E. JONES.

GUN.

APPLICATION FILED MAY 27, 1910.

1,063,882.

Patented June 3, 1913.

3 SHEETS—SHEET 1.

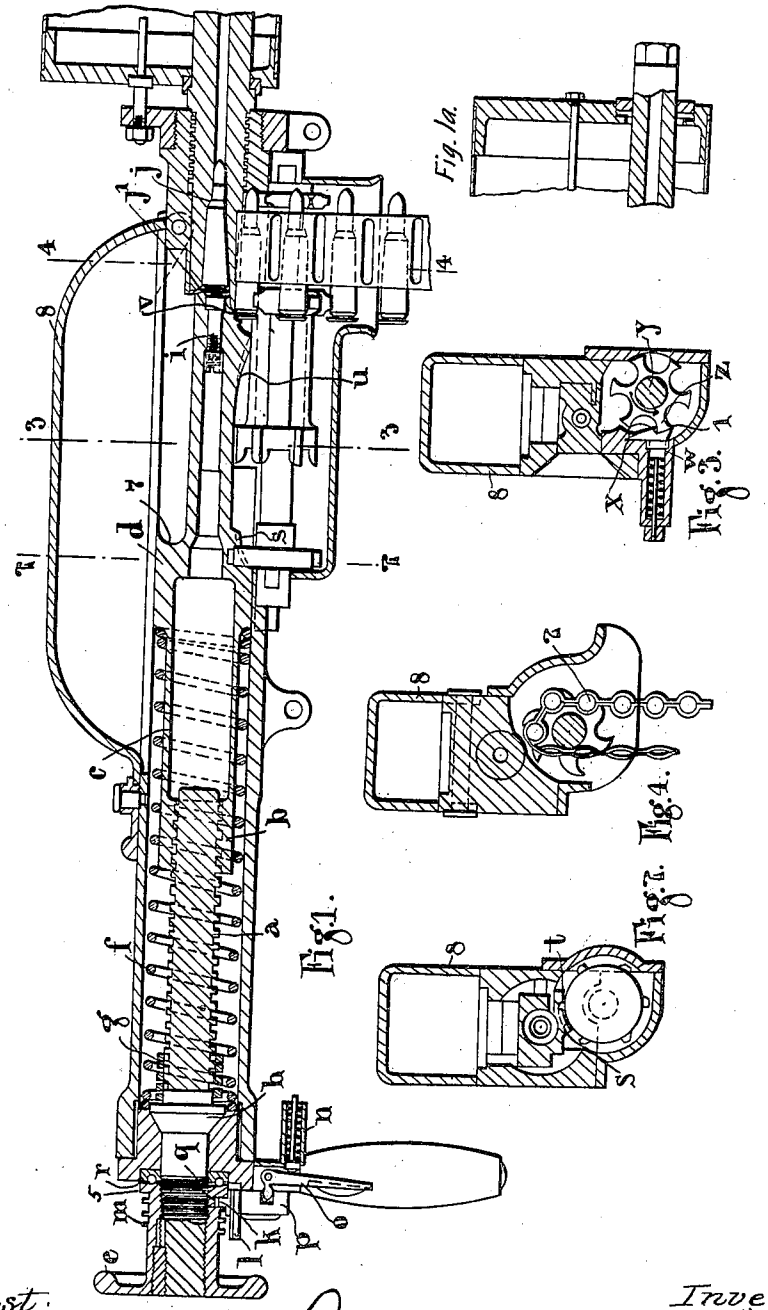

Fig. 1.

Fig. 1a.

Fig. 3.

Fig. 4.

Fig. 2.

