O. V. PAYNE.

GUN.

APPLICATION FILED AUG. 18, 1919.

1,352,412.

Patented Sept. 7, 1920.

4 SHEETS—SHEET 1.

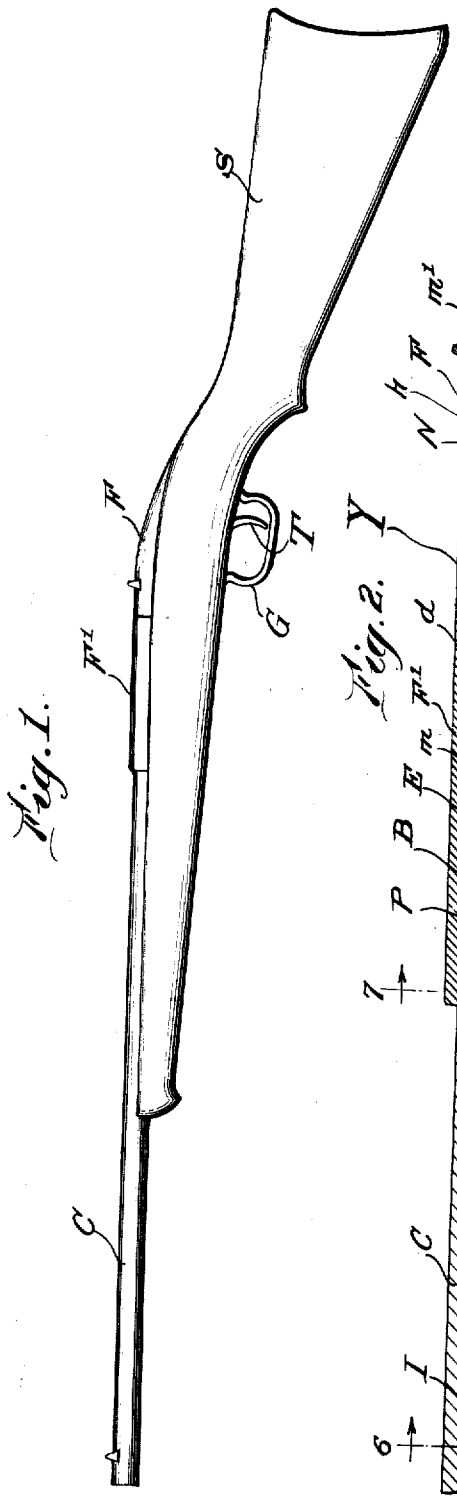


Fig. 1.

