

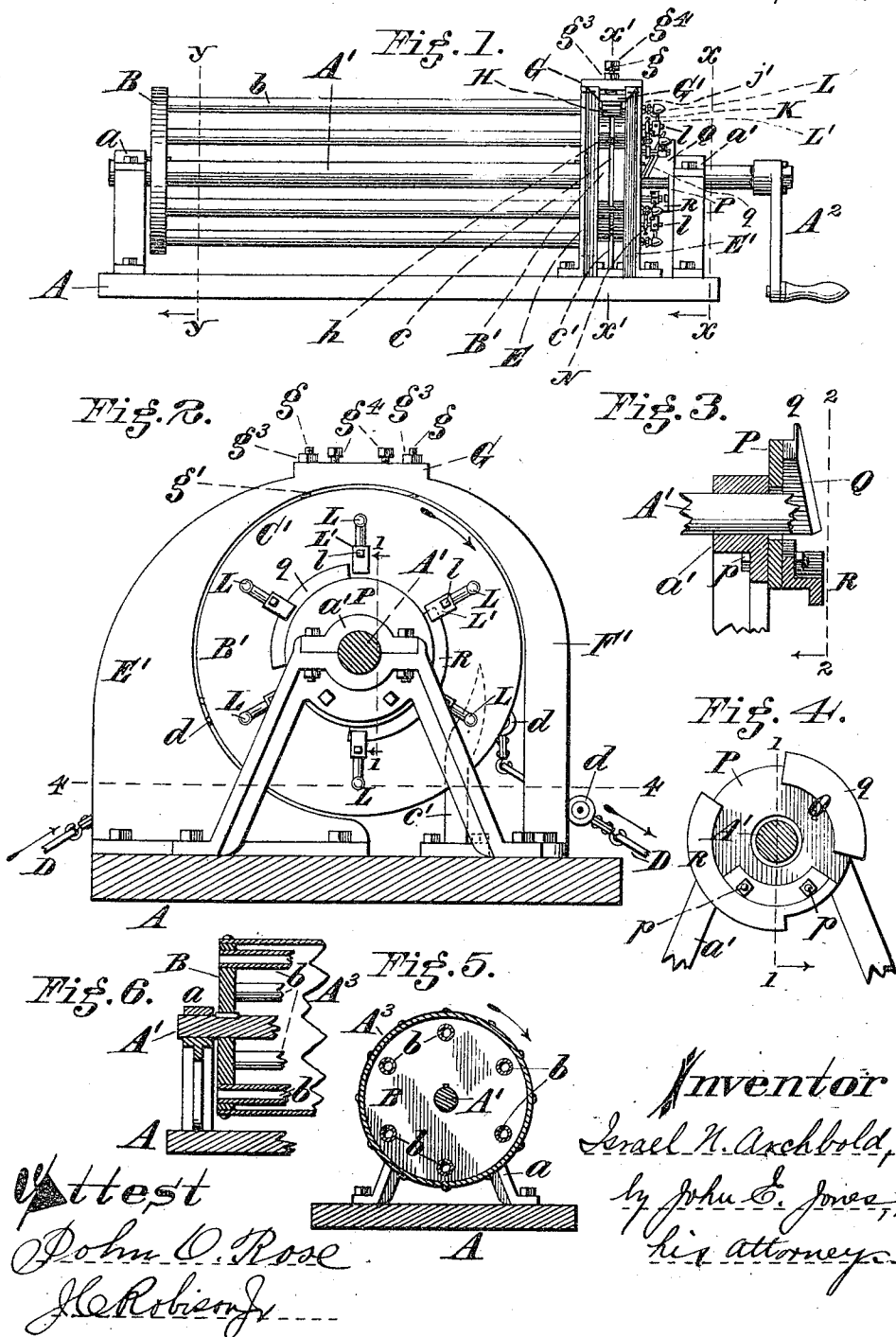
(No Model.)

I. N. ARCHBOLD.
MACHINE GUN.

3 Sheets—Sheet 1.

No. 476,590.

