May 10, 1927. 1,628,226

J. M. BROWNING

AUTOMATIC FIREARM

Original Filed July 31, 1923 3 Sheets-Sheet 1

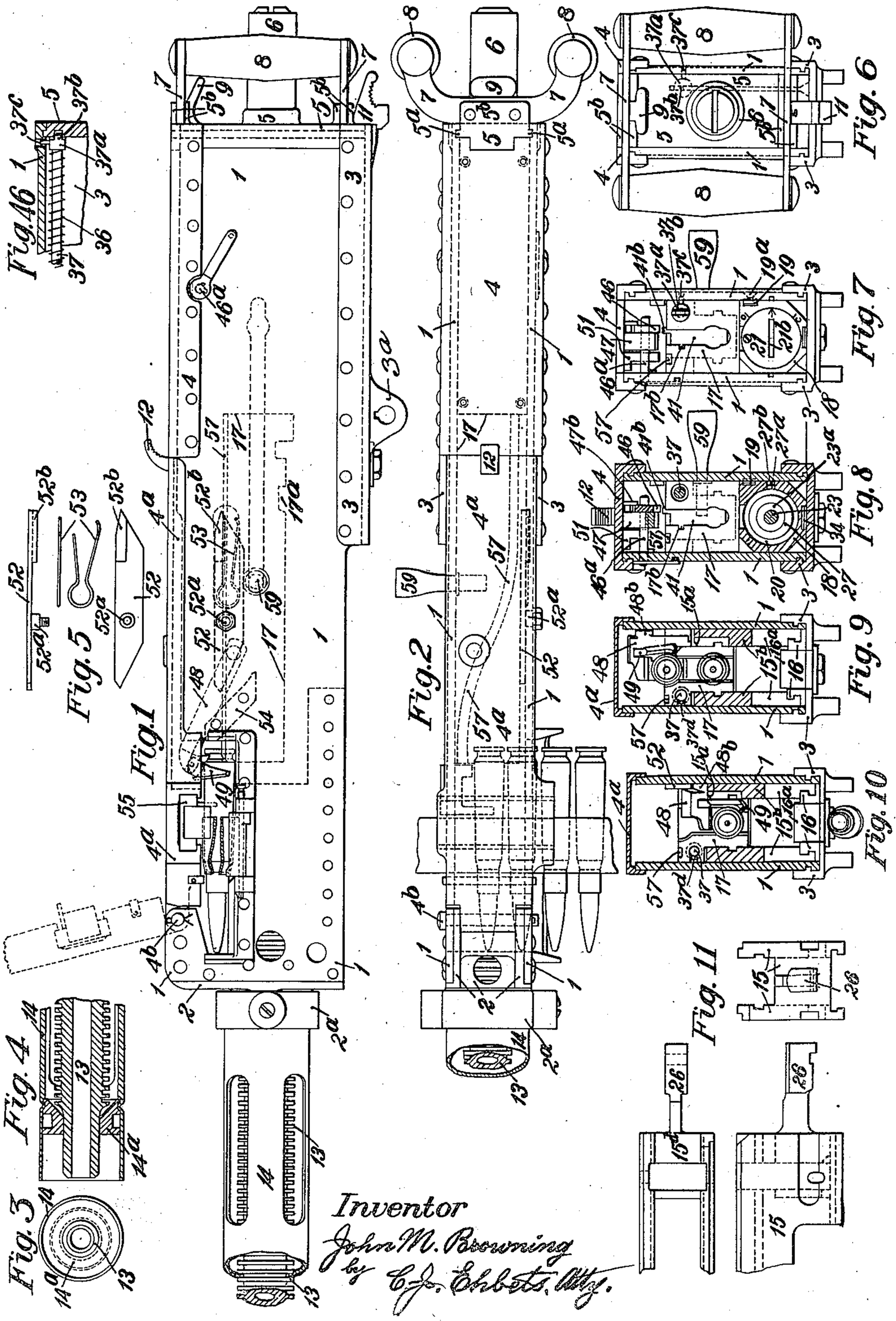

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

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AUTOMATIC FIREARM

