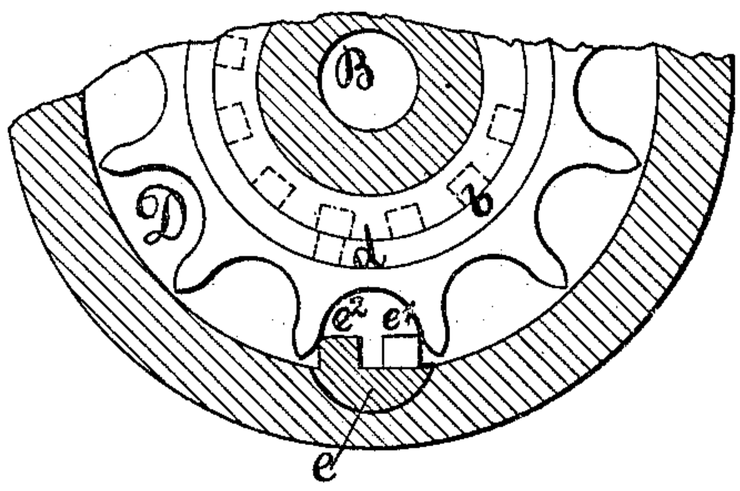


Fig. 2a.

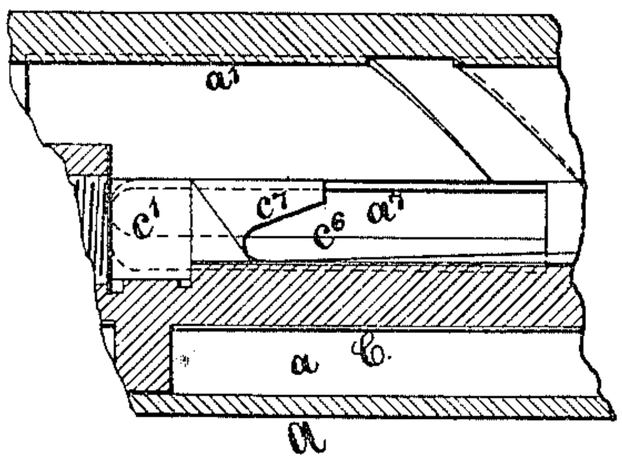


Fig. 5a.

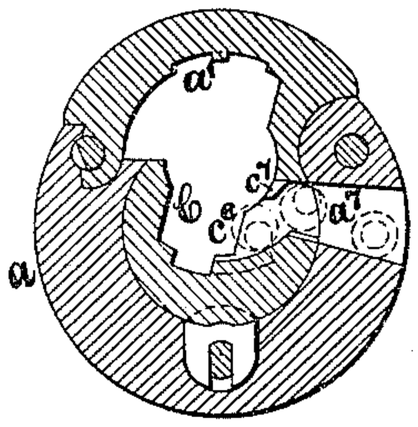
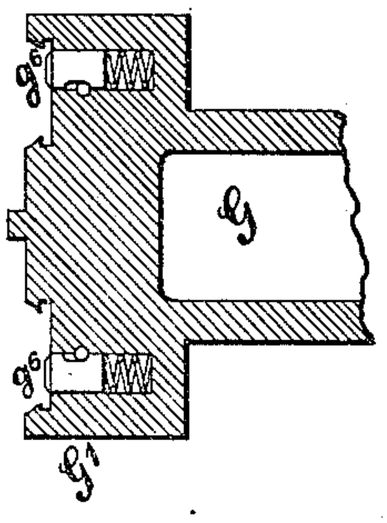


Fig. 11a.



Witnesses.

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Atty.

No. 862,384. PATENTED AUG. 6, 1907.

M. L. BRISTOL.

AUTOMATIC GUN.

APPLICATION FILED NOV. 1, 1904.

4 SHEETS—SHEET 4.

Fig. 1.

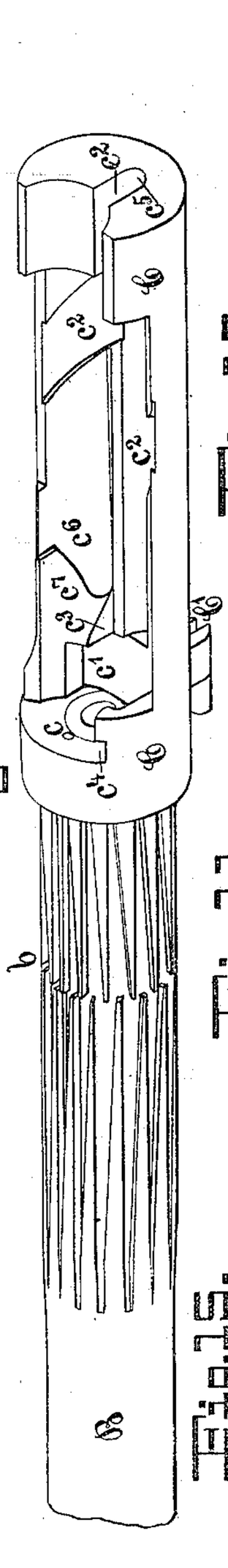

Fig. 10.

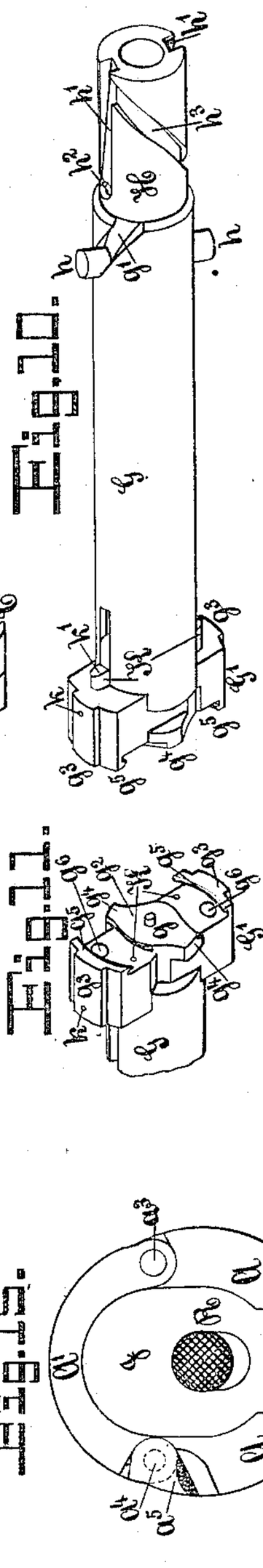

Fig. 11.

Fig. 15.

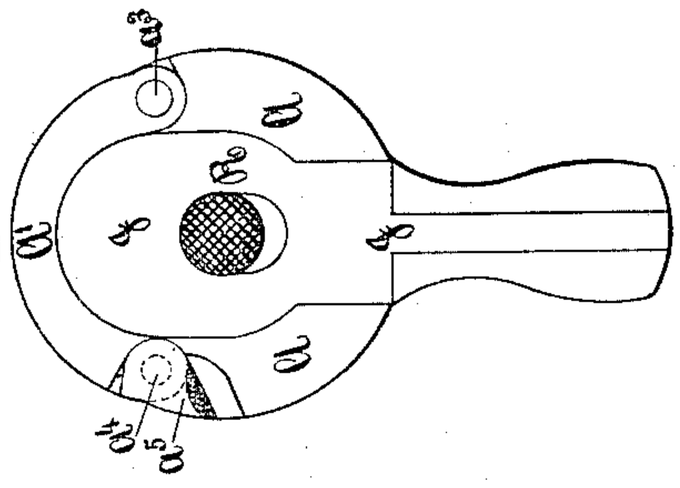

Fig. 12.

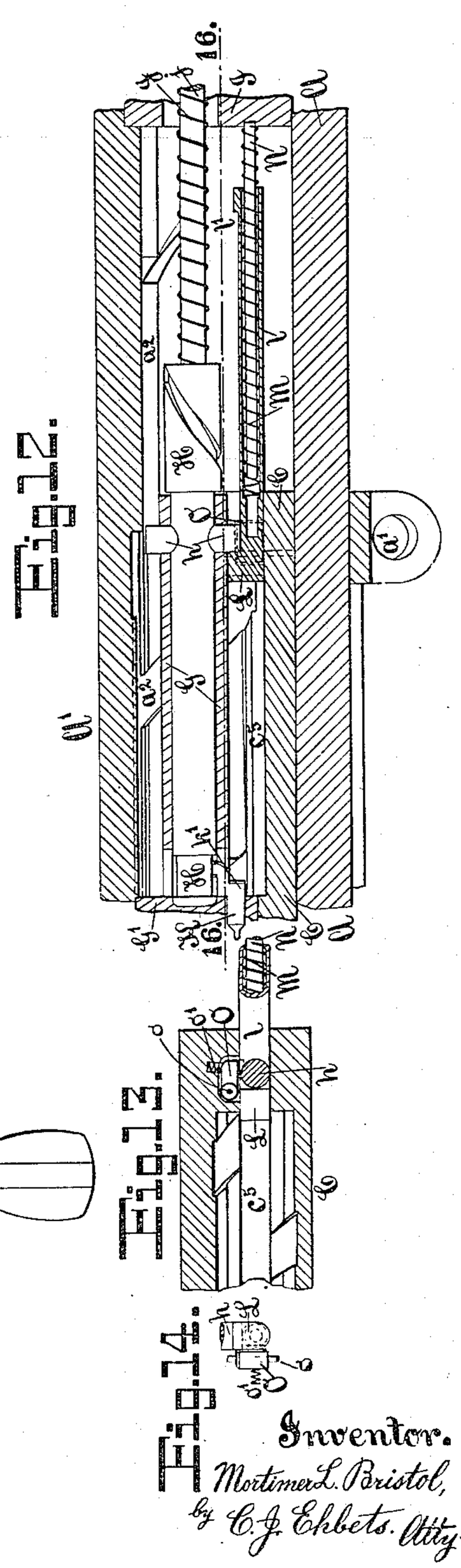

Fig. 13.

Fig. 14.

Witnesses.
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K. Powers

Inventor.
Mortimer L. Bristol,
by C. J. Ebbets. Atty.

UNITED STATES PATENT OFFICE.

MORTIMER L. BRISTOL, OF WEST HARTFORD, CONNECTICUT, ASSIGNOR TO COLT'S PATENT FIRE ARMS MANUFACTURING COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF CONNECTICUT.

AUTOMATIC GUN.

No. 862,384. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed November 1, 1904. Serial No. 230,939.