Patented June 7, 1892.



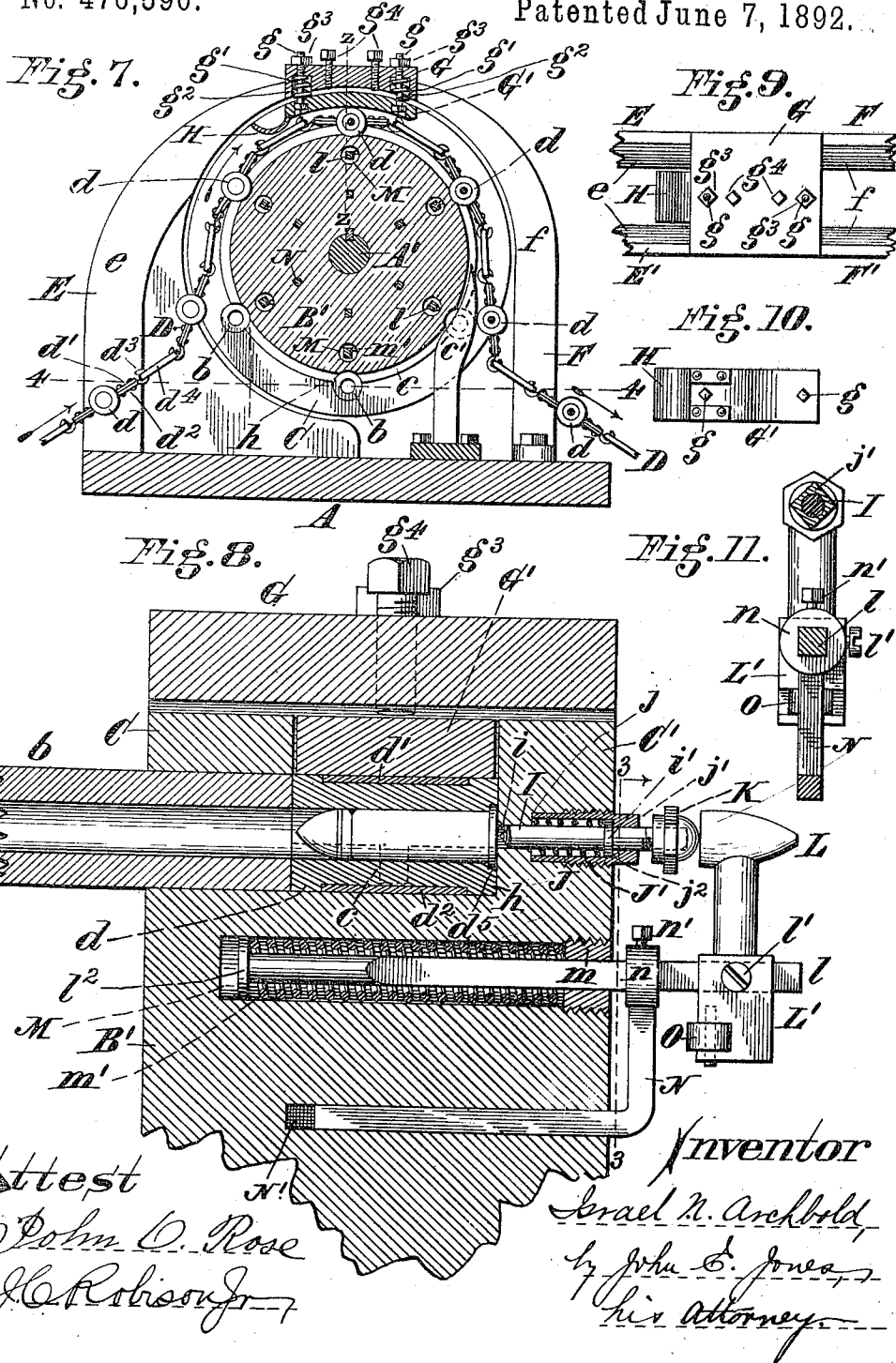
(No Model.)