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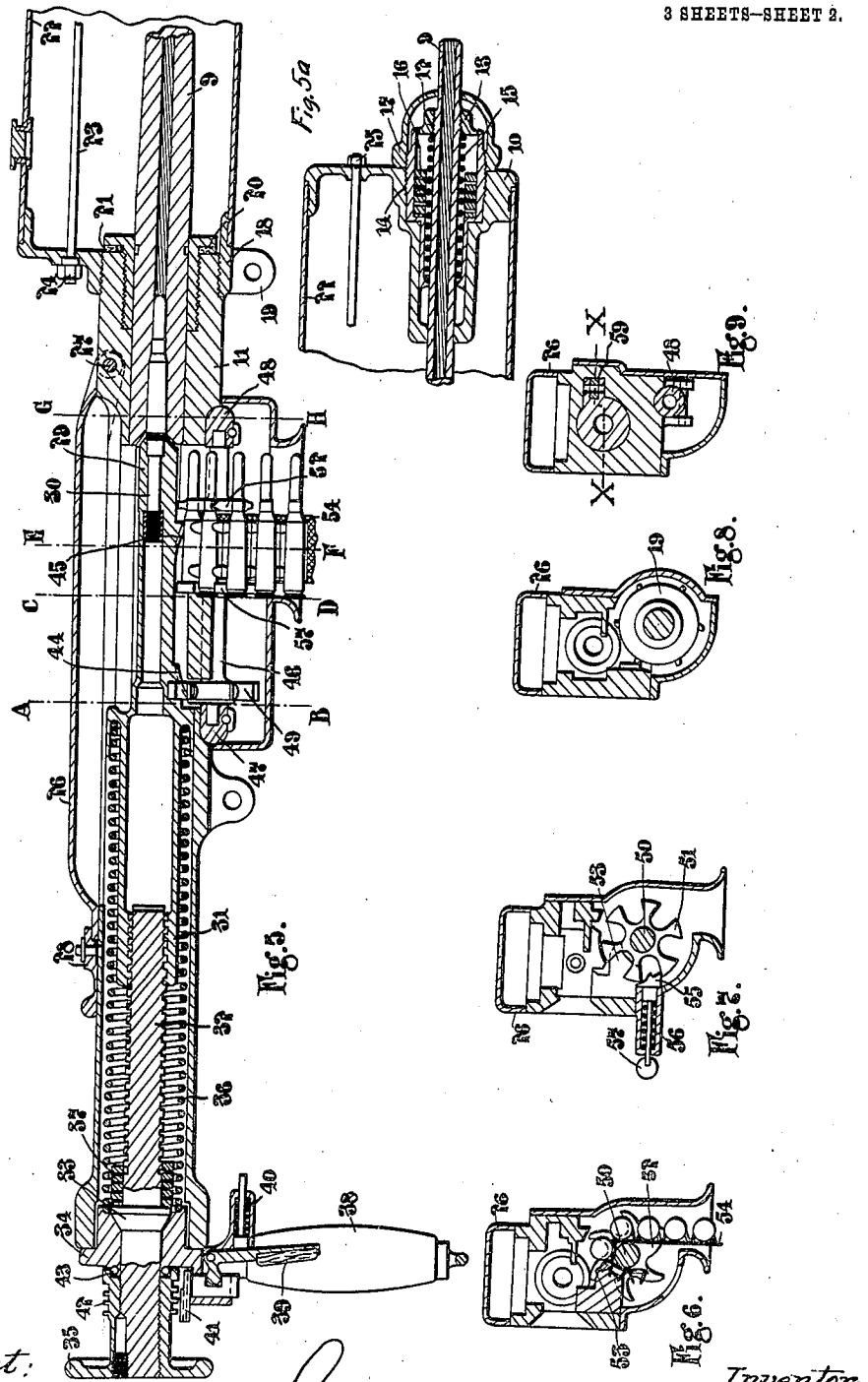