To all whom it may concern:

Be it known that I, MORTIMER L. BRISTOL, a citizen of the United States, residing at West Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Automatic Guns, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates to improvements in that class of automatic guns known as "recoil-operated guns". In the arms of this class the pressure of the gases generated in the barrel by the explosion of the powder-charge of a cartridge, expended in forward direction in the propulsion of the bullet through and from the bore of the barrel, is in rearward direction utilized to produce the rearward movement of the breech-block, and, the barrel being at the time of firing interlocked therewith, of the barrel. During the rearward movement, or recoil, of these parts, the excess of energy of recoil is stored in suitable means which yieldingly support the breech-block and the barrel in their forward position, and at the end of their recoil return these parts to their forward, firing position. During this reciprocating movement of the barrel and the breech-block the entire cycle of functions of the breech-mechanism is automatically performed; the breech is opened, the empty cartridge-case is extracted from the chamber and ejected from the gun, a charged cartridge is presented in position for introduction into the chamber of the barrel, the firing mechanism is cocked, the charged cartridge is thrust into the chamber, the breech is closed and securely locked and the firing mechanism is released to explode the cartridge. The energy of recoil is thus prevented from exerting itself disturbingly upon the gun and its mount by being absorbed and utilized in effecting the operations of the breech-mechanism of the arm, and in automatically producing rapid successive firing; it being only necessary to furnish a supply of cartridges, to thrust in and fire the first cartridge by hand in the gun, which then automatically continues the operations so long as cartridges are supplied.

The object of this invention is to produce a gun provided with a simple and efficient mechanism to be actuated by the gas-pressure in the barrel, to interlock the barrel and the breech-block of the arm in their firing position, to support and guide them while recoiling still locked together, to unlock them at the end of the recoil, to return them separately to their forward position, and during the return movement to open the breech and to perform all of the functions preparatory to firing another shot, and finally, at will, to fire the gun.

Another object of this invention is to produce an automatic gun provided with reliable means for at all times controlling the rapid automatic firing of the arm by at will interrupting the operations of not only the cocked firing-mechanism, as has been heretofore the usual arrangement for this purpose in the arms of this class, but by at will interrupting the operations of the breech-mechanism at the time when the breech is fully opened and before a charged cartridge has been thrust into the barrel. This arrangement positively averts the serious danger of uncontrollable firing continuing unchecked even though the operations of the firing mechanism are arrested, which danger exists in guns in which the control of firing depends upon at will releasing the cocked firing mechanism so as to allow it to strike upon the primer of the cartridge in the barrel the igniting blow, or at will preventing the ignition by retaining the firing mechanism in cocked position. By continued rapid firing the barrel of a gun becomes heated to such a degree that the powder charge of a cartridge inserted therein will be ignited by the heat transmitted to it, and the firing will be continued even though no percussion upon the primer occurs. In order to positively control the firing even under these conditions, so as to be able to stop the firing and also to start it again without delay, it is required to prevent at will the thrusting of a charged cartridge into the heated barrel, but yet to hold a cartridge in the gun ready to be thrust in and to be exploded. To entirely cut off the supply of cartridges from the gun would not result in the desired control, because, while this would arrest the firing, it would also prevent the firing from being instantly recommenced at will, as some time and manual operations would be required to again supply cartridges to the gun and to carry the first cartridge in the gun forward to the position where it is presented ready to be thrust into the chamber of the barrel.

The invention consists in certain improved constructions, more particularly set forth in the claims hereinafter following and forming a part of this specification, and in the combination of parts and mechanisms and their operations hereinafter described and illustrated in the accompanying drawings in which—

Figure 1 is a longitudinal, vertical section of the rear portion of the gun, showing the breech-mechanism in the closed position. Fig. 2 is a section similar to Fig. 1, but showing the barrel and the breech-mechanism in the rearmost position which they have at the end of their recoil, and before the barrel is returned forward. Fig. 3 is a section similar to Fig. 1, but showing the barrel and the inner frame returned to the forward position, and the breech-block in the rearmost position. Fig. 4 is a vertical, transverse section of the gun on the line 7—7 of Fig. 1, looking forward, showing the feed-wheel and the feed-belt in rear-view. Fig. 5 is a vertical, transverse section on the line 8—8 of Fig. 1, looking forward. Fig. 6 is a vertical, transverse section on the

line 9—9 of Fig. 1, looking forward. Fig. 7 is a vertical, transverse section on the line 10—10 of Fig. 1, looking forward, showing the vertical cam-pins in rear-view. Fig. 8 is a vertical, transverse section on the line 11—11 of Fig. 2, looking forward. Fig. 9 is a detached perspective view of the rear portion of the barrel and of the inner frame. Fig. 10 is a detached perspective view of the breech-block, showing the breech-bolt and the rear end of the bolt-tube. Fig. 11 is a detached perspective view of the head of the breech-bolt, showing the front face and one side of it. Fig. 12 is a partial, longitudinal section on the line 15—15 of Fig. 6, showing the firing mechanism. Fig. 13 is a partial, horizontal section on the line 16—16 of Fig. 12, showing a plan of the firing mechanism. Fig. 14 is a detached front-view of the hammer and sear, and of the vertical stud of the bolt-tube. Fig. 15 is a rear view of the gun. Fig. 3^a, represents a partial longitudinal section of the casing, cover and receiver, similar to Fig. 3, but with the breech-bolt and the rod E left away, to show more clearly the passage c^6 and the exit a^7 for the ejection of the cartridge-cases. Fig. 4^a is a vertical, transverse section showing the lower part of the barrel, feed-wheel, casing and the rod E, similar to Fig. 4, but on an enlarged scale. Fig. 4^b, represents a side view and a top view of the forward portion of the rod E detached, the lowest two radial arms of the feed-wheel being shown in section in the top view. Fig. 5^a, is a cross-section of the casing, cover and receiver, similar to Fig. 5, but on a line just in rear of the overhanging projection c^7, and with the breech-bolt left away, to more clearly show the passage c^6 and the exit a^7. Fig. 11^a is a longitudinal section of the head of the breech-bolt, in the plane through the axis of the pistons g^6 g^6.

Similar letters refer to similar parts throughout the several views.

The gun represented in the drawings as an embodiment of the invention consists, in its construction, of four principal parts, the outer frame or casing A, the barrel B, the inner frame or barrel-extension C and the breech-mechanism. Of these the outer frame is stationary or non-recoiling, being provided with loops a, a^1, for its attachment upon the usual gun mount of a gun-carriage or tripod.

The barrel B is firmly attached to the inner frame C which thus forms a rearward extension of the barrel, both the barrel B and the inner frame C are entered from the rear into the casing A which securely supports and carries them, but in which they are fitted to slide longitudinally, their movement being limited in forward direction by the solid front end of the casing A, and in rearward direction by the rear-plate I, which is removably secured in the casing, closes the same and binds together its side walls. The central opening in the front of the casing is surrounded by a circular boss through which the barrel extends and in which the cylindrical rear portion of the barrel is guided.

The form of the casing A is that of a cylinder from the top of which a segment has been removed in its entire length, to give access to its interior. The parti-cylindrical cover A^1 is fitted to the top of the casing and attached thereto by the hinge and longitudinal hinge-pin a^3, on the right, and by a similar locking-pin a^4 on the left side. The cover A^1 closes and strengthens the casing being interlocked with both its side walls. From the barrel rearward the left side of the cover A^1 forms a tube-shaped seat in which the locking pin a^4 is carried, and the left edge of the casing A has a longitudinal recess for its reception, at both ends the tube entirely incloses the locking-pin, but at intermediate places of its length an outer segment of the tube and the pin is cut away and the recess in the casing is shaped to fit the remaining hook-shaped projection of the cover and the flattened locking-pin, Figs. 5, 6 & 7. On the rear end of the locking-pin a turn-button a^5 is fixed, which projects from the rear of the cover, by upward pressure against this button the locking-pin is turned on its longitudinal axis until the flattened part of the pin clears the edge of the casing and releases the cover, which then may be raised and turned to the right, to open the gun-casing. When the turn-button a^5 is turned down the rotation of the locking pin a^4 causes it to enter a segmental recess in the left side wall of the casing and thereby to securely lock the cover to the casing, Figs. 5, 6 & 7. To keep the turn-button a^5 in the lower position, a small piston a^6 is fitted into the cover over the turn-button and a spiral spring presses the piston downward against the turn-button and thus yieldingly holds the button and the locking-pin in the locked position, Fig. 8.

In the casing A, between its front end and that of the inner frame C, the cartridge-feed-wheel D is mounted upon the barrel B, it consists of a cylinder having a flange at each end in which a series of semi-circular longitudinal grooves is cut, each groove separated from the next by a radial projection. The seat for the feed-wheel in the casing is open at the top, the lower portion forming a recess into which the feed-wheel D is introduced from above and wherein it is held by the barrel passing through it, so that the feed-wheel may revolve upon the barrel, but is prevented from moving lengthwise by its forward flange fitting the recess in the casing.

As shown in Fig. 4 the sides of the casing are cut down at the feed-wheel and with the corresponding under side of the cover form a transverse channel D^1 through the gun, which extends some distance forward and rearward of the feed-wheel, excepting the opening through the right side-wall of the casing which is only as long as is the space between the flanges of the feed-wheel. This channel serves for the introduction of cartridges to the gun. The cartridges are contained in the pockets of the feed-belt D^2 which inclose the central part of them and from which both ends of the cartridges project. The feed-belt is introduced into the gun from the left side, led over the feed-wheel, and out through the right side-opening in the casing. On the feed-wheel the feed-belt occupies the space between the flanges, the projecting ends of the cartridges fitting into the grooves in the flanges, so that by the stepwise rotation of the feed-wheel from the left to the right side the belt and the cartridges are drawn into the gun, and, the topmost cartridge being withdrawn into the receiver during each step of the rotation, the empty feed-belt is ejected from the right side of the gun, Fig. 4. This construction of the feed-wheel and feed-belt being a wellknown one, as applied to guns of this class, it does not require to be further specified.