I. N. ARCHBOLD.
MACHINE GUN.

3 Sheets—Sheet 2.

No. 476,590.

Patented June 7, 1892.



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Fig. 12.

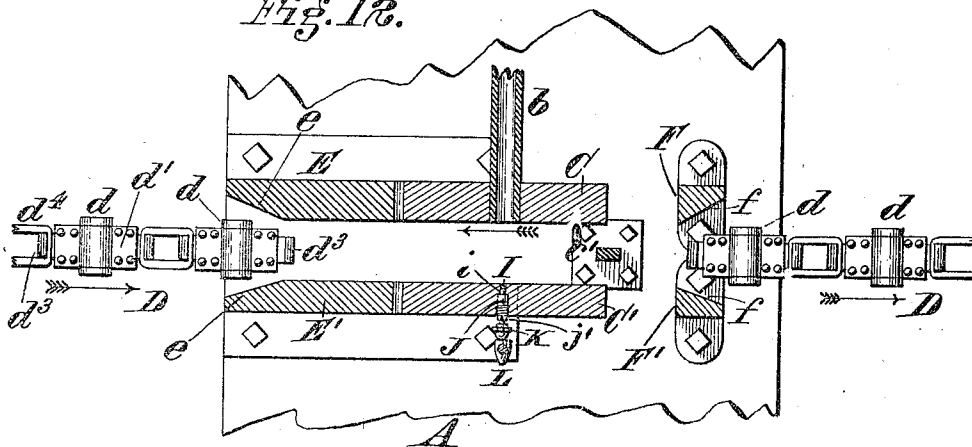


Fig. 13.

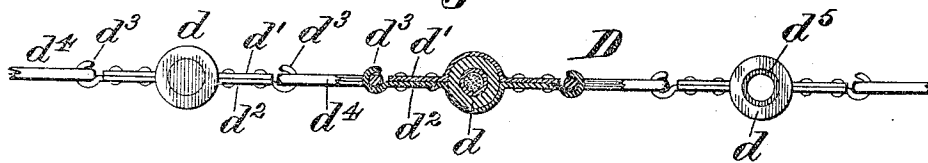


Fig. 14.

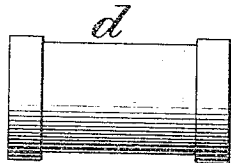


Fig. 15.

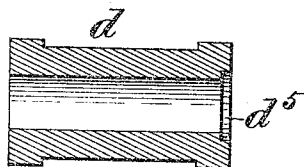
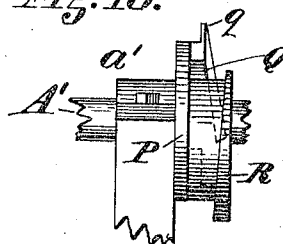


Fig. 16.



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UNITED STATES PATENT OFFICE.

ISRAEL N. ARCHBOLD, OF RIDGE FARM, ILLINOIS.

MACHINE-GUN.

SPECIFICATION forming part of Letters Patent No. 476,590, dated June 7, 1892.

Application filed July 13, 1891. Serial No. 399,416. (No model.)

To all whom it may concern:

Be it known that I, ISRAEL N. ARCHBOLD, a citizen of the United States, residing at Ridge Farm, in the county of Vermilion and State of Illinois, have invented certain new and useful Improvements in Machine-Guns, of which the following is a specification.