Original Filed July 31, 1923 3 Sheets-Sheet 2

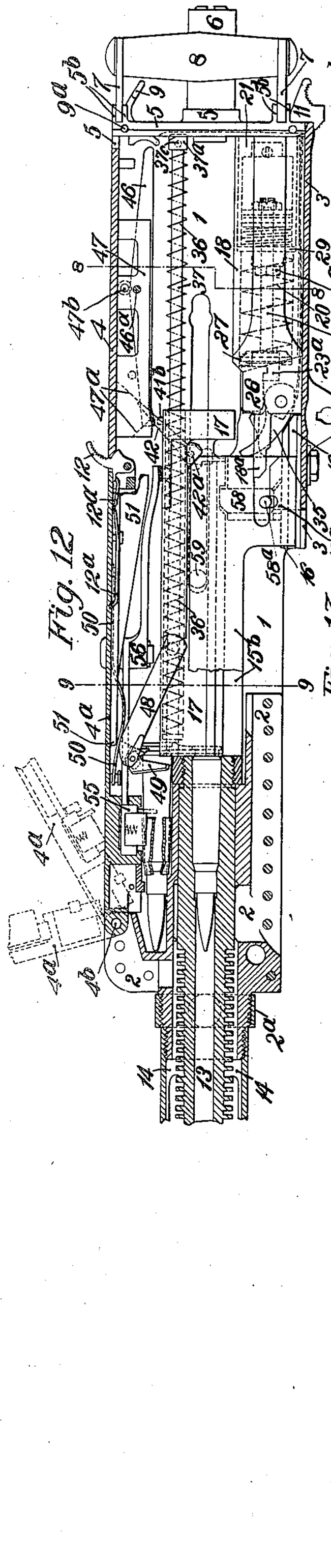

Fig. 12

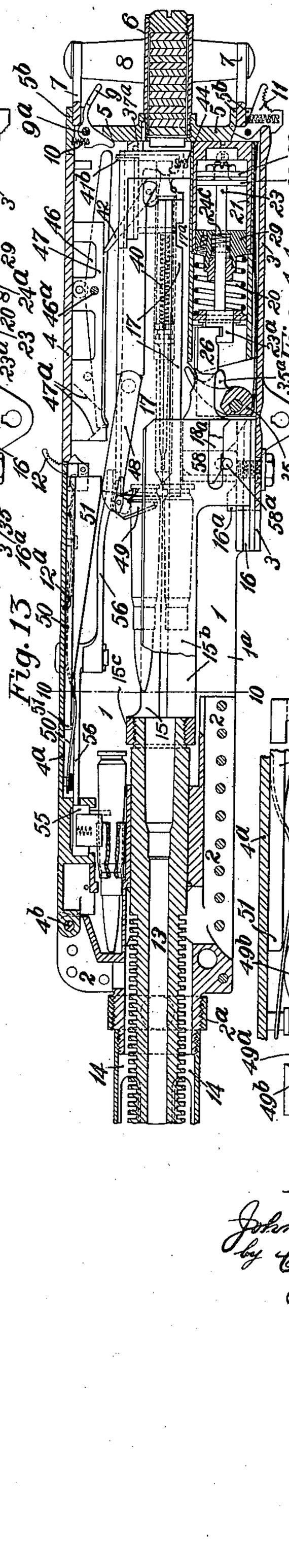

Fig. 13

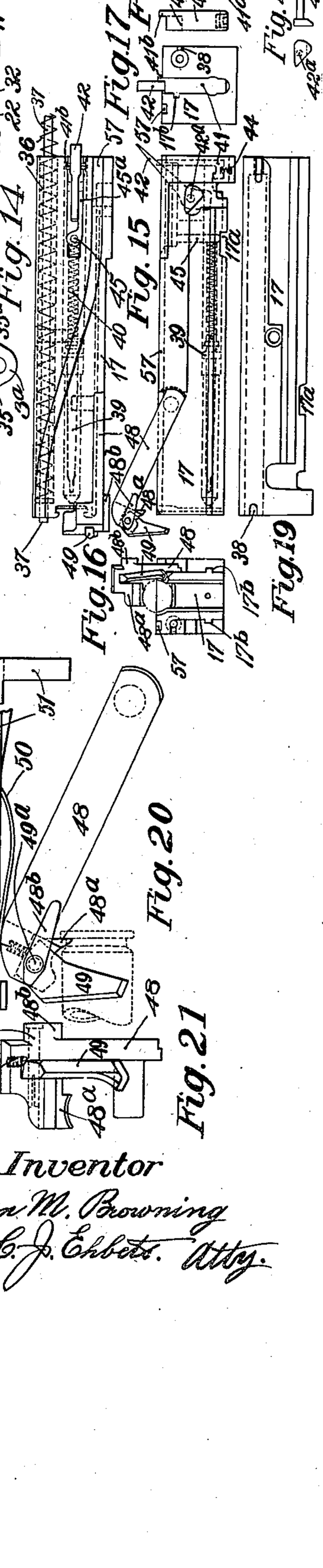

Fig. 14

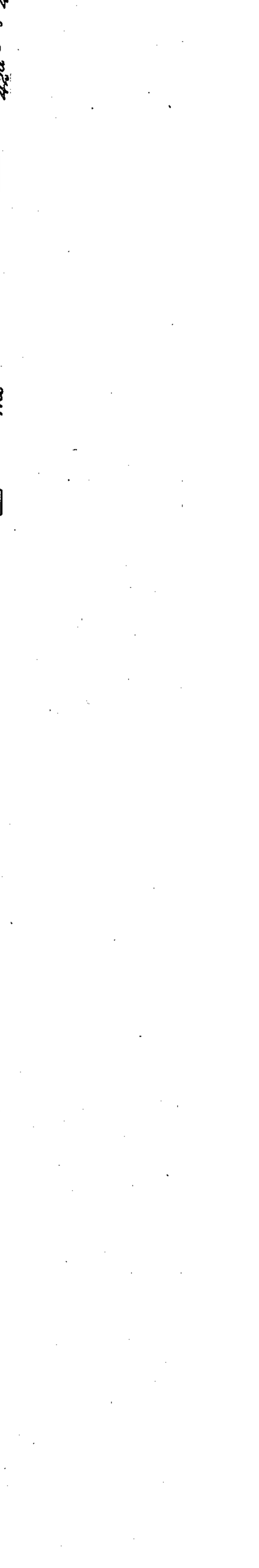

Fig. 15

Fig. 16

Fig. 17

Fig. 18

Fig. 19