The stepwise rotation of the feed-wheel is actuated by the reciprocating movement of the barrel. For

this purpose a series of cam-grooves *b*, *b*, is cut in the surface of the barrel upon which the feed-wheel is mounted and two substantially opposite radial pins *d*, *d*, fixed in the feed-wheel project inward into the cam-grooves of the barrel, the number of the cam-grooves being equal to the number of grooves in the flanges of the feed-wheel. As seen in Figs. 3 and 9, each of the cam-grooves *b*, *b*, consists of two communicating portions, of which one extends from near the rear end of the barrel forward for some distance to a point where it unites with the other portion of the groove which extends further forward. The remaining, uncut surface of the barrel between the grooves *b*, *b*, forms two series of tongues or lands, one extending from the rear and one from the front between the grooves, and separating the same. Looking from the rear towards the front of the barrel, the left hand edge of each of these tongues, in the forward series as well as in the rear series, is parallel to the axis of the barrel, and the right hand edge of each tongue is inclined. The right hand edges of the tongues in the rear series incline forward and to the left side, while the right hand edges of the tongues in the forward series incline forward and to the right side, and the pointed front ends of the rear tongues stand midway between the pointed rear ends of the forward tongues, as shown in Figs. 3 and 9. From this description it will be plain, that, when the cam-pin *d* stands in the rear end of one of the grooves *b*, *b*, and the barrel is moved rearward through the feed-wheel D, the cam-pin will not be moved laterally while the left parallel edge of the rear tongue passes by the pin, but when, during the rearward movement of the barrel, the cam-pin enters the forward portion of the cam-groove, it will be engaged by the inclined right edge of the forward tongue and the continued rearward movement of the barrel will move the cam-pin *d* towards the right side, and thus rotate the feed-wheel D from the left to the right side of the gun; during the forward, return movement of the barrel the cam-pin stands still while the left parallel edge of the forward tongue passes it, but when the point of the rear tongue reaches it, the cam-pin will enter the rear portion of the next groove to the right, and the inclined right edge of the rear tongue will move the cam-pin *d* to the right, thus further rotating the feed-wheel D to the right side. When the barrel recoils the action of the cam-grooves in its circumference on the cam pins of the feed-wheel causes the feed-wheel to be rotated from the left to the right side about one-half of the distance between two successive grooves in the flanges, and on the return or forward movement of the barrel the feed-wheel is rotated in the same direction sufficiently to complete one step; so that by each complete rear and forward movement of the barrel the succeeding cartridge on the feed-wheel is carried to the topmost position, bringing its rearward projecting head into the receiver and into the reach of the head of the breech-block by which it will be grasped and the cartridge withdrawn rearward into the receiver and introduced into the barrel.

The inner frame C also is cylindrical in form, its forward end incloses the breech-end of the barrel and a lug C^1 projects from the inner frame into a central longitudinal recess in the bottom of the casing A, and serves to guide the barrel and inner frame during the rear and forward movement therein and to prevent their rotation. The forward end of the inner frame surrounds the breech-end of the barrel, but from the barrel rearward a segment has been removed from the top of the inner frame, laying open the interior which is fitted to receive the breech-block and to support and guide it in its movements.

In the groove in the bottom of the casing the longitudinal rod E is arranged for a limited rear and forward movement, the forward end of the rod E is enlarged to form the head *e*. The head *e* is cylindrical, concentric with the rod E and fits into the groove in the bottom of the casing. From the forward end of the head *e* the upper portion has been removed, the remaining segment fills the groove and its top surface corresponds with the interior surface of the casing, so that it clears the path of the radial arms or projections on the feed-wheel D and does not interfere with the rotation of the same, Figs. 4 & 4^a. On this surface the head *e* carries two projections e^1 & e^2, the front one e^1 located at the right and the rear one e^2 at the left side of the axis of the rod and head, as seen when looking forward, Figs. 4^a, & 4^b; the width between the exterior sides of the projections e^1 & e^2 on the head is equal to the distance between two contiguous arms of the feed-wheel, and the width between the interior sides of the projections e^1 & e^2, is equal to the width of each one of the radial arms. When the rod E stands in its forward position, as shown in Figs. 1 & 3, the two lowest radial arms of the feed-wheel stand one at each side of the head *e* and in line with the rear projection e^2 of the head, so that the right side of the left radial arm rests against the exterior side of the projection e^2, as shown in Figs. 4^a & 4^b, thereby preventing backward rotation of the feed-wheel; in Fig. 4^b a top view of the head *e* is represented and the two arms of the feed-wheel are indicated in section in this position.

Before the rod E is moved to the rear, the rotation for half a step of the feed-wheel has carried the radial arm from the right side of the head *e* towards the left, (the direction of the movement being the reverse from that at the top of the feed-wheel,) until the radial arm stands vertically over the axis of the head *e*, and against the right side of the projection e^2. The rearward movement of the rod E now carries back the forward projection e^1 until it stands in line with and at the right side of this radial arm, as indicated in dotted lines in the top view in Fig. 4^b, thereby preventing backward rotation of the feed-wheel. Before the rod E is returned forward, the feed-wheel is rotated another half step, which carries the radial arms to the left until an arm again stands at each side of the head *e* and the right arm against the projection e^1, then the forward movement of the head returns the projection e^2 to the position at the right of the left radial arm. Thus the head *e* permits but limits the steps of rotation of the feed-wheel in one direction, while it prevents its rotation in the opposite direction.

In rear of the head *e* the rod E is flattened on both sides for some distance and passes through the lug C^1 depending from the inner frame C, this lug C^1 is bifurcated by a vertical slot just wide enough to allow the lug to clasp the flattened portion of the rod E. On the rod E the spiral re-action-spring F is mounted, its front end resting against the lug C^1 of the inner frame, the

rear end against a washer *f*, which is held in place by the rear plate I of the casing A; the spring F thus exerts its tension to yieldingly support the inner frame and the barrel in their forward position, and when these are moved rearward, as by the recoil, the spring F is compressed and the lug C^1 during the last of the rearward movement strikes the shoulders formed on the sides of the rod E at the end of the flattening, and forces the rod E rearward for a short distance; during the last of the return or forward movement of the inner frame and barrel under the action of the spring F, the lug C^1, striking the head *e* returns the rod E to its forward position. This rear-and forward movement of the rod causes the head *e* of the rod to clear in succession the radial projections of the feed-wheel and to allow the latter to be intermittently rotated in one direction; but the head *e* at all times prevents the feed-wheel from being rotated in the opposite direction, as herein above explained.

From the barrel rearward the interior of the inner frame C forms the receiver in which the breech-block is securely locked in the firing position and guided while opening and closing the breech. The breech-block consists of two parts, the breech-bolt G and the bolt-tube H. The breech-bolt G^1 is a cylinder provided at its front end with an integral head G^1, forming a vertical cross-head the ends of which project above and below the outside of the cylindrical body, at right angles to the axis, and the width of which between its parallel sides is somewhat less than the exterior diameter of the body. From the front of the head G^1 projects a small pivot *g* and the top and bottom of the head are concentric with the pivot *g* and with the cylindrical body.

In the front wall of the inner frame C above the breech-end of the barrel a small hole *c* provides a seat for the pivot *g* and in the forward position of the breech-bolt the pivot *g* seated in the hole *c* centers and supports the front end of the breech-bolt and allows it to rotate on the pivot *g*.

On the top and on the bottom of the breech-bolt-head are longitudinal ribs g^3, g^3, which fitting into corresponding grooves c^2 in the bottom of the receiver and a^2 in the under side of the cover A^1, serve to guide the breech-bolt-head in its reciprocating and rotary movements in the receiver, Fig. 5.

A semi-cylindrical recess in the rear wall of the inner frame and a similiar recess in the under side of the corresponding part of the cover form a bearing for the body of the breech-bolt which may freely move longitudinally and rotate therein, Fig. 6.

The breech-bolt G is bored out to receive the bolt-tube H which entering from the rear extends through the entire length of the body and a short distance into the head of the breech-bolt. The bolt-tube H moves rear-and forward with the breech-bolt, but has a limited independent longitudinal movement therein, and it projects at the rear some distance from the breech-bolt. Two radial studs *h*, *h*, on the bolt-tube project at right angles to its axis, and in the rear part of the breech-bolt are two spiral cam-grooves g^1, g^1, in which the studs *h*, *h*, fit and beyond which they extend above and below the breech-bolt-body and project into guide-grooves in the inner frame and in the cover of the casing, these grooves serve to guide the studs and to prevent rotation of the bolt-tube while the studs are in the grooves. By this construction the independent longitudinal movement of the bolt-tube H in the breech-bolt G produces, by the action of the studs in the spiral grooves, a partial rotation of the breech-bolt.

The projecting rear portion of the bolt-tube is larger in diameter than that contained in the breech-bolt and has two straight longitudinal grooves h^1, h^1, opposite to each other in the top and bottom, these grooves are of greater depth in rear than in front, their bottoms inclining outward and forward, and at the front end of each groove is a hole h^2, h^2, in diameter equal to the width of the grooves, but deeper than any part of the grooves; Figs. 1 and 10. From each of the holes h^2, h^2, a left-handed spiral groove h^3 extends rearward and upward, connecting each hole with the opposite straight groove into the deeper rear end of which the spiral groove leads. The forward end of each spiral groove h^3 is of less depth than is the hole h^2 where it starts, and the rear end of each spiral groove is of less depth than its forward end, the bottoms of the spiral grooves h^3, h^3, inclining outward and rearward, so that a shoulder is formed by the deeper straight groove at the place where the spiral groove ends therein; and similarly a shoulder is formed where the shallow forward part of each straight groove ends in a hole of much greater depth, Fig. 10.

In rear of the bolt-tube the rear-plate I has a recess into which the bolt-tube projects during the last of its recoil, Figs. 2 & 3.

In the top of the rear-plate I a small piston *i* is fitted in a vertical seat, being held therein by a transverse pin and a shoulder on the flattened rear side of the piston, a spiral spring mounted on its reduced upper end presses the piston *i* downward. The reduced lower end of the piston *i* forms the cam-pin which projects into the path of the bolt-tube, and during the last of the rearward movement of the bolt-tube the cam-pin *i* enters into the straight groove h^1 in the top of the bolt-tube. The cam-pin *i* being fixed in every other direction but held yieldingly in vertical direction, enters into the grooves h^1 and h^3 to their full depth, but yields outward when passing over the inclined bottom through the shallower parts of the grooves. By the action of the cam-pin in the straight grooves, the bolt-tube during the last of its rearward movement is held against rotation, but during the first of each forward movement the cam-pin *i* is forced, by the shoulder in rear of it, to enter into the spiral groove h^3, and the bolt-tube is thereby turned through half a rotation on its axis from the right to the left side.

The inside of the bolt-tube H, open at the rear, provides a seat for the breech-block-re-action-spring J, which rests in front against the closed end of the bolt-tube and in rear against a collar j^1 supported by the rear-plate. Compressed by the recoil of the breech-bolt and bolt-tube the spring J exerts its tension to return the bolt-tube and breech-bolt to their forward, closed position. To guide the spring J and to keep it straight a rod *j* is provided which extends through the spring from the rear-plate I forward into the bolt-tube, and on the rear end of the rod *j* the collar j^1 is fixed, so that the rearward pressure of the spring against the collar holds the rod *j* in its bearing in the rear-plate I.

To clearly show the rod *j* a central portion of the spring

J is represented in Fig. 1 as being broken away, and in Figs. 1 & 3 a portion of the lower spring F is similarly broken away, and in Fig. 2 the rear end of the spring r is represented as broken away to expose to view the location of the pin s in the rear-plate of the casing.