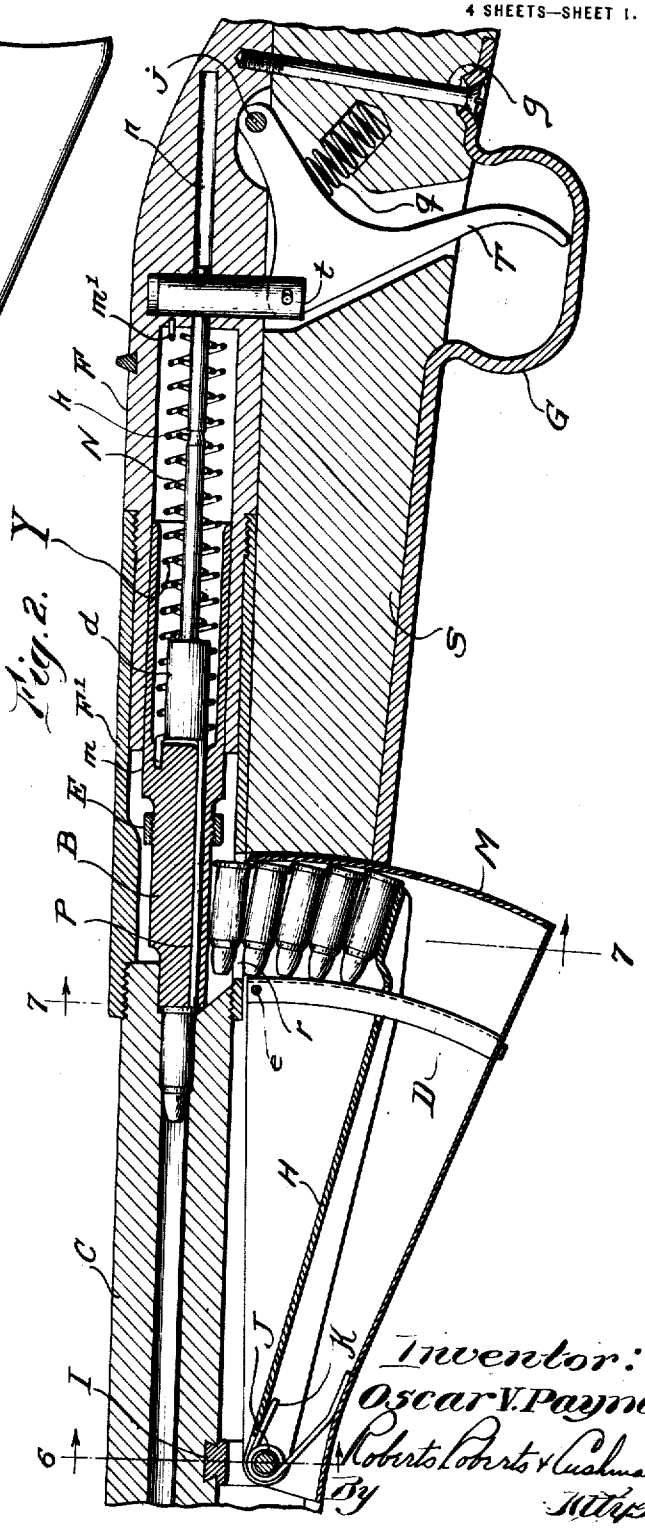


Fig. 2.

Inventor:
Oscar V. Payne
Roberts Roberts & Cushman
By
Attys

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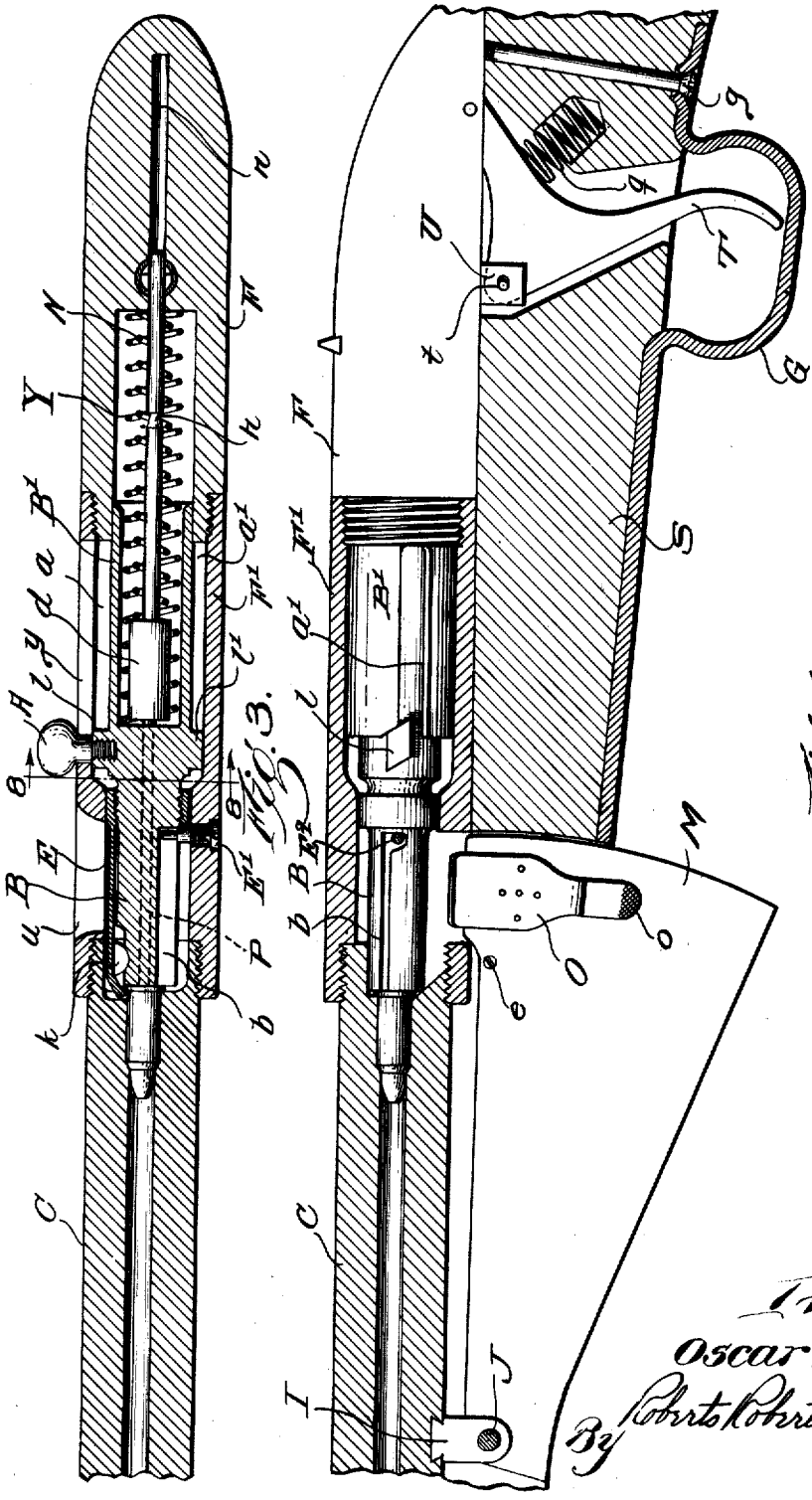