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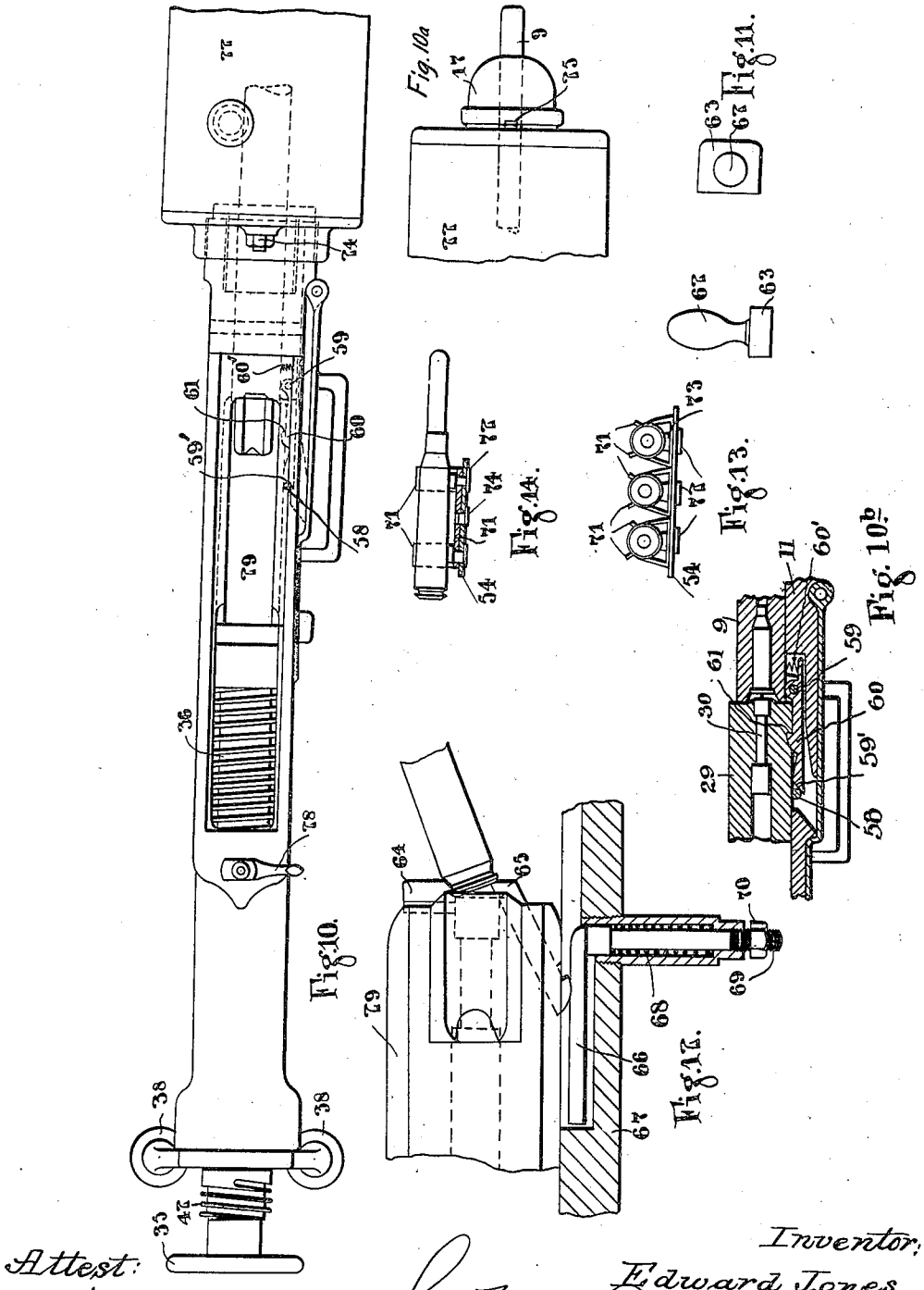

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UNITED STATES PATENT OFFICE.

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GUN.

1,063,882. Specification of Letters Patent. Patented June 3, 1913.

Application filed May 27, 1910. Serial No. 563,769.

To all whom it may concern:

Be it known that I, EDWARD JONES, a subject of the King of Great Britain and Ireland, residing at Perry-Bar, Staffordshire, England, have invented certain new and useful Improvements in and Relating to Guns, of which the following is a specification.

This invention relates to guns and the like and is especially applicable to those guns in which the force of the recoil is absorbed and entirely so far as is practicable or partially used to perform useful work.