My invention relates to improvements in revolving cannon or machine-guns and loading devices therefor, which will be fully hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal elevation of the gun embodying my invention, the loading or charging device being omitted for clearness; Fig. 2, a transverse sectional elevation on line *xx*, Fig. 1, made on a larger scale and showing the ammunition or cartridge carrier in place, the latter being broken off at either end; Fig. 3, a broken sectional elevation on lines 1 1, Figs. 2 and 4, showing the cam devices for operating the cartridge striking or exploding mechanism; Fig. 4, a broken transverse sectional elevation on line 2 2, Fig. 3, of said cam devices; Fig. 5, a transverse sectional elevation on line *yy* of Fig. 1, showing the manner in which a cylindrical shield or casing may be applied to the part of the gun containing the cluster of barrels; Fig. 6, a broken longitudinal section of the parts shown in Fig. 5; Fig. 7, a transverse section on line *x' x'*, Fig. 1, of the breech of the gun, showing the cartridge-carrier and its guiding devices in connection therewith as they appear in the operation of revolving and firing the gun; Fig. 8, a full-size broken-off portion of the breech of my gun, showing the parts on the sectional line *xx*, Fig. 7, a cartridge being in place in its carrier shell or cylinder and the firing mechanism just in the act of striking the blow for the explosion of the cartridge; Fig. 9, a plan view of the central cap or top plate of the carrier-guide mechanism, the side guides being shown broken off; Fig. 10, a bottom view of the adjustable plate forming part of the carrier-guide mechanism and when in place located beneath the cap shown in Fig. 9; Fig. 11, a transverse sectional elevation on line 3 3, Fig. 8, of the cartridge-striking device; Fig. 12, a broken sectional plan on line

4 4, Figs. 2 and 7, showing a segment of the breech, vertical portions of the carrier-guides, and parts of the cartridge-carrier, the adjacent arrows showing the direction of movement of said parts; Fig. 13, a longitudinal elevation of the cartridge-carrier, showing it broken off at either end, the first cylinder to the left being shown in end elevation and having an unexploded cartridge therein, the next cylinder and its connections being shown in section and also having a loaded cartridge therein, and the next cylinder, with its connections to the right being shown in elevation and having its cartridge chamber or bore empty; Fig. 14, a longitudinal elevation of one of the cartridge-cylinders detached from the carrier connections; Fig. 15, a central longitudinal section of the cylinder shown in Fig. 14, and Fig. 16 a broken detail side elevation of the cam devices shown in Figs. 3 and 4.

A represents a base-plate or timber upon which I have shown my gun mounted simply for convenience; but it is obvious that in use it will be applied similar to other like implements of warfare—viz., pivotally mounted on carriages, tripods, or stands having suitable elevating and depressing as well as other training mechanism, which I do not claim or deem it necessary to show or describe herein.

a a' are upright bearings on base A, and A' is the central longitudinal shaft of the gun journaling at either end in said bearings *a* and *a'* and provided with a manipulating handle or crank A².

B represents the muzzle head or disk, and B' the breech head or block, both of which are keyed to shaft A', so as to revolve therewith.

b represents each one of a circular series or cluster of barrels or tubes firmly secured at their opposite ends in said heads B and B'. The bore of these barrels may be either smooth or rifled, as desired, to suit the service or purpose intended.

Breech-block B' is provided with peripheral flanges C C', as clearly shown in Fig. 8, having an annulus or circular channel between them, which forms a receiving breech-chamber and passage-way for the cartridge-carrier D.

E E' represent upright inlet-guideways or

jaws having flaring inner faces *e*, as clearly shown in Fig. 12, and mounted on the base A adjacent the feed side of the breech-block B'.

F F' are upright outlet-guideways, also constructed with flaring inner faces *f*, similar to those on the guideways E E', and mounted on base A adjacent the cartridge-carrier, exit side of the breech-block. The main or inner portions of these guideways E E' and F F' are each of the same width or thickness as the adjacent flange of the breech-block, and the opening or space between them is also the same as that between said flanges of the breech-block, as shown in Fig. 12, so that the cartridge-carrier D is positively and uniformly guided to and from operating position within the breech-block.

G represents a central top plate or cap connecting the upper ends of the guideways E E' on one side with those F F' on the other, either integrally or otherwise, as desired, the said guideways forming suitable supports therefor.