Fig. 3.

Fig. 4.

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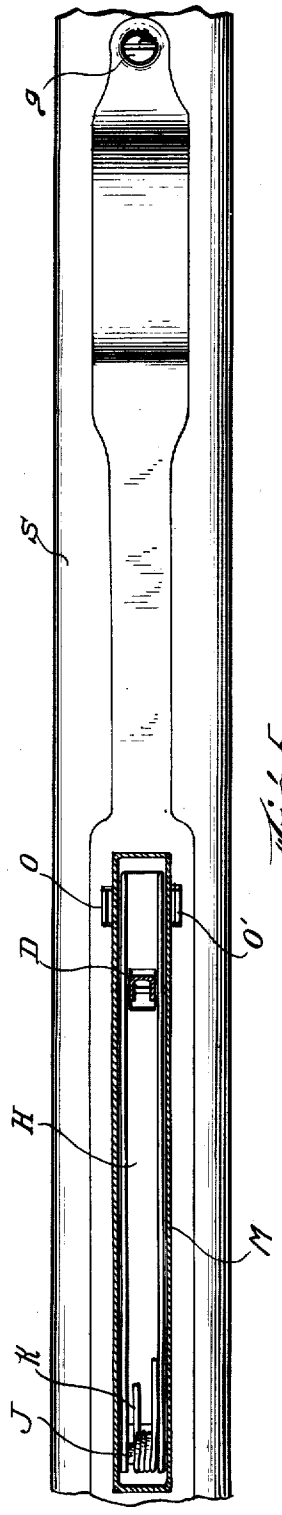


Fig. 5.

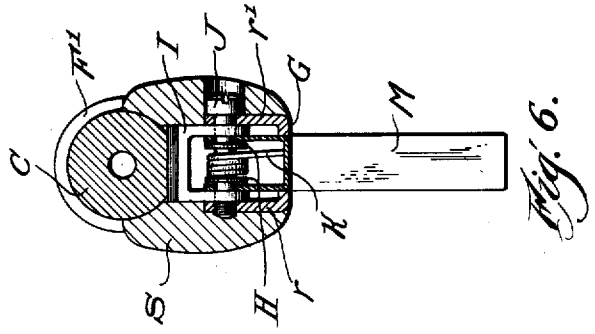


Fig. 6.

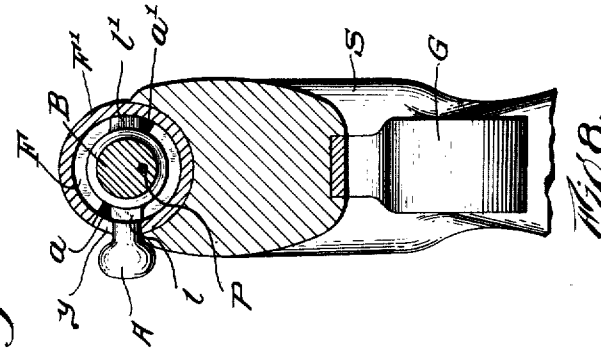


Fig. 8.

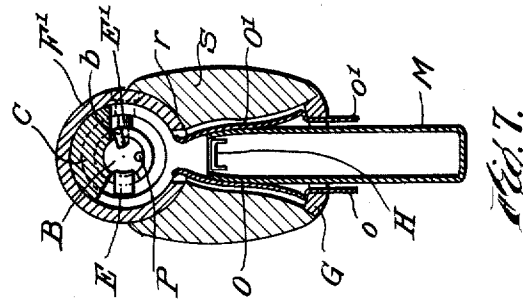


Fig. 7.