The object of the invention is mainly to obtain an improved method of and means for effecting such storage of energy.

A further object of the invention is to obtain improved feeding, firing and ejecting devices especially applicable to guns of this type.

It has been proposed heretofore in automatic or machine guns to store energy of recoil of the barrel or of the breech closure or of both in a flywheel, in the latter two types a spring being also provided in some cases to take a portion of the energy and aid the further rotation of the flywheel, the motion of the gun being transmitted by any suitable and usual means such as a crank and connecting rod, an eccentric, a crank pin working in a cam slot or a cam groove in a disk secured to the flywheel shaft or the motion of the barrel in the former case being transmitted by a rack formed upon the same co-acting with a pinion connected to the flywheel shaft (in one case through a spring coupling and freewheel device) or by levers. In all such cases the flywheel in operation is rotated continuously in one direction only.

This invention consists in an arrangement whereby the force of recoil of a gun or the like acting on a bolt and nut device preferably of multithreads and high pitch causes the same to effect storage of energy.

In one form this invention consists in the employment of this device in an automatic machine gun or the like having a reciprocating barrel, *e. g.* one in which the barrel and breech block or equivalent device move together for a certain portion of the recoil travel, the latter element and the barrel then moving relatively to each other for a further portion of the travel.

Further features of this invention are an improved cartridge feeding mechanism, in which the cartridges are fed to the breech upon a carrier, to which they are attached by clip or like members, from which, upon reaching a predetermined position, the round is transversely forced, permitting it to be afterward pushed or otherwise moved into position into the chamber of the barrel; an arrangement, whereby, when the cartridge is moved into a definite position ready for firing it automatically brings a substantially fixed firing pin in action to operate the primer for firing; an improved feeding arrangement comprising operating cams in which during the interval between the action of the cams on the cartridge or round when the bolt may normally tend to rotate or move the cartridge back such rotation is stopped by a spring latch or notched piece coöperating with an element adapted to latch with or enter the notch therein; and an improved ejector-extractor comprising an extractor element and an ejector element, which co-act when the breech block or the like is moved relatively to the barrel, to cause the cartridge case or unfired cartridge to be ejected, the extractor element acting as the pivot about which ejection occurs, the ejector element being operated by a spring, compressed by the breech block or the like in its rearward travel, and operative immediately the front end of the object to be ejected has cleared the chamber of the barrel.

This invention also consists in the improvements in and relating to guns, hereinafter described.

Referring to the accompanying drawings:—Figures 1 and 1ª represent a longitudinal sectional view of one form of a machine gun according to our invention, the muzzle end appearing in Fig. 1ª. Figs. 2, 3 and 4 are sections on the lines 2/2 3/3 and 4/4 respectively of Fig. 1. Figs. 5 and 5ª show a form of gun according to this invention having a reciprocating barrel in sectional elevation through the center line and feed drum, the muzzle end appearing in Fig. 5ª. Fig. 6 shows a section on E F of Fig. 5. Fig. 7 a section on C D. Fig. 8 a section on A B, and Fig. 9 a section on G H of Fig. 5. In Figs. 10 and 10ª is shown a plan of the gun, with the cover removed, the muzzle end appearing in Fig. 10ª and Fig. 10ᵇ is a section taken on the line X—X of Fig. 9. Fig. 11 an elevation and plan of

a tool, the purpose of which is described hereafter. Fig. 12 shows an ejector-extractor mechanism, according to the present invention, and Figs. 13 and 14 respectively an end and sectional view of a portion of an improved cartridge feeding belt.

In carrying the invention into effect in the form illustrated in Figs. 1–4 as applied by way of example to an automatic gun we provide a screw member *a* of suitable length having multithreads of high pitch which is adapted to be rotated by a nut device *b* on a suitable sleeve *c* which forms part of the bolt or breech block *d* and is moved by the recoil during firing. To this screw member *a* is connected a flywheel *e* and the rotation of the member *a* by the recoil stores energy in the flywheel, which energy may be used entirely so far as is practicable or in part to perform useful work in connection with the next round.