The inner frame C and the barrel B are concentrically seated in the outer frame or casing A, but the seat for the breech-block is partly in the inner frame and partly in the cover A^1 of the casing, Figs. 5 & 6, and the axis of the breech-block in its seat lies in a horizontal plane parallel to and considerably above that in which the axis of the barrel lies, as is indicated by the position in the receiver above the barrel of the seat c for the central pivot g on the face of the breech-bolt, Figs. 9 & 11. This arrangement brings the lower part of the head G^1 of the breech-bolt into line with the bore of the barrel, and when the breech-block is in the forward position the lower part of the head G^1 closes the chamber of the barrel and supports the cartridge therein, while the upper part of the head G^1 projects above the barrel and inner frame and stands in rear of the topmost cartridge in the feed-belt on the feed-wheel D. The heads of both cartridges, of that on the feed-wheel and of that in the chamber of the barrel, extend rearward into the receiver sufficiently to expose the annular groove in the cartridge-case beyond the end of the barrel; the front wall of the feed-channel D^1 in the casing guiding the upper cartridge, while the chamber in the barrel holds the lower one in that position. The head G^1 of the breech-bolt has on its face the central boss g^2 which occupies the space between the projecting heads of the two cartridges, and the parti-circular ribs g^5 on the outer edges of its face fills the spaces outside of the cartridge-heads and between these and the cover A^1 at the top and the inner frame at the bottom. The upper and lower edges of the central boss g^2 and the opposite inner edges of the ribs g^5, g^5, are undercut, and between the boss and the ribs are formed on the face of the breech-bolt-head G^1 an upper and a lower section of a circular T-shaped channel or flange-way, concentric to the axis of the breech-bolt; the heads of the cartridges fit into the wider rear part of this channel, and the overhanging edges at the front of the channel are adapted to enter the annular grooves in the cartridge-cases and thus to grasp the heads of the cartridges.

During the movements of the breech-bolt in the inner frame while opening and closing the breech, the cross-head G^1 is erect, but not quite vertical, the rib g^3 on its top being guided in the groove a^2 in the cover A^1 at the right side of the vertical center-line, and the lower rib g^3 in the groove c^2 in the receiver on the left side of the center-line, Fig. 5. When the breech-bolt has been moved fully forward the cross-head G^1 is pressed against the rear of the barrel under the forward pressure of the re-action-spring J in the bolt-tube, transmitted to the breech-bolt by the studs h, h, on the bolt-tube, which during the forward movement stand near the rear end of the spiral grooves g^1, g^1, in the breech-bolt-body, Fig. 3, and above and below this are guided and held against rotation in the straight grooves in the cover A^1 and in the inner frame C, Fig. 6. The cross-head G^1, which until then also was prevented from turning by being guided in the straight grooves a^2 and c^2, now finds in rear of the barrel in the receiver the recess c^1 at the right of its lower arm, and, under the continued forward pressure of the spring J, the breech-bolt is rotated, the lower arm of its head is turned to the right into the recess c^1, by the action of the studs h, h, in the spiral grooves g^1, g^1, the studs moving to the front ends of the grooves as they turn the breech-bolt, Figs. 1 & 5. In rear of the recess c^1 the receiver C has an inward projection c^3, Figs. 5 & 9, which forms a strong abutment against which the lower arm of the breech-bolt-head rests when in the recess c^1, and this abutment securely locks the head of the breech-bolt against rearward movement and rigidly supports it and confines the cartridge in the chamber of the barrel.

The support of the locked breech-bolt-head by the abutment c^3 while on one side only, is so closely in rear of and so nearly in line with the base of the cartridge that it alone would be strong enough to safely withstand any stress liable to be brought upon it by the firing of even excessive charges in the chamber of the barrel, but to further insure the absolute safety of the gun a support of the breech-bolt on the left side also has been provided. The breech-bolt-head has on each side a lateral projection g^4, the diameter of the outer edges of which is equal to the diameter of the cylindrical body of the breech-bolt and in the left-side of the receiver, in rear of the barrel, is a corresponding recess c^4 and an abutment in rear of it. The partial rotation of the breech-bolt by which the lower arm of its cross-head G^1 is turned into the recess c^1, turns the lateral projection g^4 on the left side of the head from above downward into the recess c^4, so that the head of the breech-bolt is locked and supported in both sides of the receiver.

In rear of the abutment c^3 is a passage c^6 in the right side of the receiver, Figs. 3, 3^a, 5, 5^a, & 9, which leads laterally and upward, the forward portion passing under an overhanging projection c^7 to the top of the right side wall of the inner frame which at this place is cut down in height and, when the inner frame is in its normal position in the casing, corresponds with the lower edge of the opening a^7 in the casing through which the cartridge cases are ejected from the gun. In Fig. 5^a the passage c^6 and the opening a^7 are clearly shown, and several cartridge-cases are represented in dotted lines to indicate the path of their ejection.

To prevent the cartridge held in the grasp of the head of the breech-bolt from being displaced by the rapid rotation of the breech-bolt, and to assist in holding the cartridge in the position for being thrust into the barrel, two small pistons g^6, g^6, may be set into the head of the breech-bolt to have a limited movement therein and to be yieldingly held forward by small spiral springs placed in rear of said pistons. The ends of the pistons project slightly from the face of the breech-bolt-head and press against the cartridge in its grasp. In Fig. 11 the front ends of the pistons are indicated, and Fig. 11^a shows the pistons g^6, g^6, and the springs as arranged in the breech-bolt-head.

In Fig. 5 the head of the breech-bolt is represented as locked in the forward firing position, with the lower arm turned to the right into the recess c^1 in front of the abutment c^3 and the lateral projection g^4 turned into the recess c^4.

The partial rotation of the breech-bolt on its axis turns the top of the cross-head G^1 to the left and causes

side being in the hinge-tube of the cover A^1, the recess on the left side in the inner surface of the button a^5 on the locking-pin a^4. The length of the pins s, s, is such that either their lower ends project into the cylinder R, when their upper ends are flush with the tops of their seats, or the upper ends of the pins project into the hinge and into the button a^5 respectively, when their lower ends clear the cylinder R.

When the cylinder R is pressed forward, the recesses therein move away from underneath the pins s, s, and these are locked in the raised position, in which the top of the pin in the left side stands in the recess in the button a^5 and positively locks it against being turned, until the cylinder R is returned to its normal position, and the recess therein allows the pin to yield to the movement of the button a^5. By raising the cover A^1 the right-hand pin is forced down into the cylinder R and locks it, until the recess in the hinge is returned to the top of the right pin by the closing of the cover, and the recess in the button to the top of the left pin by the locking of the cover.

On the under side of the casing A a sliding handle T is provided, a loop t extends upward from the handle through a longitudinal slot in the bottom of the casing to the lug C^1 on the inner frame, the loop t being hung upon a boss projecting from the front of the lug C^1; from the handle T a flat rod t^1 extends rearward into a corresponding opening in the base of the loop a^1 of the casing, the rod t^1 covers the slot in the bottom of the casing and serves to hold in place and to guide the handle T. By drawing the handle T rearward the inner frame, barrel and the breech-block may be brought to their rearmost position, and, when the handle is released, the return movement of the inner frame, by the re-action-spring F, also carries the handle forward. The automatic recoil of the inner frame does not affect the handle T, the opening in the loop t being large enough to allow the head e on the rod E, which normally stands in front of the loop t, to partly enter into it when the last of the recoil carries the rod E a short distance rearward, and at the end of the forward movement the head e and the rod E are returned forward by the boss on the lug C^1 reëntering into the loop t. By this arrangement the hand of the operator is protected against receiving the shock of recoil, even if it grasps the handle during the automatic operation of the gun.

From the foregoing description in detail of the construction of the several parts of the improved gun and their operations, the operation of the mechanism of the gun as a whole will be readily understood. Cartridges are supplied to the gun by passing the end of a loaded feed-belt from the left to the right side through the feed-channel D^1, the first cartridges in the feed-belt finding their seats in the grooves of the feed-wheel D. By then drawing rearward the handle T the inner frame, barrel and the breech-block firmly interlocked, and the rod E are carried to their rearmost position, in which the bolt-latch takes its hold upon the bolt-tube, and both the re-action-springs F and J are compressed, the parts being changed from the positions shown in Fig. 1 to those shown in Fig. 2, excepting that there is as yet no cartridge in the grasp of the breech-bolt in the receiver. The hammer L also is carried to its rearmost position by the lower firing-pin in the breech-bolt, the sear in the inner frame being kept away from the hammer by the lower stud h of the bolt-tube which remains in the same relative position in which it removes the sear from the path of the hammer. By the rearward movement of the barrel the feed-wheel is rotated and carries the feed-belt and the cartridges therein a part of a step into the feed-channel. On releasing the handle T the barrel and the inner frame are at once returned to their forward position by the re-action-spring F, the feed-wheel, being thereby rotated, carries the cartridges forward in the feed-channel to complete one step. The breech-bolt remaining interlocked with the barrel in the inner frame, the forward movement of the inner frame draws the breech-bolt forward, the bolt-tube, however, is firmly fixed in its rearmost position by the bolt-latch P which, as specified, cannot be depressed to release the bolt-tube even by the operation of the button R while the rod E remains at the rear, the forward movement of the breech-bolt, while the bolt-tube remains fixed, causes the breech-bolt to draw away from the bolt-tube, retracts the firing-pins and, by the action of the spiral grooves of the breech-bolt on the studs of the bolt-tube, partially rotates the breech-bolt and, turning its head in the inner frame, unlocks the breech-bolt from the barrel and inner frame, which thus released move forward and open the breech. The parts change from the positions shown in Fig. 2 to those shown in Fig. 3, and the studs h, h, of the bolt-tube are changed to the position near the rear end of the spiral grooves in the breech-bolt. The straight groove in the cover by which the head of the breech-bolt is guided, is at the proper place intersected by a spiral groove which allows the partial rotation. By the forward movement and partial rotation of the breech-bolt, which unlocks it and releases the inner frame, the shoulder of the firing-pin is laterally withdrawn from in front of the hammer, but a shoulder l^1 provided on the rear end of the hammer-tube stands in rear of the lower stud h, which thus keeps the hammer in its rearmost position. After the barrel, the inner frame, the handle T and the rod E have returned to their forward position, pressure upon the button R in the rear-plate will depress the bolt-latch and release the bolt-tube, and under the tension of the re-action-spring J, the breech-bolt and bolt-tube as a whole will be moved forward. During the first of their forward movement, by the action of the cam-pin and the top of the bolt-latch in the spiral grooves of the bolt-tube, the entire breech-block, breech-bolt and bolt-tube together, will be turned one-half of a revolution on its axis, from the right to the left side, the guide-grooves in the receiver and in the cover for the breech-bolt-head having corresponding spiral portions for the passage through them of the ends of the breech-bolt-head, and a similar spiral portion of the groove in rear in the cover allowing the studs h, h, of the bolt-tube to interchange positions. This semi-rotation of the bolt-tube withdraws the lower stud from in front of the shoulder l^1 on the rear end of the hammer and the hammer is moved forward by the main-spring until arrested in the full-cock position by the sear in the inner frame which enters the cock-notch. After interchanging by the semi-rotation the upper and lower parts, the breech-block as a whole continues its forward movement in the straight guide-grooves, until the breech-bolt-head is brought up

tube; but I prefer to provide the upper cam-pin and thus to utilize both the opposite sets of straight and spiral grooves for holding and for rotating the breech-block.