G' is a presser plate or shoe suspended from the cap or top plate G by means of vertical bolts *g g*, so that it lies freely within the upper part of the cartridge-carrier annulus or passage-way of the breech-block.

g' g' are spiral springs on the bolts *g*, seating within the sockets or chambers *g² g²* in the cap G and exerting a downward pressure on the shoe G'.

g³ g³ are nuts on the upper ends of bolts *g* for holding said shoe in position and adjusting it and the tension of its pressure-springs *g'* in relation to the under passing cartridge-carrier.

g⁴ g⁴ are set-screws in cap G for auxiliary use in case it is desired to adjust the shoe G' firmly or rigidly in position or said spiral springs become impaired temporarily.

H represents a horizontal spring-lip attached to the bottom of presser-plate G', as shown in Figs. 7 and 10, and projecting outwardly into the inlet side of the cartridge-carrier passage-way, thus forming a positive guard and guide device, whereby the said cartridge-carrier is properly seated in the bottom of said passage-way of the breech-block for subsequent action.

h represents each one of a series of concavities or sockets in the bottom of the breech-chamber, constructed in line with the respective gun-barrels and immediately following their inner ends, as shown in Figs. 7 and 8.

c is a central circumferential groove or race in the bottom of said breech-chamber, and *c'* an upright arm, whose tapered upper end lies within said groove and serves as an ejector to engage the under side of the spent part of the cartridge-carrier and readily, as well as positively, causes its disengagement or withdrawal from the breech-head during action of the gun, all as very clearly shown in said Fig. 7. Ejector-arm *c'* is mounted on base A, just inside the guideways F F' on the cartridge-carrier-exit side of the breech.

The cartridge-carrier D is in the nature of a long flexible chain composed of small cylinders or shells *d*, straps *d'* and *d²*, (the latter having upwardly-turned ends or hooks *d³*) and links *d⁴*. The cartridge-cylinders *d* are flanged or shouldered, as shown in Figs. 14 and 15, the depth of the recess between the flanges corresponding with the thickness of the material in the upper and lower binding-straps *d'* and *d²*, respectively, so that when the opposite fastening ends of these straps are secured by flat-headed rivets, (or otherwise, as desired,) as shown in Fig. 13, the outer faces of the semicircular portions around the recessed cylinders shall lie in the same plane as the faces of said flanges, and thereby present an even surface for a free and easy passage into and through the breech-chamber. The opposite ends of the links *d⁴* engage the hooks *d³*, formed at the opposite ends of the lower cylinder-straps *d²*, as also clearly shown in said Fig. 13.

The bore or caliber of the cylinders *d* corresponds with that of the gun-barrels *b* and also with the size of the cartridges to be used in the gun, and a countersunk recess *d⁵* is constructed in the rear end of each one, as shown in Figs. 8 and 15, to accommodate or seat the usual flange or rim on the cartridge and prevent any part of the head of the cartridge projecting rearwardly beyond the back face of the cylinder to come into frictional or other contact with the flange C' or adjacent parts, thus successfully receiving and carrying cartridges with defective rims or heads, as well as those that are perfect, and without danger of accidental discharge.

I represents each one of a circular series of firing or strike pins mounted in boxes J, the latter being in turn mounted or screwed into suitable chambers in the flange C' of the breech-head and corresponding in radii and number with the gun-barrels *b*. The inner end of each of the box-chambers terminates in an opening *i*, which is of lesser diameter and forms a bearing-passage for the inward movement of the firing-pin.

J' represents an expansive spiral spring in each of the boxes J, surrounding the accompanying firing-pin and abutting at one end a collar or flange *i'* on said pin and at its other end the shoulder *j*, which latter forms the bottom or inner end of each box-chamber.

Boxes J are provided with square outwardly-projecting heads *j'* for receiving the wrench or other adjusting-tool. The internal opening or bore of these heads forms a bearing-passage for accommodating that part of the firing-pins which project from their collars *i'* outward beyond said heads *j'*, and a shoulder *j²* is provided, against which the said collars *i'* normally bear, owing to the expansive action of springs J', all as clearly shown in Fig. 8.