A spring *f* which may be a comparatively light spring is also provided between the bolt *d* and the breech of the gun and a further stiff spring *g* may also be provided as indicated to form a buffer for the end of the nut *b* when this reaches practically the limit of its backward travel. The bolt *d* is preferably provided with a recess 7, so that it can be retracted if necessary by hand on opening the cover 8. A conical head *h* is formed on the screw rod *a* to which the fly-wheel is attached to engage with a similar depression in the rear end of the gun, to take the heavy reaction immediately on firing.

In order to effect firing a firing pin *i* is carried in the end of the bolt *d*, and this may be removable to allow it readily to be renewed when desired.

It will be noted that a shoulder *j* is provided by which the movement of the cartridge is arrested. When cartridges with formed heads are used the shoulder is formed at the part *j'*. The effect of this will be explained hereinafter.

The gun is preferably arranged so that by a suitable trigger device automatic firing may be insured, or a single round may be fired as desired. The construction illustrated for enabling this to be effected includes a projection *k* adapted to travel on a suitable way *l*, motion being given to it by the rotation of the flywheel *e* and the screw thread *m*. The projection *k* is normally pressed by the spring *n*, acting through the lever *o*, and the block *p* into the bottom of the screw thread so that it can enter a recess *q* when it is in position so to do. It will be understood that an arrangement of this kind is required in practice when the flywheel performs more than one revolution during the recoil, otherwise the flywheel and the bolt might be arrested at the wrong moment. That is to say, as the bolt recoils on firing the projection *k* runs from its extreme outward position to its inner position and then engages the recess *q*. For automatic firing the thumb piece of the lever is depressed and thus the projection kept from the recess throughout the entire travel. A ball race *r* is also provided in the gun illustrated and the side member 5 of this is preferably somewhat slack so that during recoil the balls do not come into play but on the firing stroke the side 5 approaches the balls and an ordinary ball race is formed.

As to the feeding in the type of gun wherein the cartridge is moved and controlled by cams there is a position when the cartridge becomes uncontrolled and in that position the weight of the belt and cartridges tends to rotate the cartridge carrier back again. Arrangements have heretofore been proposed to prevent this, but according to the present invention it is prevented by applying a spring pressed latch piece having a notch cut therein so that when one cam is not acting and until the other cam comes into action the carrier is latched from rotating in a backward direction thus insuring correct feed. In the form illustrated the cartridge carrier is rotated on the forward stroke of the breech bolt by the cam *s* to bring the cartridge into position for the hook *v* to withdraw it from the belt on the next back stroke and on the back stroke by means of the cam *u* operating the teeth *t* to bring the cartridge into position for feeding prior to firing.

A spring pressed latch piece *w* is provided in which there is a notch *x*. As the cartridge carrier shaft *y* rotates in the direction shown by the arrow this carrier passes the latch piece readily but is prevented from being rotated backward by the weight of the cartridge belt 2 during the interval between the action of the two cams by means of one of the arms *z* catching in one case the notch *x*, and in the other the edge 1, that is to say, when one cam has finished its action backward rotation is stopped by reason of the notch, and when the other cam has finished it is stopped because of the edge 1. The operation of the gun illustrated is as follows: Assume the bolt to be traveling to the right, it pushes the cartridge forward until it is right home against the shoulder *j* or *j'*. It is then fired by the firing pin and the inertia of the flywheel and its connecting parts together with the binding of the cartridge case in the breech due to elasticity under the gaseous pressure is sufficiently great to prevent any motion of the fly-wheel until the bullet has traveled some distance along the barrel. After this the pressure gradually releasing, the bolt moves backward, compresses the spring *f* and rotates the flywheel *e* which therefore, gradually absorbs energy and

subsequently imparts some or all of it to the spring *f*. Energy is also stored in the buffer spring *g* when the bolt reaches the same. When another round is to be fired the thumb lever *o* being pressed the potential energy of the springs *f* and *g* is converted into kinetic energy which forces the bolt forward and at the same time rotates the flywheel in a reverse direction, thereby storing energy again in it, which store of energy is utilized for firing when the cartridge is pushed into its proper place, and suddenly stopped.