The breech-bolt is longitudinally interlocked with the bolt-tube by the studs *h*, *h*, in the spiral grooves g^1, g^1, and also by the firing-pins which are locked to the breech-bolt by the cross-pin and to the bolt-tube by their tails in the annular recess therein, and, therefore, the raised bolt-latch P prevents the breech-bolt as well as the bolt-tube from being returned forward, and keeps the re-action-spring J fully compressed in the bolt-tube.

The lower part of the bolt-latch P is bifurcated and a vertical slot in the rear-plate, below and in rear of the bolt-latch P, provides a seat for the bell-crank lever *p* pivotally mounted therein, the upper arm of the lever extends into a recess in the bolt-latch P while the lower lever-arm depends into an inclining hole cut through the rear-plate I. In this hole the cylinder R is seated, the checked end of which projects in rear in form of a push-button from the rear-plate in a convenient position to be operated by the thumb of the hand grasping the grip at the bottom of the rear-plate. In a recess in the upper side of the cylinder R the spiral-spring *r* is fitted, to rest in front against the depending arm of the lever *p*, and in rear against the end of the recess in the cylinder R, so that the tension of the spring *r* is exerted through the lever *p* to yieldingly hold the bolt-latch P in its raised position, and also to yieldingly keep the cylinder R in its rearmost position. The recess in the top of the cylinder R allows the cylinder to move forward without coming into contact with the lever *p*.

Between the cylinder R and the bolt-latch P an intermediate slide Q is provided in the vertical slot in the rear-plate, the straight top of the slide Q is T-shaped in cross-section, having a rib on each side, in the lower forward part of the cylinder R is a correspondingly T-shaped seat into which the slide Q is fitted. While the cylinder R is held and guided in the rear-plate with its axis inclining downward and forward, the T-shaped seat therein is horizontal, parallel to the axis of the gun, and guides the slide Q with its top parallel thereto. Forward of the cylinder R the slide Q extends through the bifurcated lower part of the bolt-latch P, through the vertical slot in which it passes, the upper part of the slot in the bolt-latch P is increased in width, the sides of the slot are recessed to form a T-shaped opening into which the slide Q fits, Figs. 1, 3 & 7. The ribs on the slide Q do not extend to the front of the slide, but terminate in the bolt-latch P, the forward ends of the ribs incline downward and rearward. Between the top of the T-shaped slot in the bolt-latch P and the top of the slide Q there is a considerable clearance, the shoulders at the bottom of the recesses in the sides of the slot in the bolt-latch P are inclined downward and rearward parallel to the ends of the ribs on the slide Q. In the normal position of these parts, Figs. 1 & 3, the inclined ends of the ribs of the slide Q rest upon the inclined bottoms of the recesses in the bolt-latch P, and if the cylinder R is moved forward and downward, as by pressure against its projecting rear-end, it carries down the slide Q, and this depresses the bolt-latch P, withdraws its top from the bolt-tube and releases the breech-block from its rearmost position, allowing it to be moved forward by the spring J. On releasing the cylinder R the spring *r* returns it to the rear and through the lever *p* raises the bolt-latch P into the path of the bolt-tube.

On its lower side the slide Q has a projection *q* which depends into a vertical recess in the rod E in the bottom of the casing, the projection *q* fills the recess longitudinally, but it is free to move vertically therein. When the rod E is moved to the forward position by the lug C^1 on the inner frame, the slide Q is carried forward by the rod until the inclined front ends of the ribs thereon rest against the inclined bottoms of the recess in the bolt-latch P, Figs. 1 & 3, in which position forward pressure upon the cylinder R will cause the resulting downward movement of the slide Q to be communicated to the bolt-latch P and to withdraw it out of the bolt-tube, thereby releasing the breech-block for forward movement. When, however, by the recoil of the breech-block, inner frame and barrel, the lug C^1 has carried the rod E rearward, Fig. 2, the rod carries the slide Q to the rear and the ribs thereon are brought so far to the rear that, when the slide Q is moved downward by forward pressure upon the cylinder R, the ribs do not come into contact with the bolt-latch P and do not draw it out of the bolt-tube; so that unless the barrel and inner frame are in their normal forward position the breech-block cannot be released by pressure upon the cylinder R. Moreover, if the cylinder R is kept continuously pressed forward and the slide Q is kept thereby in its lower position, the bolt-latch P is not drawn down but retains the breech-block as long as the rod E and the slide Q are in the rearward position; but when the last of the return movement of the barrel and inner frame to their forward position, under the pressure of the re-action-spring F, carries the rod E forward, the slide Q is carried forward by the rod and the ribs thereon are moved forward against the inclines in the bolt-latch and draw down the bolt-latch. The return of the barrel and inner frame to their normal position thus automatically releases the breech-block and controls the closing of the breech, whenever continuous pressure is exerted upon the cylinder R.

Fig. 8 illustrates the parts of a safety-device by which the cover of the casing is kept locked so that it cannot be released and opened while the button R is pressed forward; and by which the act of releasing and of opening the cover locks the button R and keeps it locked while the cover of the casing remains open. Through the rear-plate, adjacent to its rear face, two diagonal holes are bored which cross the seat of the cylinder R at substantially right-angles to each other and at 45 degrees to the vertical plane through the axis of the gun. In the upper part of each hole a pin *s* is loosely seated, the upper end of each pin is slightly reduced in diameter and the holes are correspondingly shouldered, so that after the pins are introduced from below into their seats and the cylinder R is placed in the rear-plate, the pins are free to move in their seats but cannot escape therefrom. The cylinder R has two slight recesses in its surface which correspond with the seats of the pins when the cylinder R is in the normal rearward position, and similar recesses correspond with the upper ends of the seats, the recess on the right

the upper section of the flange-way on its face to slide over the rear end of the top-most cartridge in the feed-belt on the feed-wheel, and the overhanging edges of the ribs to enter the groove in the cartridge-case and to grasp the head of the cartridge; the feed-wheel being locked against rotation to the left side, holds the cartridge in position to be grasped.

The head of the breech-bolt is provided with two firing-pins K, K, one in each of its arms, and so situated that only when the breech-bolt is turned and locked in the firing position are the firing-pins brought into the vertical plane through the axis of the barrel, and the lower firing-pin is brought into line with the cartridge in the chamber of the barrel; in all other positions of the breech-bolt, as the lower arm of the head in being unlocked is turned to the left side in the receiver, the firing-pin therein is carried laterally out of line with the cartridge in the barrel, thus positively preventing premature firing of the gun.

The firing-pins K, K, extend through the head of the breech-bolt and are held therein for a limited longitudinal movement by a cross-pin *k*, which running diagonally through the head G[1] from the top to the bottom, partially cuts through the seat of both firing-pins, these are correspondingly flattened, and the cross-pin passing between the resulting shoulders on the firing-pins, locks them in their seats, in the head of the breech-bolt. In Figs. 1 and 2 the shoulders on the lower firing-pin are exposed to view and a central portion of the diagonal cross-pin *k* is shown in section.

In rear of the head G[1] each firing-pin has an external shoulder k^1 and a rearward extension which is seated in a slot in the body of the breech-bolt and a tail of which projects inward into the bolt-tube, an annular recess in the bolt-tube near its front end being provided for the tails of the firing-pins, Figs. 1, 2 & 12. When the bolt-tube is in its forward position in the breech-bolt, the shoulders formed by the annular recess are not in contact with the firing-pins and these are free to be moved forward; but when the bolt-tube is moved rearward in the breech-bolt, the shoulder at the forward end of the annular recess in the bolt-tube is brought against the tails of the firing-pins and these are retracted, and their points withdrawn into the head G[1] of the breech-bolt.

Below the breech-bolt the hammer or striker L is arranged, the solid head at its front end resting in the groove c^5 in the bottom of the inner frame in which the lower stud *h* of the bolt-tube is guided during the last of the forward movement, the groove being deepened and extended forward to allow the hammer to move therein without interfering with the stud *h* above it, Figs. 6 & 12. From the head rearward the hammer forms a tube 1 in which the spiral main-spring M is seated on a guide-rod N, the rear end of which is supported in the rear-plate I of the casing, Fig. 12. On the right side of the hammer the sear O is pivoted on a vertical pin *o* in the inner frame and a spring o^1 presses the sharp inner rear corner of the sear into the cock-notch in the side of the hammer-tube 1 in rear of the head of the hammer. When the locked breech-bolt moves rearward the projecting shoulder k^1 of the lower firing-pin being in line with the hammer moves it rearward and compresses the main-spring M. During the return or forward movement of the breech-bolt and bolt-tube the hammer is retained in rear by the sear engaging the cock-notch, until the last of the forward movement of the bolt-tube turns and locks the breech-bolt and carries the lower stud *h* to the side of the sear O. The lower end of the stud *h* clears the hammer-tube, but the top of the sear projects above the hammer-tube and the rear corner of the sear turned inward into the cock-notch stands in the path of the stud *h*, which, in the last of its forward movement, engages this corner of the sear and turns the sear on its pivot out of the cock-notch, thereby releasing the hammer, which under the tension of the main-spring is thrown forward against the shoulder of the lower firing-pin.

Fig. 12 is a longitudinal section of the casing, inner frame and breech-bolt in the plane through the axis of the studs *h*, *h*, of the bolt-tube on the line 15—15 of Fig. 6, showing a section of the hammer and an elevation of the bolt-tube, Fig. 13 is a part-section of the inner frame, representing a top-view of the forward part of the hammer and of the sear, and a section of the stud *h*. In Fig. 14 a front end-view of the hammer, sear and stud *h* is shown. In each of these three figures the hammer, sear and stud are represented in the position they have when the stud *h* has turned the sear out of the cock-notch and released the hammer, but before the hammer has been thrown forward.