Inventor,

Oscar V. Payne

By Roberts Roberts & Cushman

Attys.

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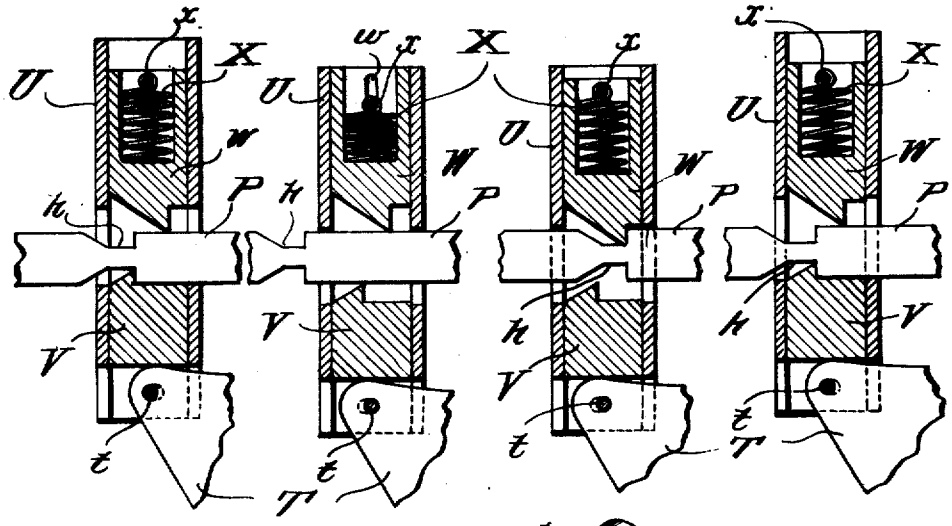
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4 SHEETS—SHEET 4.

Fig. 9. Fig. 10. Fig. 11. Fig. 12.



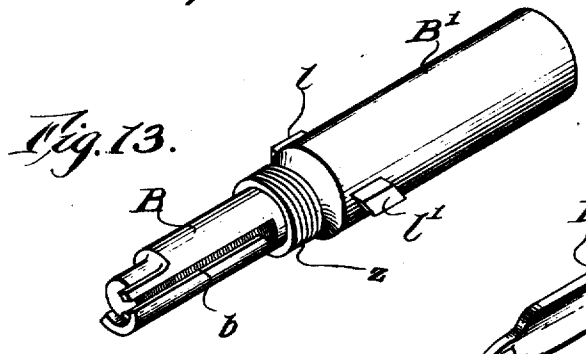


Fig. 13.

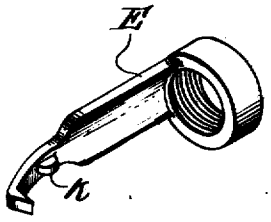


Fig. 14.

Inventor:
Oscar V. Payne
by Roberts Roberts & Cushman
Attys.

UNITED STATES PATENT OFFICE.

OSCAR V. PAYNE, OF CLEVELAND, OHIO, ASSIGNOR TO AUTO-ORDNANCE CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

GUN.

1,352,412. Specification of Letters Patent. Patented Sept. 7, 1920.

Application filed August 18, 1919. Serial No. 318,201.

To all whom it may concern:

Be it known that I, OSCAR V. PAYNE, a citizen of the United States, and resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Guns, of which the following is a specification.

This invention relates to guns and more particularly to the breech mechanism of firearms of relatively small caliber, such as sporting rifles and pistols, although the invention in certain of its aspects is applicable to firearms of larger caliber, such as military rifles and machine guns and even heavy ordnance guns.

The principal objects of the invention are to provide a gun with breech mechanism which is simple in construction and operation, which has a small number of parts, which is reliable and durable, and in which the parts are so shaped and coördinated that they may be manufactured and assembled or disassembled with great facility.

Other objects are to provide a gun in which the breech closure or bolt is locked in closed position during high breech pressure and is automatically unlocked directly in response to the breech pressure when the pressure decreases to a safe value (according to the discovery of Blish, Patent No. 1,131,319 granted March 9, 1915), in which this method of locking is incorporated in a breech closure adapted to reciprocate into and out of closed position and to rotate into and out of locked position, and in which a single spring is arranged to reciprocate the closure into closed position and to rotate the closure into locked position.

Other objects are to provide improved firing mechanism, extracting and ejecting mechanism and cartridge feeding mechanism, and to correlate these mechanisms with an automatic breech closure having both reciprocatory and rotary movement, and generally to improve guns of the character referred to.