In connection with this it may be mentioned that should the cartridge not fit right home through dust or other causes the dissipation of energy will take place through a sufficiently long space that the pressure will not be sufficient to fire the charge. Of course while the actions referred to above are taking place a cartridge is also being withdrawn from the belt and fed into position for the bolt to engage it as referred to above.

The gun shown in Figs. 5–10 is one form of a gun in which the breech remains closed until the bullet has left the barrel and has a reciprocating barrel, 9, adapted to slide within a bearing element 10, and a further bearing element 11. The front end of the barrel is screw threaded at 12, and provided with a nut or equivalent 13. The bearing element 10 is hollowed, provided with a bushing 14, screwed therein carrying a light spring 15, and a heavy spring 16, a cap member 17 being also screwed over the front of this bushing. The second bearing element 11 forms part of the main structure of the gun, and has fixed to it a screwed ring element 18, provided with an eye 19, or equivalent for attachment to the supporting tripod or the like. There is also a bush member 20, and a suitable washer or equivalent element 21. Formed about the forward end of the reciprocating barrel is a cooling vessel 22, formed of a cylindrical metal tube co-acting with flanged parts of the members 10 and 18. The structure is maintained in co-action by the stay bolt element 23 and the nuts 24 and 25. The main structure of the gun, of which 11 forms a part, is provided with a cover 26, hinged at 27 and provided with a latch element 28. The breech mechanism comprised a breech block member 29, into which is screwed or otherwise attached at its forward end a fixed firing pin 30, and which has formed upon it a recessed head 31, adapted to receive a screw with multiple thread and high pitch, indicated at 32. This screw is provided with a conical shoulder 33, co-acting with a bearing 34, and has fixed to it the flywheel or equivalent element 35. Between the element 34 and the breech block head 31 is provided a light spring 36, and a heavy buffer spring 37. Trigger means similar to those described in the form of gun shown in Figs. 1–4 are indicated, and comprise the training handles 38, the trigger element 39, the spring means 40, the stopping bolt 41, and the screwed portion of the flywheel shaft 42. A ball race 43 is also provided as before referred to. The breech block element 29 is provided with two cams 44 and 45 which co-act with the mechanism referred to hereinafter for the feeding of the cartridges.

The cartridge feeding means comprise a horizontal shaft 46, mounted in bearings 47 and 48, provided with a toothed operating wheel 49, and a feeding drum composed of a drum 50 forming part of the shaft 46 and star wheel elements 51 and 52. An incline 53 is formed upon the fixed part of the gun, as shown, for the purpose hereinafter referred to. A portion of the cartridge feeding belt is shown at 54 in Figs. 5 and 6. A doubly toothed retaining latch member 55 co-acts with the feeding drum, and is spring pressed by a spring 56, and provided with a retracting handle 57. A latch member 60 indicated at Fig. 10 attached to the barrel upon a pivot 59 (see Figs. 9 and 10) is provided with a tooth 61, and co-acts with a fixed pin 58 Fig. 10^b, to be by the co-action of this pin with the incline 59′ upon the member 60, retracted in opposition to the spring 60′ from co-action with a notch in the breech block 29.

In Fig. 11 is shown a tool member, comprising a handle 62 and a stop portion 63, adapted to be interposed between a portion of the element 31 and a fixed portion of the gun, for the purpose and in the manner hereinafter referred to. Or we provide a hole in the body registering with a corresponding hole in the bolt or breech block in which we insert a pin which may be attached by a chain or otherwise to the body to serve the same purpose as the tool shown in Fig. 11.

In Fig. 12 is indicated the front portion of a breech block element 29, provided with an extractor claw or the like 64, an ejector pin 65, an 1-shaped element 66, supported in a hollowed portion of the gun 67, provided with a compressed spring 68, a threaded head 69, and adjustable nut 70. The method of operation of this ejecting device will be referred to hereinafter.