In the rear-plate I of the casing A the retainer or bolt-latch P is arranged, it consists of a cylindrical piston fitted for a limited movement in a vertical seat below the recess in the rear-plate occupied by the end of the bolt-tube in its rearmost position. The axis of the retainer P in its seat coincides with that of the piston and cam-pin *i* above the recess, and the upper end of the retainer P is reduced to a diameter equal to that of the cam-pin *i*, a small bell-crank lever *p*, pivoted in rear of the retainer yieldingly raises it into the recess. As the two sets of straight and spiral grooves in the bolt-tube are on opposite sides thereof, the end of the retainer P, enters and operates in the lower grooves at the same time and with the same result as does the cam-pin *i* in the upper grooves; the semi-rotation of the bolt-tube during the first of its forward movement interchanges the opposite grooves so as to be alternately engaged by the cam-pin *i* and the retainer P. While the retainer P thus operates in the grooves as an opposite duplicate of the cam-pin *i*, it also performs another important independent function. The reduced top of the retainer P is longer than the cam-pin *i*, a bevel on its front side allowing it to enter the lower groove in the bolt-tube, and while the cam-pin *i* cannot project into the bolt-tube beyond the depth of the grooves h^1 and h^3, the longer top of the retainer, at the end of the rearward movement of the bolt-tube, enters the hole h^2 in front of the lower straight groove h^1 in the bolt-tube, and, projecting into it beyond the depth of the spiral groove h^3, the retainer P locks the bolt-tube against longitudinal and rotary movements, and retains the bolt-tube in its rearmost position, Figs. 2, 3 & 7. The retainer or bolt-latch P when fully raised operates to hold the bolt-tube retracted, and when drawn down it engages the grooves in the bolt-tube and operates in them as a duplicate cam-pin; in fact, the upper cam-pin *i* may be entirely dispensed with, and the bolt latch P alone may be depended on to perform the function of the cam-pin in the grooves of the bolt-

against the barrel, when, by the last of the forward movement of the bolt-tube, the head of the breech-bolt is turned into the locking recesses in the receiver and securely locked to the barrel, by the action of the studs in the spiral grooves of the breech-bolt. The locking movement causes the breech-bolt-head to grasp the topmost cartridge on the feed-wheel, and finally releases the hammer from the sear. On drawing the handle T once more to the rear, the parts are again retracted, but now the head of the breech-bolt having grasped the topmost cartridge on the feed-wheel, on moving rearward draws this cartridge out of the feed-belt into the receiver, Fig. 2. After completing the rearward movement, the barrel and inner frame are at once returned forward, the breech-bolt being partially rotated and unlocked during the first of their return movement, is retained until released by the operation of the button R. The released breech-block moves forward and, being turned through a semi-rotation, the upper part of the breech-bolt-head is carried down, the cartridge in its grasp is thereby brought into line with the chamber of the barrel, and by the completed forward movement of the breech-bolt is thrust into the chamber and confined therein by the locking of the breech-bolt in the inner frame. The last of the locking movement of the breech-bolt automatically releases the hammer which striking against the firing-pin explodes the cartridge in the barrel. The pressure of the powder-gases generated by the explosion causes the breech-block, inner frame and barrel to recoil, and automatically performs the same operations which were before manually performed, with the addition that the lower part of the breech-bolt-head now extracts the empty cartridge-case from the chamber of the barrel, while the upper part draws the next cartridge from the feed-belt into the receiver. On the forward movement of the breech-block, after the return forward of the barrel and inner frame, the rapid semi-rotation of the breech-block by which the cartridge is carried into line with the barrel, carries the empty cartridge-case laterally to the right and upward under the overhanging projection c^7 into the passage c^6 in rear of the abutment in the receiver and through it into the exit in the right side of the casing, and ejects it from the gun. The overhanging projection c^7 standing radially inside of the path of the cartridge-case in which the same is carried upward and forward by the semi-rotation and forward movement of the breech-bolt, it insures the entrance of the forward end of the cartridge-case into the passage c^6; and the lateral projections g^4, g^4, on the breech-bolt-head extending in front as well as radially into the path of the cartridge-head in the flange-way on the face of the breech-bolt, one of these projections alternately imparts to the head of the cartridge-case a final, rapid upward impulse which carries the case upward into the passage c^6 and causes it to impinge against the closed top of the passage, by which the cartridge-case is reflected and ejected through the exit a^7 in the casing. These operations are repeated so long as cartridges are supplied to the gun, and by retaining the button R in its forward position a number of shots are fired in rapid succession, while single shots will be fired if the button is pressed forward and at once released.

The hammer being automatically released by the last of the locking movement of the breech-block, the gun does not require a trigger, in the generally accepted sense of this term, but the button R positively controls the firing of the gun.

When by continued firing the barrel has become heated and the firing is at will interrupted by the release of the button R, the breech of the gun remains fully open, in the most favorable position for the cooling of the barrel, and the cartridge in the receiver is held in a position out of line with the barrel and so far in rear of it that its charge cannot be ignited by heat transmitted to it, making unintentional firing impossible. By pressing upon the button R the operations and firing of the gun may be at once recommenced.

It is evident that in carrying out the invention some changes from the construction herein described and shown may be made, and also that one or more of the several features of the improvements as described herein may be embodied in other forms of fire-arms so far as applicable. I, therefore, do not limit myself to the exact construction shown and described, but hold myself at liberty to make such departures therefrom as fairly fall within the spirit and scope of my invention.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. The combination of the casing having longitudinal upper and lower guide-grooves, the barrel and its receiver having a guide-lug which enters the lower groove in the casing and a guide-groove opposite to the upper guide-groove in the casing, and the breech-bolt adapted to slide in the said receiver and having a cross-head projecting upward into the upper guide-groove in the casing and downward into the guide-groove in the receiver, by which the receiver and the breech-bolt are both kept in and guided by the grooves in the casing and mutually support each other.

2. In a machine-gun, the combination of the casing, the barrel and its receiver and means for moving the same lengthwise through the casing, a cartridge-feeding device for moving cartridges transversely into line with and above the barrel, the breech-bolt arranged for reciprocating and rotary movements in the receiver and having a cross-head projecting upward above the barrel and the receiver, and downward to the rear of the barrel, and adapted to grasp the cartridge in the feeding device and the cartridge in the barrel, connections whereby the movements of the barrel operate the cartridge-feeding device, means for unlocking the breech-bolt from the barrel and receiver, for retaining it during their forward movement and for releasing the breech-bolt on their return forward, and means for returning the breech-bolt forward, and during its forward movement to turn the breech-bolt through a semi-rotation, and after its return forward to lock the breech-bolt to the barrel by a partial rotation, substantially as and for the purpose specified.

3. In a breech-loading gun, a breech-bolt having a transversely projecting cross-head, provided with a firing-pin in each of the arms thereof, and a bolt-tube movably mounted in said breech-bolt.

4. In a breech-loading gun, a breech-bolt having a transversely projecting cross-head, and provided on the face thereof with opposite sections of a flange-way adapted to grasp the heads of cartridges, and a bolt-tube movably mounted in said breech-bolt.

5. In a breech-loading gun, a breech-bolt having a transversely projecting cross-head carrying a firing-pin in each of the arms thereof and provided on its face with opposite sections of a flange-way adapted to grasp and to hold cartridges, and a bolt-tube movably mounted in said breech-bolt.

6. In a breech-loading gun, the combination of the breech-bolt having a transversely projecting cross-head and carrying a firing-pin locked for a limited movement in each of the arms thereof, and the bolt-tube movably mount-

ed in the said breech-bolt and having an annular shoulder, the said firing-pins constructed with inward projections in rear of the said shoulder, whereby the breech-bolt and the bolt-tube are interlocked, and the firing-pins are retracted by the relatively rearward movement of the bolt-tube, substantially as described.

7. In a breech-loading fire-arm, the combination of the casing, the barrel and the receiver, and the breech-bolt having the transversely projecting cross-head carrying a firing-pin in each of the arms thereof, and provided on its face with opposite sections of an annular flange-way, the casing and the receiver constructed for holding and guiding the breech-bolt for reciprocating and rotary movements, with the axis of the breech-bolt eccentric to that of the barrel, whereby the axis of either of the said firing-pins may be alined with the axis of the barrel, and one of the sections of the flange-way will be moved to grasp the cartridge in the barrel by a partial rotation of the breech-bolt.

8. In a machine-gun, the combination of the casing, the barrel and the receiver, a cartridge-feeder or magazine holding a cartridge above and parallel with the barrel, and the breech-bolt having the transversely projecting cross-head carrying a firing-pin in each of the arms thereof and provided on its face with opposite sections of an annular flange-way, the casing and the receiver for holding and guiding the breech-bolt for reciprocating and rotary movements, with the axis of the breech-bolt eccentric to that of the barrel, whereby the axis of either of the said firing-pins may be alined with the axis of the barrel, and the said sections of the flange-way will be moved to grasp the cartridge in the said magazine and that in the barrel, by a partial rotation of the breech-bolt.

9. In a breech-loading fire-arm, the combination of the casing, the barrel and its receiver, and the breech-bolt arranged for reciprocating and rotary movements in the receiver and having a transversely projecting cross-head, guide-grooves in the casing and in the receiver for the opposite arms of the said cross-head, whereby the breech-bolt is adapted, on being moved forward and rotated, to interchange the arms of said cross-head relatively to the said grooves and to the barrel.

10. In a breech-loading fire-arm, the combination of the barrel and its receiver and the breech-bolt arranged for reciprocating and rotary movements in the receiver and having a transversely projecting cross-head, a guide-groove in the receiver for an arm of said cross-head, whereby the breech-bolt is adapted, on being moved forward and rotated, to interchange the arms of the cross-head relatively to their position to the barrel.

11. In a breech-loading gun, the combination of the casing, the barrel and its receiver and the breech-bolt arranged for reciprocating and rotary movements in the receiver, and having a transversely projecting cross-head, guide-grooves in the casing and in the receiver for the arms of the said cross-head, and an abutment in the receiver, whereby the breech-bolt is adapted on having forward and rotary movement imparted to it, to interchange the arms of the said cross-head relatively to the barrel, and, at the end of the forward movement, to be locked to the barrel by the turning of the arm in the receiver in front of the said abutment.

12. In a breech-loading fire-arm, the combination of the casing, the barrel and its receiver and the breech-bolt arranged for reciprocating and rotary movements in the receiver and having a transversely projecting cross-head carrying lateral projections and a central pivot, guide-grooves in the casing and in the receiver for the arms of the said cross-head, a pivot-seat above the barrel and abutments in rear of it in the receiver, whereby the breech-bolt is adapted, on having forward and rotary movement imparted to it, to interchange the arms of the said cross-head relatively to the barrel, and at the end of the forward movement to be locked to the barrel by the pivot entering the said seat and by the lower arm of the cross-head and a lateral projection thereon being turned in front of the said abutments on both sides of the receiver.