In the accompanying drawings which illustrate one concrete embodiment of the invention,—

Figure 1 is a left side elevation with the magazine removed;

Fig. 2 is a vertical central longitudinal section with parts broken away;

Fig. 3 is a horizontal central longitudinal section;

Fig. 4 is a vertical central longitudinal section showing parts in elevation;

Fig. 5 is a bottom plan showing parts in section;

Fig. 6 is a vertical transverse section on line 6—6 of Fig. 2;

Fig. 7 is a vertical transverse section on line 7—7 of Fig. 2;

Fig. 8 is a vertical transverse section on line 8—8 of Fig. 3;

Figs. 9 to 12 are vertical central longitudinal sections of parts of the firing mechanism in their various operative positions; and

Figs. 13 and 14 are perspective views of the bolt and extractor respectively.

The particular embodiment of the invention chosen for the purpose of illustration consists of a caliber .22 target rifle which in general comprises a stock S, a barrel C, a frame or receiver formed in two parts F and F′, a bolt B, a firing pin P, a bolt actuating spring Y, a firing pin actuating spring N, an extractor E, an ejector E′, a trigger T, a magazine M, firing mechanism, etc. The stock is of the general shape illustrated in the drawings, and the frame parts F and F′ are mounted in a groove in the top of the stock. The rear portion F of the frame is provided with a cylindrical opening extending inwardly from its forward end and the forward end of this part is made cylindrical and is provided with threads on its outer periphery at the rear end of the cylindrical forward portion. The forward part F′ of the frame is substantially cylindrical throughout its entire length both inside and outside and is adapted to telescope snugly over the forward cylindrical part of the frame member F, the extreme rear end of the part F′ being provided with threads adapted to thread over the threaded part of F. The part F′ is interiorly threaded at its forward end to receive the barrel C. The frame member F′ is provided with an opening *r* in the bottom to receive cartridges from the magazine M and with an opening *u* at the right-hand side through which cartridge shells may be ejected and with a longitudinal slot *y* on the right hand side to receive the actuator A of the bolt. The ejector E′ is threaded through the left-hand side of the tubular frame member F′.

The bolt B, which is shown in perspective

in Fig. 13, comprises a substantially cylindrical forward portion and a tubular extension B′ extending rearwardly therefrom. The forward end of the bolt is somewhat smaller in cross-section than the rearward part and at the rear end of the forward part threads *a* are provided. A longitudinal slot *b* is provided on the left-hand side of the forward part of the bolt to receive the ejector E′, and the rear end of this slot is enlarged at one side to permit the bolt to rotate into locked position. The extractor E, which is shown in perspective in Fig. 14, has an annular threaded portion at its rear end adapted to thread over the threaded portion of the bolt B. A lip *k* is provided on the inside of the extractor near its forward end to seat in a slot in the side of the bolt to prevent the extractor from rotating relative to the bolt after being placed in position on the bolt, the arm of the extractor being sufficiently flexible to permit the forward end of the extractor to be flexed outwardly until the catch K clears the bolt while the extractor is being threaded on or off the bolt.

Locking lugs *l* and *l′* are provided on opposite sides of the bolt, these lugs having oblique rearward faces adapted to abut against oblique forward faces on the forward end of the frame member F when the bolt is in locked position. By inclining the abutting faces of the lugs *l* and *l′* at the proper angle according to the discovery set forth in the patent to Blish above cited, the bolt is automatically held in locked position at high breech pressure and is automatically unlocked directly in response to breech pressure acting through the bolt when the pressure has decreased to a safe value. This angle depends upon the caliber of the gun, the weight of the parts, etc., but for a gun of the character illustrated the angle should be of the order of 30° with respect to the normal to the line of breech pressure. Slots *a* and *a′* are provided in the sides of the tubular forward portion of frame F to receive the lugs *l* and *l′* when the bolt recoils.

An important feature of the present invention consists in associating with an automatic bolt of the character described a combined tension (*i. e.*, a compressible or stretchable) and torsion spring which will both return the bolt to forward position after it has been automatically retracted and also rotate the bolt into the locked position illustrated in the figures. Thus in the drawings the coil spring Y is disposed in the axial opening in the frame member F with its forward end abutting against the bolt and its rearward end abutting against the frame F. The forward and rearward ends of this spring are anchored to the bolt and frame respectively as shown at *m* and *m′* in Fig. 2, and in assembling the parts the spring is twisted in the direction which will tend to rotate the bolt in a clockwise direction into locked position.