K represents a nut on the outer threaded end of each of the firing-pins. These nuts are preferably mounted on said pins for the

purpose of accurately adjusting the amount of their inward movement or stroke, so that their inner pointed ends shall enter the percussion-cap of the cartridge just sufficient to explode it and not far enough to materially batter or upset the metal therein to cause any wedging of the cartridge-carrier in the breech-chamber. The outer end or face of each of the adjusting-nuts K is rounded or convex to form a suitable battering-head.

L represents each one of a circular series of hammers corresponding in radii and number with the firing-pins and gun-barrels and mounted in line with said pins and barrels, as shown in Fig. 8.

L' represents blocks from which the hammers L project. These blocks are each adjustably and detachably secured in place on the outer end of a bar l by means of a screw l', so that the blow or impact of the hammer may be readily adjusted and regulated, thus readily preventing too great or too light a blow on the strike-pin for the discharge of the cartridge. Each of the bars l is provided at its inner end with a circular head l' and lies within a chamber M in the breech-head.

m represents a screw-plug in the mouth of each chamber M, and m' is a spiral spring surrounding bar l in the chamber between circular head l' and said screw-plug m and exerting an expansive or longitudinal pressure against said circular head and screw-plug to give the necessary firing strength to the blow of the hammer, and also cause the hammer to react or strike the blow after its retraction backward by the cam device I shall presently describe. Each of the bars l is preferably square of cross-section the greater part of its length, as clearly shown in Figs. 7, 8, and 11, so that the hammer-block cannot accidentally turn thereon, thus maintaining the hammer itself in a direct line with the strike-pin at all times.

The hammer device is set or arranged in proper position by first introducing bar l and spring m' in chamber M, then sliding on said bar the screw-plug m, which latter has a square opening to correspond with the square bar. Then the hammer-block is slipped upon the outer end of the said bar and the screw-plug turned home by using the hammer as a handle and the block as a wrench until the face of the hammer assumes the position shown in Fig. 8, just touching the strike-pin head. Then the hammer-block is removed from the bar l and an auxiliary right-angled bar N, having a head n, is slipped upon said bar l and secured in position by a set-screw n', (as also shown in Fig. 8,) and finally the hammer-block, with its hammer, is again placed on said bar l and restored to the position above stated, being held there firmly by means of the set-screw l'. The right-angled bars N are each square in cross-section, as shown in Fig. 11, similar to bars l, and their long horizontal portions reciprocate in square holes or chambers N' in the breech-head.

The set-screws n' adapt the bars N to be set in proper position on the bars l and cause both sets of bars to move in unison, either inwardly or outwardly, and an auxiliary safety device is thus furnished for each hammer mechanism, so that it cannot possibly turn out of line at any time, and particularly during the revolutions and firing of the gun. Without this auxiliary device for each hammer mechanism it is quite obvious that the hammer mechanism might accidentally turn with the screw-plug m in case the latter became loose in the mouth of its chamber M, and the hammer would therefore get out of line with the firing-pin and the gun miss fire.

O represents a trundle or roller on the inner face of each hammer-block I', as clearly shown in Figs. 8 and 11.

P is a plate or disk loosely slipped over shaft A', being rigidly secured by means of bolts p to the inner face of the upright support of bearing a', and provided on its periphery with cam-tracks Q and R. The track Q has an inclined rib q upon whose outer inclined face the roller O of each hammer-block in its turn travels, and thereby causes the retraction of the hammer mechanism until the latter reaches its uppermost position at the top of said rib, at which time, upon the further movement of the handle A², the hammer device is released and the firing of the gun results. The cam-track R is inclined on the same side as the cam-track Q, as shown in Fig. 16, the inclination beginning at the uppermost part of the track, which is a short distance beyond the upper end of the cam-track Q, as shown in Figs. 2 and 4, and increases gradually till it reaches a point slightly beyond a perpendicular line drawn through the center of the shaft, as seen in line 1 1, Fig. 4. This track R again receives each roller O immediately after the firing-action, and causes a slight retraction of the hammer mechanism, which permits the point of the adjacent firing-pin to retract entirely free from the spent cartridge, and allows the ejector-arm c' to readily throw or release the outwardly-passing portion of the cartridge-carrier from the breech-block. I provide the cam-track R as an extra precaution, so that the hammer devices will positively retract out of the way of the backward movement or retraction of the firing-pins subsequent to a firing operation. This track R is bolted to the disk P, as shown in Figs. 3 and 4; but it is obvious that it could be made integral therewith, the same as is the track Q.