In Figs. 13 and 14 is shown a portion of a cartridge belt, composed of canvas or equivalent belt 54, having cartridge clips 71 attached thereto. These clips are preferably placed in juxta-position, and are preferably formed by simple stamping from single suitably formed metal sheets. They are attached to the belt 54 by rivet members 72, provided with projecting heads 73, one rivet of this nature being placed within each of the clip jaws, as shown in Fig. 14, in such a manner that the cartridge, when seated

within the clips, is raised some distance above the body of the belt. A suitable additional rivet or the like, provided with a countersunk head, may be employed, as at 74 Fig. 14.

The method of operation is as follows, it being assumed that, as shown in Fig. 5, a cartridge is within the breech, in the position of having just been struck, and the cap fixed and the barrel in its forward position of repose. Upon the cartridge being fired, the bullet travels through the barrel, and the barrel 9 and breech block 29 commence to recoil together, being latched the one to the other by the hook 61, co-acting with the notch and forced in by the spring 60'. In recoiling, the barrel first compresses the light spring 15 and then strikes the heavy spring 16. At the same time, the breech block, in its rearward travel, by co-action with the multi-thread screw 32, is rotating the flywheel, and compressing the light spring 36. When a predetermined position is reached, the connected elements 9 and 29 are unlatched as the pin 58 acting on the surface 59', withdraws the hook 61 from the notch, and the members 9 and 29 are free to move relatively to each other. The barrel then immediately commences to return, its initial heavy reversal being produced by the heavy spring 16, and the light spring 15 completing the travel and return to initial position. The breech block 29, however as the result of the momentum which it has acquired, continues its rearward travel, continues also the compression of the spring 36, and assisted or co-acting with the flywheel, eventually abuts against the heavy buffer spring 37, whereat it commences to return, the flywheel also reversing its motion. This energy storing device is described in detail with reference to Figs. 1–4.

During the forward and rearward travel of the breech block, the cam surfaces 44 and 45 co-act with the teeth on the wheel 49, to effect a two-step advance of the feeding drum 50, and of the cartridge belt 54. The result of this is to bring a cartridge into its uppermost position, by the action of the incline 53, and of the teeth of the wheels of the drum, having forced the same from the clips, and placed it in such a position that when the breech block next advances, it shall force or push the bullet forwardly into the conical mouth of the breech chamber, and so advance the same into position.

It will be seen that the incline 53 in co-action with the teeth of the drum wheel act positively to force the cartridge transversely from the belt, and up the incline to present it at the breech, instead of, as in the case heretofore proposed, withdrawing the same axially, and then advancing it to the breech. The breech block 29 having advanced under the action of the spring 36, and pushed the cartridge home into the breech, is suddenly arrested when the cartridge is firmly seated, and as a result, the dissipation of the energy of motion concentrated in the firing pin effects ignition of the cap, and the cycle of operations recommences.

It will be seen that in the above device, the breech may be arranged to remain closed until the bullet has left the barrel. Among the results of this fact are that when the breech opens, no substantial pressure remains within the barrel, the tendency of the cartridge cases to jam is diminished, and extraction is rendered substantially more easy.

It will be seen that ready means are also provided by the employment of the latch member 55 (which acts during the moments when the cams 44 and 45 are not positively acting on the feed drum, to hold the same in position) whereby the belt may be easily adjusted or removed, or the drum for various purposes rotated. This is easily effected by the operator pulling the hand member 57, thus retracting the member 55, and so freeing the drum 50. It will be necessary, in order to do this, to place the cam out of co-action with the toothed wheel 49; and for this purpose the tool shown in Fig. 11 is provided. Upon opening the latch member 28 and lifting the lid 26, the breech block 29 may be retracted by pulling the same rearwardly being if desired assisted by a slight rotation of the wheel 35, and when it has reached such a position that neither of the cams acts upon the wheel 49, the surface 63 of the tool is dropped into a recess, which is then formed between the moving part, that is, the breech block, and a fixed part or shoulder. When the breech block is so held, the operator is free to withdraw the member 57 from co-action with the drum by hand, and then to perform such operations of rotation as he may desire, with the said drum.