13. In a machine-gun, the combination of the casing, the barrel and its receiver, and means for moving the barrel and receiver lengthwise through the casing, the breech-bolt arranged for reciprocating and rotary movements in the receiver and provided with a transversely projecting cross-head and with cam-grooves, the bolt-tube in the breech-bolt and extending therefrom, studs on the bolt-tube projecting through the said cam-grooves, and opposite straight and spiral grooves in the said bolt-tube, guide-grooves in the casing and in the receiver for the arms of the said cross-head and for the studs of the bolt-tube, and an abutment in the receiver, a spring-pressed cam-pin and bolt-latch held in the casing in the path of the bolt-tube, a spring for moving the bolt-tube forward and a controller for releasing the said bolt-latch from the bolt-tube, whereby during the rearward movement of the barrel and receiver the breech-bolt remains locked thereto, on their forward movement the breech-bolt is unlocked and retained to open the breech, and on their return forward the breech-bolt is released and returned forward, during its forward movement the arms of the cross-head are interchanged relatively to the barrel, and at the end of its forward movement the breech-bolt is locked to the barrel by an arm of the cross-head being turned in front of the abutment.

14. In a machine-gun, the combination of the casing, the barrel and the receiver, and means for moving the same lengthwise through the casing, the breech-bolt having the transversely projecting cross-head and the cam-grooves, and the bolt-tube having radial studs projecting through the cam-grooves, guide-grooves in the casing and in the receiver for the arms of the cross-head and for the said studs, a locking-recess in the receiver for an arm of the cross-head, and means for moving the said bolt-tube lengthwise in the receiver, a bolt-latch engaging the bolt-tube to hold it retracted, a bolt-latch-controller, and operating connections between the bolt-latch and the receiver, whereby, when said controller is kept in operative position, the forward movement of the receiver releases the bolt-latch, substantially as described.

15. In a machine-gun, the combination of the casing, the barrel and the receiver and means for moving the same lengthwise through the casing, the breech-bolt having the transversely projecting cross-head and having the cam-grooves, the bolt-tube having the radial studs projecting through the said cam-grooves and having the opposite straight grooves and spiral grooves, guide-grooves in the casing and in the receiver for the arms of the cross-head and for the said studs, the locking-recess and the abutment in the receiver, and means for moving the bolt-tube lengthwise through the receiver, the spring-pressed combined cam-pin and bolt-latch in the casing, the said bolt-latch engaging the bolt-tube to hold it retracted, a bolt-latch-controller, and operating connections between the bolt-latch and the receiver, whereby, when said controller is kept in operative position, the forward movement of the receiver releases the bolt-latch and adapts the same to operate as a cam-pin in the grooves of the bolt-tube, substantially as described.

16. In a machine-gun, the combination of the casing, the barrel and the receiver and means for moving the same lengthwise through the casing, the breech-bolt having the transversely projecting cross-head and having the cam-grooves and the firing-pin in each arm of the cross-head, the bolt-tube having the radial studs projecting through the said cam-grooves, and having the opposite straight grooves and spiral grooves, guide-grooves in the casing and in the receiver for the arms of the cross-head and for the said studs, the locking-recess in the receiver, and means for moving the bolt-tube lengthwise through the receiver, the spring-pressed combined bolt-latch and cam-pin in the casing to engage the said bolt-tube and hold it retracted, and on the release of the bolt-latch to operate in the grooves of the said bolt-tube, and means to release the bolt-latch whereby during the forward movement of the said breech-bolt and bolt-tube the arms of the said cross-head and the firing-pins therein are interchanged relatively to the barrel, and at the end of the forward movement an arm of the cross-head is turned into the locking-recess in the receiver and the firing-pin in the said arm is alined with the axis of the barrel, substantially as described.

17. In a machine-gun, the combination of the casing, the

barrel and the receiver, and means for moving the same lengthwise through the casing, the breech-bolt having the transversely projecting cross-head and having the cam-grooves, and carrying a firing-pin in each arm of the cross-head, the bolt-tube having the radial studs projecting through the said cam-grooves and having the opposite straight grooves and spiral grooves, and means for moving the bolt-tube through the receiver, guide-grooves in the casing and in the receiver for the arms of the cross-head and for the said studs, the locking-recess in the receiver, and means for moving the bolt-tube lengthwise through the receiver, the spring-pressed bolt-latch and cam-pin in the casing and means to release the bolt-latch, the hammer and the main-spring mounted in the casing and in the receiver in alinement with the axis of the barrel, the spring-pressed sear pivoted in the receiver, whereby during the rearward movement of the bolt-tube and the breech-bolt the hammer is retracted, during the forward movement of the breech-bolt the arms of the cross-head are interchanged, the hammer is kept retracted by the sear, and the firing-pin is kept out of alinement with the hammer, and at the end of the forward movement of the bolt-tube the breech-bolt is locked, the firing-pin is carried into alinement with the hammer and the sear is operated to release the hammer, substantially as described.

18. In a machine-gun, the combination of the casing, the barrel and the receiver, the breech-bolt arranged for reciprocating and rotary movements in the receiver, having a transversely projecting cross-head carrying a firing-pin in each of the arms thereof, and the cam-grooves in the breech-bolt, the bolt-tube having the radial studs projecting through the said cam-grooves, guide-grooves in the casing and in the receiver for the arms of the cross-head and for the said studs, and the locking-recess in the receiver, whereby forward movement imparted to the bolt-tube will move the breech-bolt forward and keep the firing-pin in the lower arm of the cross-head out of alinement with the axis of the barrel, and the last of the forward movement of the bolt-tube will turn the said arm of the cross-head into the locking recess and carry the firing-pin therein into alinement with the axis of the barrel, substantially as described.

19. In a machine-gun, the combination of the casing, the barrel and the receiver, the breech-bolt having the transversely projecting cross-head carrying a firing-pin in each of the arms thereof, and the cam-grooves in the breech-bolt, the bolt-tube having the radial studs projecting through the said cam-grooves, and means for moving the bolt-tube lengthwise through the receiver, guide-grooves in the casing and in the receiver for the arms of the cross-head and for the said studs, and the locking recess in the receiver, the hammer and the main-spring mounted in the casing and in the receiver in alinement with the axis of the barrel, and the spring-pressed sear pivoted in the receiver, whereby, during the rearward movement of the bolt-tube and the breech-bolt the hammer is retracted, and during the forward movement of the breech-bolt the hammer is kept retracted by the sear, and at the end of the forward movement of the bolt-tube the breech-bolt is locked, the firing-pin is carried into alinement with the hammer and the sear is moved to release the hammer, substantially as specified.

20. In a machine-gun, the combination of the casing, the barrel and the receiver and means for moving the same lengthwise in the casing, the breech-bolt having the transversely projecting cross-head and the cam-grooves, and the bolt-tube having the radial studs projecting through the cam-grooves, guide-grooves in the casing and in the receiver for the cross-head and for the said studs, the locking-recess in the receiver and means for moving the bolt-tube lengthwise in the receiver, the bolt-latch engaging the bolt-tube to hold it retracted, the controller-button and the spring connected with it and with the bolt-latch and yieldingly holding the latch and the button in their normal positions, the intermediate slide carried and guided in the controller-button and extending into the bolt-latch, whereby the forward movement of the controller-button releases the bolt-latch, substantially as and for the purpose described.

21. In a machine-gun, the combination of the casing, the barrel and the receiver, and means for moving the same lengthwise through the casing, the breech-bolt having the transversely projecting cross-head and the cam-grooves, and the bolt-tube having the radial studs projecting through the cam-grooves, guide-grooves in the casing and in the receiver for the cross-head and for the said studs, the locking-recess in the receiver, and means for moving the bolt-tube lengthwise in the receiver, the bolt-latch engaging the bolt-tube to hold it retracted, the controller-button and the spring connected with it and with the bolt-latch, the intermediate slide carried and guided in the controller-button and extending into the bolt-latch, and operating connections between the intermediate slide and the receiver, whereby, when the controller-button is held in its forward, operative position, the forward movement of the receiver releases the bolt-latch and the rearward movement of the receiver retracts the intermediate slide to prevent the release of the bolt-latch, substantially as specified.

22. In a machine-gun, the combination of the casing, the barrel and the receiver, the handle for moving the same rearward, and the spring for moving the same forward in the casing, the shouldered rod in the casing and the lug on the receiver clasping the rod, the breech-bolt having the transversely projecting cross-head and the cam-grooves, and the bolt-tube having the radial studs projecting through the said cam-grooves, guide-grooves in the casing and in the receiver for the cross-head and for the said studs, the locking-recess in the receiver, and the spring for moving the bolt-tube forward in the receiver, the bolt-latch engaging the bolt-tube to hold it retracted, the controller-button and the spring connected with it and with the bolt-latch, the intermediate slide carried and guided in the controller-button and extending into the bolt-latch and into the shouldered rod, whereby, when the controller-button is held in its operative, forward position, the forward movement of the receiver releases the bolt-latch, and the rearward movement of the receiver retracts the intermediate slide and prevents the release of the bolt-latch, substantially as specified.

23. In a machine-gun, the casing having the cover attached to its sides and means for locking it in the closed position, the barrel, the receiver and the breech-block in the casing, and means for reciprocating the breech-block in the receiver, the bolt-latch engaging the breech-block and holding it retracted, and the controller-button for releasing the bolt-latch, the safety-device in the casing between the cover and the controller-button, whereby operation of the controller-button keeps the cover locked, the unlocking of the cover locks the controller-button against operation and the opening of the cover keeps the controller-button locked, all combined and substantially as described.

24. In a breech-loading gun, the combination of the casing having the movably attached cover carrying the rod and the turn-button for locking it in closed position, the barrel, the receiver, and the reciprocating breech-block, the bolt-latch for holding the breech-block retracted, and the thumb-piece for releasing the bolt-latch, the recesses in the cover, in the turn-button and in the thumb-piece, and the pins in the casing between the said recesses, whereby the operation of the thumb-piece keeps the cover locked, and the operation of the turn-button locks the thumb-piece, and the opening of the cover keeps the thumb-piece locked.

25. In a recoil-operated gun, the combination of the casing and the cover constructed to inclose the recoiling members of the breech-mechanism, means for locking and for releasing the said cover, springs for returning the recoiled members of the breech-mechanism forward in the casing, a latch for holding the breech-mechanism open and the controller for releasing the said latch, operating connections between the controller and the cover, whereby the unlocking and opening of the said cover locks and keeps locked the controller against operation, and the operation of the controller keeps the cover closed and locked, substantially as described.

26. In a recoil-operated gun, the combination of the casing, the recoiling barrel and its receiver, breech-bolt and bolt-tube, the casing and the receiver constructed to form the seat for the breech-bolt in its lengthwise and rotary

movements, the breech-bolt having a transversely projecting cross-head and cam-grooves, and the bolt-tube having radial studs projecting through the cam-grooves, guide-grooves in the casing and in the receiver for the arms of the cross-head and for the said studs, a locking-recess in the receiver, separate springs for moving the barrel and the bolt-tube, the bolt-latch for holding the bolt-tube retracted, the bolt-latch-controller, and operating connections between the bolt-latch and the receiver, whereby, when said controller is kept in operative position, the forward movement of the barrel releases the bolt-latch, all substantially as described.