In operating my gun the loaded cartridge-carrier D is fed or admitted transversely from the side into the breech-chamber after first passing between the guides or jaws E E', the end of the carrier being composed of one of the cartridge cylinders or holders d, which is placed in the first socket h to the left of the guard spring or lip II. The crank A² is then turned or revolved to the right, which action simultaneously causes the gun to revolve and

the cartridge-carrier to be conveyed or advanced under said lip II and the presser-block G' (both of which serve to properly seat the cartridge-cylinder *d* in its socket *h*) until the cartridge is brought perpendicularly above the central shaft, or, in other words, in its uppermost position. Simultaneous with the revolving of the gun and the advancement therewith of the cartridge-carrier by crank A² the hammer-block is being retracted by its contact with the cam-track Q, and at the time the cartridge is in said uppermost position the hammer device is released from said cam-track Q, and the hammer strikes the firing-pin, which in turn is thereby forcibly driven against the cartridge and its point explodes the fulminate, causing the shot to be fired. On the further turning of the crank the succeeding cartridge-cylinders in the chain are consecutively brought into the same position as the first one, just described, for the action of firing, and immediately after each cartridge has been fired that part of the carrier in which its cylinder is mounted passes outward and downward within the breech-block until said cylinder comes in contact with the rigid ejector-arm *c'*, which disengages it from its socket *h* and leads the chain outward to the right between the exit-guideways F F', all as clearly shown in Fig. 7, the arrows therein indicating the direction of movement of the several parts. As stated hereinbefore, the cam-track R causes each of the hammer devices to retract slightly immediately after the firing of a shot, so that the adjacent firing-pin may assume its normal position without hinderance, thereby withdrawing its point from the head of the spent cartridge and bringing it within the flange C', so that the operation by the ejector-arm *c'* can successfully and immediately follow. It will be seen that at each full revolution of the crank the whole six barrels (or as many as there may be in the gun) are discharged, and as the gun cannot possibly become heated, owing to the open breech and barrels, and also the independent cartridge-cylinders, which leave the breech immediately after firing the contents of each, the faster the said crank is turned the greater the number of shots fired. I have found that in actual practice with my gun the shots follow each other in such close succession that their discharge is all but simultaneous, so rapid is their firing and so quickly can the cartridge-carrier be fed into and conveyed through the breechway by the simple turning of the crank. The circulation of air through the barrels, which are open at both ends, serves to keep them normally cool, and it will be seen by reference to Fig. 7 that one-half of the barrels are open at all times and that but a single one of the others is really in firing operation at a time. The cartridge-carrier can of course be made or connected in any length desired, and charged chains of prescribed lengths in any number may be kept in reserve. As soon as a chain has been exhausted and

passed from the gun another may be readily fed into the breechway without stopping the crank and the spent cartridges or empty shells in the discharged chain readily removed and the cylinders again charged ready for action. It will also be seen that in the turning of the crank the following actions take place: The gun is revolved, the cartridge-carrier is simultaneously advanced or drawn into and expelled from its open breechway, and the retraction and firing operation of the hammer devices. The act of drawing the cartridge-carrier into and through the gun is similar to that of the passage of a chain over a sprocket-wheel, which is positive and reliable at all times, and the cylinders, with their cartridges, are consecutively presented at the rear of each barrel, and as soon as firmly seated are at once fired and passed out of the breechway. Whatever recoil there is after firing each cylinder is readily taken up by the presser-block G', whose springs well adapt it to such action, and the flange C' readily takes any back-pressure from discharging cartridges.

It is obvious that a cylindrical shield or casing A³ can, if desired, be applied to the gun-barrels by attaching its ends to the muzzle-head B and flange C of the breech-block, as partly shown in Figs. 5 and 6.