The method of operation of the extractor-ejector above described is briefly as follows:—When a cartridge is held in the breech, and the latter commences to open, the smooth curved end of the ejector pin 65 co-acts with a curved knee of the member 66, and rising over the same as the member 65 travels rearward, forces the member 66 against the action of the spring 68 toward the bottom of the hollow formed in the member 67 which is part of the body. While therefore the breech block 29 is being retracted, there is a pressure arising from the compression of the spring 68, normally tending to eject the cartridge about the claw 64, acting as a pivot, and immediately the front end of the member to be ejected is clear of the breech, it will be thrown sidewise from the axis of the barrel, about this point, by

the action of the pin 65, pushed forward by the member 66 through the spring 68, whatever position upon the surface of 66 the pin 65 may occupy. As a result of this, ejection of an unfired cartridge is just as efficacious as that of an empty cartridge case, and the means for ejection thus provided overcome difficulties existent in known weapons when dealing with such cases, and provide means allowing ejection of objects of varying lengths with equal facility.

The construction of cartridge belt shown in Figs. 13 and 14 offers many advantages. Since the cartridges are raised above the main surface of the belt, there is no danger of the same fouling any of the surfaces near which it passes, the projecting parts, viz, the heads of the rivets 73 being within the limits of the clips 71, and the clearance between the cartridge case and the belt being adequate to allow ample clearance for the member 53, when the same is interposed between the cartridge and the belt to forcibly withdraw the former. It will be also be seen that a construction of belt of this nature offers advantages as regards easy filling, since the cartridges need only to be dropped across the clips, and pressed home.

It will be understood that the invention described in detail with reference to the above drawings may be varied in many respects, without departing from the spirit of the same, and is applicable to guns and like weapons of varying dimensions.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is: —

1. A gun having a member reciprocated by the recoil, an energy storing mass, bolt and nut means converting reciprocation of the aforesaid reciprocating member into rotation of the energy storing mass, and spring elements absorbing the energy stored by said mass, and adapted to return the same for effecting operation of the gun; as set forth.

2. An automatic gun comprising in combination a recoil-operated bolt; resilient means absorbing energy from said bolt on recoil; rotatable means and means for operating the same from said bolt, said rotatable means also absorbing energy from said bolt on recoil, and means including said operating means for transferring energy absorbed by said rotatable means to said resilient means, as set forth.

3. An automatic gun comprising in combination a recoil-operated bolt; resilient means absorbing energy from said bolt on recoil movement thereof; rotatable energy-storing means rotated by recoil movement of said bolt, continued rotation of said rotatable means by virtue of its stored energy acting to move said bolt farther than its recoil movement.

4. A feeding mechanism for guns having a rotatable cartridge belt feeding element a carrier shaft, cam surfaces upon a part of the gun reciprocated by a recoil said cam surface coöperating with said carrier shaft, and a manually retractable notched spring element, coacting with said carrier shaft to insure uni-directional rotation of said shaft, as set forth.

5. In a gun, a reciprocable breech block, an extractor claw mounted thereon, an ejector finger loosely mounted on said block, and a spring pressed element presenting a surface parallel and in proximity to the path of reciprocation of said breech block, said ejector finger co-acting with said surface, as set forth.

6. In an automatic gun including a barrel a receiver, a reciprocable breech block effecting closure of said barrel, and having a screw thread at one extremity, a longitudinally stationary but rotatable screwed shaft co-acting with the screw thread of the aforesaid breech block, a light spring adapted to be compressed between the said breech block and the rear wall of said receiver on reciprocation of the breech block, a short heavy spring adapted to be similarly acted upon by the breech block, and a relatively massive rotatable element carried on the extremity of aforesaid rotatable shaft, as set forth.

In testimony whereof, I affix my signature in presence of two witnesses.

EDWARD JONES.

Witnesses:
WILLIAM MORRIS,
ROLAND E. OUGHTON.