The firing pin P comprises a central body portion *d* disposed axially in the tubular extension B′ of the bolt, a pin extending forwardly from the lower side of the forward face of the body portion *d* through an opening in the bolt B in alinement with the rim of the cartridge in the firing chamber, and a pin or rod extending rearwardly from the center of the body portion *d* axially through the opening in the frame F and thence into an opening *n* just large enough to receive and guide the rod. A spring N is provided around the rearwardly extending part of the firing pin, this spring abutting against the body portion *d* and the frame F at its forward and rearward ends respectively. The spring N is coiled in a direction opposite to the coil of spring Y to prevent the springs from interlinking. The rearwardly extending rod of the firing pin is provided with an annular notch *h* to coöperate with the firing mechanism which will now be described.

The firing mechanism comprises a trigger T pivotally mounted in the frame F on a transverse pin *j* and urged in a clockwise direction (Fig. 2) by a compression spring *q* seating in a socket in the stock S, as shown in Figs. 2 and 4. The firing mechanism also comprises a sear which, as illustrated in Figs. 9 to 12, consists of a tubular member U, a catch V fixedly secured in the lower end of the tube U, a plunger W slidably mounted in the upper end of the tube U, and a spring X fitted in an axial recess in the plunger W. The spring X bears against the bottom of the recess in the plunger W at its lower end and at its upper end against the pin *x* which passes through opposing slots *w* in the plunger and thence is secured in the opposite sides of the tube U. The tube U is provided with alined openings between the catches V and W, which openings are adapted to permit the rearwardly extending rod of the firing pin to extend through the tubular member. The trigger T is pivotally connected to the lower end of the tube U by means of a pin *t* which is fast to the trigger and which extends through openings in the opposite sides of the tube U, the openings in tube U being slightly elongated longitudinally of the gun to accommodate the arcuate movement of the pin *t* about the axis *j* of the trigger.

The magazine M is made of pressed metal approximately in the shape of a segment as illustrated in the drawings, the bottom and rear end of the magazine being closed and the top and forward end being open. The magazine is pivotally mounted to the barrel by means of a bracket I dovetailed into the

under side of the barrel, a pivot pin J passing through the opposite sides of the bracket I, and thence through the opposite sides of the lips r and r' of guard G, and magazine M. A follower H which is U-shaped in cross-section, as shown in Fig. 7, is pivotally mounted on the pin j at its forward end and a coiled spring K fitting around the pin j with its opposite ends bearing against the bottom of the magazine and bottom of the follower respectively is provided to urge the follower in a counter-clockwise direction (Fig. 2) about the pin j. An arcuate post D is secured in the magazine in substantially parallel relationship to the arcuate rearward end of the magazine and in advance of the rearward end of the magazine a distance substantially equal to the length of the cartridges. This post is U-shaped in cross section as illustrated in Fig. 5, and is provided with a lip at its lower end extending through a slot in the bottom of the magazine and with a screw e extending inwardly through the right-hand side of the magazine (Fig. 4), thence through the opposite sides of the post and thence into the opposite side of the magazine. The follower H is provided with an opening through which the post D extends.

Spring fingers O and O' are riveted to the opposite sides of the magazine M in the region of the cartridge chamber, the upper ends of these fingers being bent inwardly and then slightly outwardly over the mouth of the cartridge chamber so as to engage the upper cartridge and prevent the cartridges from being expelled by the follower H. The spring fingers O and O' are provided at their lower ends with shoulders adapted to engage over the guard plate G and hold the magazine in position, the extreme lower ends o and o' extending beneath the guard G and being knurled on their outer sides so that the magazine may be disengaged and swung downwardly about the pivot J by pressing inwardly on the parts o and o'.

The trigger guard G is secured to the stock by a screw g at its rearward end and its forward end is extended to the forward end of the magazine where it is provided on opposite sides with the bent up ears or tabs r and r' connected to the screw J for the purpose of supporting the forward end of the guard. In the region of the magazine the guard G is widened and is provided with an opening just large enough to receive the magazine, notches being provided on opposite sides of this opening to permit the passage of the spring fingers O and O' when the magazine is opened and closed.