I claim—

1. In a machine-gun, a revolving integral breech block or head having flanges C and C' at its ends and an open annular groove or breechway between them, one or more barrels projecting from the flange C, and a suitable firing mechanism in the flange C', and a stationary shoe or pressure-plate within the groove at the point of firing, said groove being adapted to receive the cartridges or other ammunition and pass it under the shoe, substantially as described.

2. In a machine-gun, a revolving breech-block having a flange at each end and an open groove or breechway between them, one or more barrels projecting from the front flange and suitable firing mechanism in the rear flange, a stationary pressure-plate or shoe within the groove, and a cartridge carrier or chain provided with cartridge-cylinders of the same length as the width of the groove and adapted to pass between the shoe and the bottom of the groove, substantially as described.

3. In a machine-gun, a revolving breech-block having an open breechway between its peripheral flanges C C', one or more barrels leading from flange C, suitable firing mechanism in the flange C', and a flexible cartridge carrier or chain D, comprising a series of cartridge-holders *d*, binding-straps *d'* and *d''*, the latter *d''* having hook ends, and connecting-links *d'*, engaging the hooked ends of said straps, said carrier being adapted to be fed into the gun and passed through the said open breechway for the firing operation, substantially as described.

4. In a machine-gun, the combination of a

muzzle block or disk B and breech-block B', mounted on a revolving shaft, a cluster of barrels mounted in said blocks, said breech-block having an open breechway constructed between its peripheral flanges C C' and said barrels being open both at muzzle and breech, adjustable firing-pins I, mounted in flange C' in line with said barrels, hammers L, suitable cam devices for operating said hammers, and a cartridge carrier or chain D, the latter being adapted to be fed into and conveyed through the open breechway of said breech-block, substantially as and for the purpose specified.

5 5. In a machine-gun, a muzzle-block and a breech-block mounted on a revolving shaft, a circular cluster of barrels grouped around said shaft in said blocks, said breech-block having an open breechway between its flanges C C', firing-pins I, mounted in flange C', hammers L, mounted on spring-controlled bars l, projecting from the breech-block, rigidly mounted cams Q and R on the shaft-bearing a', and cartridge-carrier D, the latter being fed and conveyed through the breechway transversely, substantially as and for the purpose specified.

6. In a machine-gun, the combination, with breech-block B', having an open breechway between its flanges C C', of a top plate or cap G, having suitable supports, and a presser-plate or shoe G', suspended from said cap G within said open breechway and adapted to seat the advancing cartridge-carrier cylinders in the sockets h of the breechway, substantially as and for the purpose specified.

7. In a machine-gun, the combination, with breech-block B', having an open breechway between its flanges C C', of a top plate G, mounted centrally over the said breech-block upon the upper ends of supports E E' and

F F', the said supports having flaring inner faces e and f, respectively, which form inlet and outlet guideways or jaws to and from said open breechway, presser-plate or shoe G', suspended from said top plate G within said open breechway at its uppermost portion, vertical bolts g g and springs g' g' for adjusting the position of said presser-plate, and a spring lip or guard H, attached to the bottom of said presser-plate on the inlet side of the breechway, substantially as herein set forth.

8. In a machine-gun, the combination, with a breech-block B', having an open breechway between its flanges C C', and a central groove or race c in the bottom of said breechway, of an upright arm or ejector e', the latter being adapted to positively release or dislodge the paying-out or spent portion of the cartridge-carrier D from said breechway on the exit side of the gun, substantially as herein set forth.

9. The combination, with the breech-block B', having the open breechway between its flanges C C', of the firing-pins I, boxes or chambers J, springs J', collars i' on the said pins, and the adjusting heads or nuts K on the outer threaded ends of the pins, substantially as herein set forth.

10. The combination, with the breech-block B', having the open breechway between its flanges C C', of the firing-pins I, hammers L, blocks L', upon which the hammers are mounted, headed bars l, springs m', screw-plugs m, and right-angled bars N n, substantially as and for the purpose specified.

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Witnesses:

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