27. In recoil-operated gun, the combination of the casing having a longitudinal recess, the recoiling barrel and receiver, breech-bolt and bolt-tube, the receiver having a lug guided in the said recess, and the casing and the receiver constructed to form the seat for the breech-bolt in its lengthwise and rotary movements, the breech-bolt having the transversely projecting cross-head and the cam-grooves, and the bolt-tube having radial studs projecting through the cam-grooves, guide-grooves in the casing and in the receiver for the arms of the cross-head and for the said studs, a locking-recess in the receiver, a spring in the said recess in the casing for moving the barrel and a shouldered rod clasped by the said lug, a spring for moving the bolt-tube, the bolt-latch in the casing for holding bolt-tube retracted, the bolt-latch controller, and an intermediate slide between the bolt-latch and the said rod, whereby, when said controller is kept in operative position, the forward movement of the receiver releases the bolt-latch, substantially as specified.

28. In a recoil-operated gun, the combination of the casing, the recoiling barrel and receiver, breech-bolt and bolt-tube, a cartridge-feed in the casing operated by the movements of the barrel to hold a cartridge above and alined with the barrel, the breech-bolt having the transversely projecting cross-head and the cam-grooves, and provided on its face with opposite sections of a flange-way, the bolt-tube having the radial studs projecting through the said cam-grooves, and having the opposite straight grooves and spiral grooves, the guide-grooves in the casing, and in the receiver for the arms of the cross-head and for the said studs, the locking-recess and abutment, the overhanging rearward extension, the lateral passage in the receiver and the exit in the casing, separate springs for moving the barrel and receiver and the bolt-tube forward, the spring-pressed bolt-latch and cam-pin in the casing, and the controller for releasing the said bolt-latch, whereby the barrel and receiver after recoiling are returned forward, the bolt-tube is held retracted, the breech-bolt is unlocked and retained, extracting the cartridge from the said cartridge-feed and the cartridge-case from the barrel, and, on the release of the said bolt-latch, the breech-bolt and the bolt-tube are moved forward and rotated, alining the cartridge with the bore of the barrel and ejecting the cartridge-case through the exit, and at the end of the forward movement the breech-bolt is locked in the receiver, the said sections of the flange-way holding the cartridge in the barrel and engaging the cartridge in the cartridge-feed, substantially as specified.

29. In a recoil-operated gun, the combination of the casing, the recoiling barrel and receiver, breech-bolt and bolt-tube, the cartridge-feed-wheel in the casing operated by the movements of the barrel to hold a cartridge above and alined with the barrel, the breech-bolt having the transversely projecting cross-head and the cam-grooves, and provided on its face with opposite sections of a flange-way for engaging cartridges and carrying a firing-pin in each arm of the cross-head, the bolt-tube connected with the said firing-pins and having radial studs projecting through the said cam-grooves and having the opposite straight grooves and spiral grooves, the guide-grooves in the casing and in the receiver for the cross-head and for the said studs, the locking recess and the ejecting passage in the receiver and the exit in the casing, the hammer and main-spring mounted in the casing and in the receiver, and the spring-pressed sear pivoted in the receiver, separate springs for moving the barrel and receiver and the bolt-tube forward, the spring-pressed cam-pin and the bolt-latch in the casing and the controller for releasing the bolt-latch, a handle for moving the barrel and receiver, whereby the barrel and receiver, breech-bolt and bolt-tube are moved rearward interlocked, the barrel and receiver are returned forward, the bolt-tube is held retracted, the hammer is cocked, and the breech-bolt is unlocked and retained, extracting the cartridge from the feed-wheel and the cartridge-case from the barrel, and on the release of the bolt-latch the breech-bolt and bolt-tube are returned forward, ejecting the cartridge-case and moving the cartridge into the barrel, and, at the end of the forward movement, the breech-bolt is locked and the hammer released, substantially as specified.

30. In a recoil-operated gun, the combination of the casing, the recoiling barrel and receiver, breech-bolt and bolt-tube, the cartridge-feed-wheel in the casing operated by the movements of the barrel to hold a cartridge above and alined with the barrel, the breech-bolt having the cross-head and cam-grooves, and provided on its face with sections of a flange-way for engaging cartridges, and carrying a firing-pin in each arm of the cross-head, the bolt-tube having radial studs projecting through the said cam-grooves and having the opposite straight grooves and spiral grooves, the casing having a recess and the receiver having a lug guided in the said recess, the casing and the receiver having guide-grooves for the cross-head and for the said studs, the locking-recess, the overhang and the passage in the receiver and the exit in the casing for the ejection of cartridge-cases, the hammer and main-spring mounted in the casing and in the receiver, and the spring-pressed sear pivoted in the receiver, a spring for moving the barrel and receiver forward, and a spring for moving the bolt-tube forward, the spring-pressed 'cam-pin' and bolt-latch for guiding and for rotating the bolt-tube and for holding the same retracted, and a controller for releasing the bolt-tube, a shouldered rod moved by the movements of the receiver to control the movement of the feed-wheel, and connected with the bolt-latch and controller to prevent the release of the bolt-latch by the controller unless the barrel and receiver are in the forward position, and to release the bolt-latch by the forward movement of the receiver, substantially as and for the purpose specified.

31. In a machine-gun, the combination, with the reciprocating barrel, of a reciprocating and rotating breech-mechanism, a firing-mechanism, and a manually operable controller to determine the successive operations of said breech-mechanism and of said firing-mechanism, substantially as described.

32. In a machine-gun, the combination of the reciprocating barrel and breech-block, the firing-mechanism operable by the breech-block, a latch to engage and to hold the said breech-block and a manually operable controller for operating said latch to release said breech-block, and to effect the operation of said firing-mechanism, substantially as specified.

33. In a machine-gun, the combination, with the reciprocating barrel, of a reciprocating and rotating breech-block, a firing-mechanism, a latch to engage and retain said breech-block, and a manually operable controller for moving said latch to release said breech-block and to effect the operation of the firing-mechanism, substantially as specified.

34. In a machine-gun, the combination, with the reciprocating barrel, of the reciprocating breech-mechanism, comprising the rotating breech-bolt and the rotating bolt-tube, firing-mechanism operated by the breech-mechanism, and a manually operable controller to determine the operation of said breech-mechanism, and the operation of the firing-mechanism, substantially as described.

35. In a machine-gun, the combination, with the reciprocating barrel, of the reciprocating and rotating breech-bolt, the reciprocating and rotating bolt-tube movably mounted in said breech-bolt, firing-mechanism operable solely by the movements of said breech-bolt and bolt-tube, and a manually operable controller to determine the successive operations of said breech-bolt and bolt-tube, and of said firing-mechanism, substantially as specified.

36. In a machine-gun, the combination of the reciprocating breech-block carrying a plurality of firing-pins, the firing-mechanism operated by the breech-block to actuate in succession each of said firing-pins, and a manually op-

erable controller to determine the operation of said breech-block, substantially as described.

37. In a machine-gun, the combination of the reciprocating breech-block, provided with a plurality of firing-pins, the firing-mechanism operated by the breech-block to actuate in succession each of said firing-pins, a latch to engage and hold said breech-block, and a manually operable controller for said latch, substantially as specified.

38. In a machine-gun in combination with the reciprocating breech-block having a transversely projecting crosshead and carrying a firing-pin in each of the arms thereof, the firing-mechanism operated by the breech-block to actuate in succession each of said firing-pins, and a manually operable controller to determine the operation of said breech-block, substantially as described.

39. In a machine-gun, in combination with the reciprocating breech-block having a transversely projecting crosshead and carrying a firing-pin in each of the arms thereof, the firing-mechanism operated by the breech-block to actuate in succession each of the said firing-pins, a latch to engage and hold said breech-block, and a manually operable controller for said latch, substantially as specified.

40. In a machine-gun, the combination of a reciprocating barrel, cartridge-feeding mechanism operated by the reciprocation of the barrel, a receiver carried by the barrel, a breech-block mounted to reciprocate in said receiver, and a connector between the cartridge-feeding mechanism and said receiver, operated by the movements of said receiver to limit the movement of said feeding mechanism in one direction and to prevent movement of the same in the opposite direction, substantially as described.

41. In a machine-gun, the combination of the casing, the barrel mounted for reciprocation in the casing, cartridge-feeding mechanism operated by the reciprocation of the barrel, a receiver carried by the barrel, a breech-block mounted to reciprocate in said receiver, and a connector located in the casing, operated by the movements of the receiver, and provided with projections engaging said feeding mechanism, to limit the movement of the same in one direction and to prevent movement of the same in the opposite direction, substantially as specified.

42. In a machine-gun, the combination of a casing, a movable cover therefor, a reciprocating breech-mechanism, and a safety-device to prevent operation of said breech-mechanism, and operated by the closing of said cover to release said breech-mechanism for operation, substantially as described.

43. In a machine-gun, the combination of a casing, a movable cover therefor, a reciprocating breech-mechanism, a manually operable controller to determine the operation of said breech-mechanism, and a safety-device to prevent operation of said controller, and operated by the closing of said cover to release said controller, substantially as specified.

44. In a machine-gun, the combination of a casing, the movable cover therefor, a reciprocating breech-block, a latch to engage and hold said breech-block, a manually operable controller for said latch, and a safety-device to prevent operation of said controller and operated by the closing of said cover to release said controller, substantially as described.

45. In a machine-gun, the combination of a casing, a movable cover therefor, a locking-device for said cover, a reciprocating breech-mechanism, and a safety-device to prevent operation of said breech-mechanism, and operated by the locking of said cover to release said breech-mechanism for operation, substantially as described.

46. In a machine-gun, the combination of a casing, a movable cover therefor, a locking-device for said cover, a reciprocating breech-mechanism, a manually operable controller to determine the operation of said breech-mechanism, and a safety-device to prevent operation of said controller, and operated by the locking of said cover to release said controller, substantially as specified.

47. In a machine-gun, the combination of a casing, a movable cover therefor, a locking-device for said cover, a reciprocating breech-block, a latch to engage and hold said breech-block, a manually operable controller for said latch, and a safety-device to prevent operation of said controller, and operated by the locking of said cover to release said controller, substantially as specified.

48. In a machine-gun, the combination of the casing, the recoiling barrel and receiver, the reciprocating breech-block, means for rotating said breech-block to lock the same in the receiver, firing-mechanism cocked by the reciprocation and released by the rotation of the said breech-block, a latch to engage and hold said breech-block, and a manually operable controller for said latch, substantially as specified.

This specification signed and witnessed this twenty-ninth day of October, A. D. 1904.

MORTIMER L. BRISTOL.

In the presence of—
C. J. EHBETS,
K. POWERS.