The operation of the gun is as follows: Upon firing the gun with the bolt in locked position, as shown in Fig. 3, the breech pressure is transmitted through the forward end of the bolt to the locking lugs l and l', and thence to the oblique faces at the forward end of frame F. After the breech pressure has decreased to a relatively low value the lugs l and l' slide on said oblique faces thereby rotating the bolt in a counter clockwise direction until the lugs come into alinement with the slots a and a', whereupon the bolt is automatically retracted by the residual breech pressure. The recoil of the bolt is taken up by the spring Y which immediately returns the bolt to forward position. Any excess recoil which is not absorbed by the spring Y is absorbed by the rear end of the bolt striking the rear end of the chamber in frame member F, a leather washer or other shock absorbing device being provided between the rear end of the bolt and the rear end of said chamber to assist in absorbing the excess recoil if desired. When the bolt has been returned to forward position by the expansion of the spring Y it is rotated in a clockwise direction by the torsion imparted to the spring in assembling the gun and in rotating the bolt in a counter-clockwise direction in unlocking. This rotation of the bolt brings the lugs l and l' into the locking position illustrated in Fig. 3, etc. During the recoil of the bolt the empty cartridge case is extracted by the extractor E and ejected through the opening u by the ejector E'. During the forward movement of the bolt a fresh cartridge is fed to the firing chamber from the magazine.

The operation of the firing mechanism is as follows: When the gun is cocked the shoulder h on the firing pin is hooked over the catch V of the sear as illustrated in Fig. 9. Upon pulling the trigger the tube U and catch V are moved downwardly as a unit until the catch V disengages the firing pin, whereupon the pin is shot forward by the spring N. The parts will then occupy the relative positions shown in Fig. 10. If the trigger be held back the firing pin is caught by plunger W upon the recoil of the bolt as illustrated in Fig. 11. When the trigger is subsequently released the tube U moves upwardly into the position shown in Fig. 12 and during this upward movement the pin x engages the upper ends of the slots w in the plunger W and lifts the plunger out of engagement with the firing pin whereupon the pin snaps forwardly under the influence of spring N into engagement with the catch V. In this position the firing pin is again in position for firing. By virtue of this construction the firing pin is recocked during the recoil of the bolt whether the trigger is released before the end of the recoil or after the bolt has advanced.

To refill the magazine the fingers o and o' are pressed inwardly and the magazine is swung downwardly in a clockwise direction (Figs. 2 and 4). Cartridges are then in-

serted through the open end of the cartridge chamber and the magazine is swung back into the position shown in the figures.

From the foregoing description of one concrete embodiment of the invention it will be evident that according to the invention guns may be produced which in many respects are superior to guns heretofore provided. The reciprocatory rotary bolt is both reciprocated and advanced by a single spring which is placed under both tension and torsion, and the parts are so coördinated that the barrel may be fixedly connected to the frame and the bolt may be formed as a single integral part, in contradistinction to guns heretofore proposed. Moreover the discovery set forth in the aforesaid patent to Blish is so incorporated in a reciprocatory-rotary breech closure having a combined tension and torsion spring that the bolt is automatically unlocked and retracted and advanced and locked continuously without detention at any point in its movement, the parts being so coördinated that after the opening impulse has been imparted to the closure by the residual breech pressure and until the closure has returned to closed position the propulsion of the closure is controlled solely by the combined tension and torsion spring.

By virtue of the concentric arrangement of the tubular extension of the bolt and the body of the firing pin in slightly spaced relationship the combined tension and torsion spring is maintained accurately in position. Moreover the two springs Y and N coöperate with each other and with the rearwardly extending rod of the firing pin to maintain the springs in position as they contract and expand, the opposite winding of the springs preventing them from interlinking with each other.

From the foregoing it is evident that the bolt is moved into locked position solely by the torsion of the recoil spring and wholly without the usual oblique guides and other accessories heretofore employed. The elimination of the oblique guideways has not only the merit of doing away with the difficult and delicate task of accurately cutting these ways at the proper position and proper angle on the inner wall of the receiver chamber but also the more important merit of wholly avoiding certain disadvantageous features inherent in the prior construction, owing to the fact that the cam faces of the bolt lugs and guideways rapidly deteriorate from the blows of the lugs on the guideway in the closing movements of the bolt and to the fact that the oblique guideways cam the bolt over with excessive force in the closing movement of the bolt. By producing the rotary movement of the bolt by torsion of the recoil spring instead of by camming guideways the locking lugs are moved into locked position only with the slight force necessary to rotate the bolt.

I claim:

1. A gun comprising a receiver, a breech closure, oblique abutments on said receiver and closure respectively for retarding the opening of the closure upon firing, and a combined tension and torsion spring associated with said closure to reciprocate the closure forwardly by its tension and to move the closure abutments transversely in front of the receiver abutments by its torsion, said receiver being constructed to impart no force to move the closure abutments into position in front of the receiver abutments, whereby the transverse movement of the closure abutments into position in front of the receiver abutments is controlled solely by the torsion of said spring.

2. A gun comprising a receiver, a breech closure, oblique abutments on said receiver and closure respectively for retarding the opening of the closure upon firing, and a combined tension and torsion spring associated with said closure to reciprocate the closure forwardly by its tension and to move the closure abutments transversely in front of the receiver abutments by its torsion, said receiver being clear of the closure abutments on the forward side of the closure abutments, whereby the transverse movement of the closure abutments into position in front of the receiver abutments is controlled solely by the torsion of said spring.

3. A gun comprising a receiver having a circular bolt chamber, a bolt arranged in said chamber to reciprocate into and out of breech closing position and at the forward end of its reciprocation to rotate into and out of locked position, the bolt and receiver being concentric and being separated throughout a part of their length by an annular space, bolt and receiver abutments disposed in said space, the receiver abutments lying in the rear of the bolt abutments when the bolt is in locked position, the diameter of said chamber immediately in front of the locked position of said bolt being at least as great as the diameter of the bolt to the outside of the bolt abutments, and a combined tension and torsion spring arranged to reciprocate the closure forwardly by its tension and bring the bolt abutments into advance of the receiver abutments by its torsion.

4. A gun comprising a receiver, a bolt therein, locking abutments on the receiver and bolt respectively arranged to engage each other along surfaces inclined to the line of breech pressure at such angles that the bolt is maintained closed at high breech pressure but is caused to unlock when the breech pressure has decreased to a relatively low value, and a combined tension and torsion spring arranged to advance the bolt by

its tension and to lock the bolt by torsion, said parts being correlated to unlock the bolt in response to the breech pressure solely and to lock the bolt in response to said torsion solely.

5. A gun comprising a frame, a breech closing bolt mounted in said frame to reciprocate into and out of closed position and to rotate into and out of locked position, means for locking said bolt in closed position, a firing pin extending longitudinally through said bolt and thence rearwardly therefrom, and a coil spring disposed around the rearward portion of said pin between the said bolt and said frame, said spring being connected to the bolt and frame respectively at its opposite ends and being under both tension and torsion so as both to reciprocate and rotate the bolt, and said spring being positioned by said firing pin extending therethrough.

6. A gun comprising a frame, a breech closing bolt mounted in said frame to reciprocate into and out of closed position and to rotate into and out of locked position, means for locking said bolt in said last position, said bolt comprising a forward body portion and a rearward hollow extension, a firing pin extending longitudinally through said bolt and thence rearwardly therefrom through said hollow extension into an opening in said frame, and a coil spring disposed around said firing pin at least in part within said hollow extension, said spring being connected at opposite ends to said frame and bolt respectively and being subjected both to tension and torsion when said bolt is unlocked and retracted so as both to advance the bolt and rotate the bolt into locked position.

7. A gun comprising a frame, a breech closing bolt mounted in said frame to reciprocate into and out of closing position and to rotate into and out of locking position, a firing pin extending longitudinally through said bolt and thence rearwardly therefrom, a coil tension spring surrounding the rearward portion of said pin for actuating same, and a coil tension spring surrounding said first spring for actuating the bolt, said springs being coiled in opposite directions so as not to interlink with each other.

8. A gun comprising firing mechanism including a firing pin, a tubular member movable transversely of the firing pin, said member having an opening extending transversely therethrough and said pin extending through said opening, and a plunger catch movable longitudinally in said tubular member to hold said pin in retracted position.

9. A gun comprising firing mechanism including a firing pin, a firing pin sear movable transversely of the firing pin, said sear having a fixed catch and a movable catch, said catches being arranged so that the movable catch engages the firing pin in one position of the sear and when the sear is moved into another position the firing pin is released by the movable catch and engaged by the fixed catch.

10. A gun comprising a receiver having a circular bolt chamber, a bolt arranged in said chamber to reciprocate into and out of breech closing position and at the forward end of its reciprocation to rotate into and out of locked position, the bolt and receiver being concentric and being separated throughout a part of their length by an annular space, bolt and receiver abutments disposed in said space, the receiver abutments lying in the rear of the bolt abutments when the bolt is in locked position, and a combined tension and torsion spring arranged to reciprocate the closure forwardly by its tension and bring the bolt abutments into advance of the receiver abutments by its torsion.

Signed by me at New York, N. Y., this seventh day of August, 1919.

OSCAR V. PAYNE.