Fig. 20

Fig. 21

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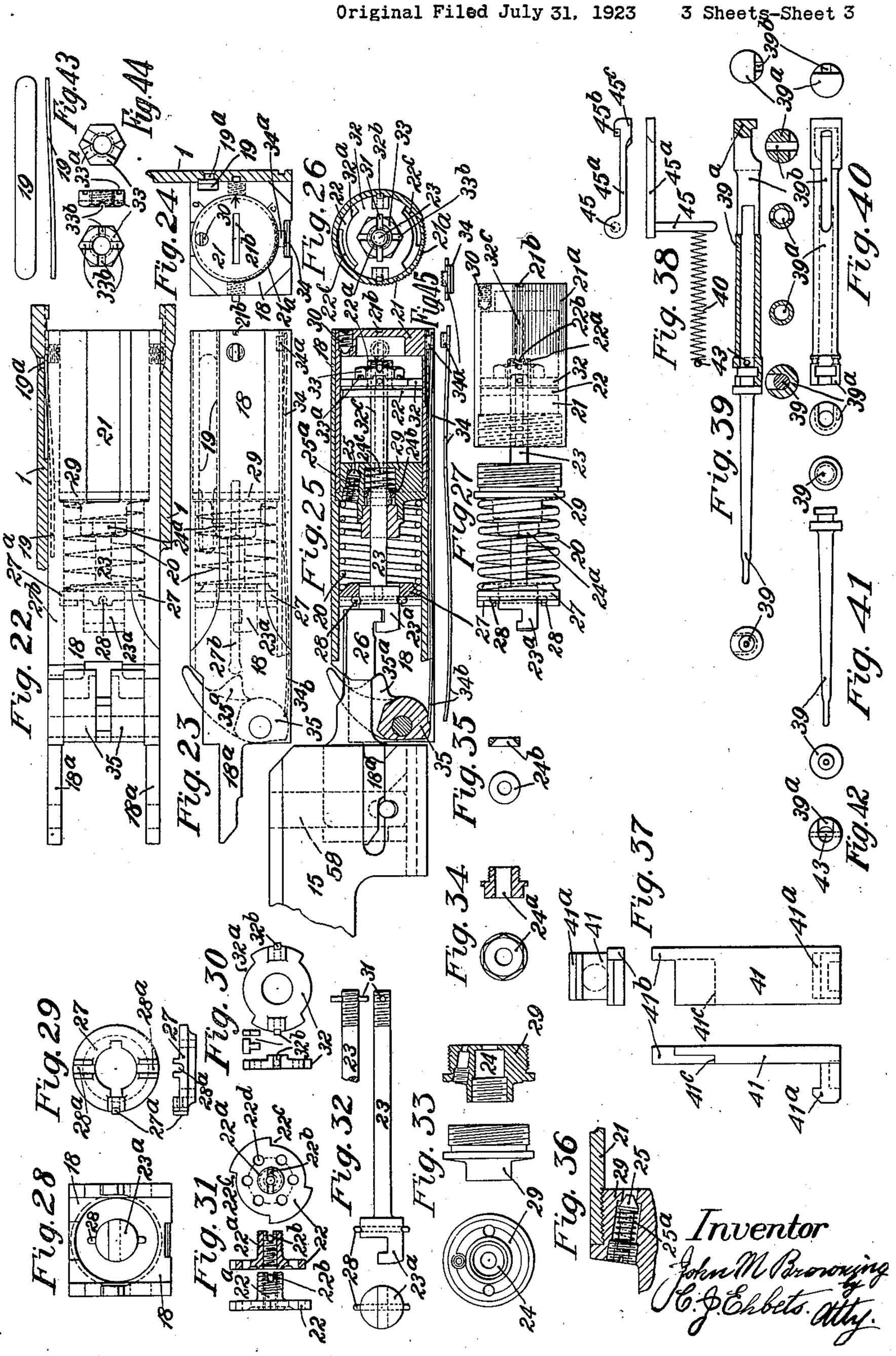
AUTOMATIC FIREARM

Original Filed July 31, 1923 3 Sheets-Sheet 3



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Patented May 10, 1927. 1,628,226

UNITED STATES PATENT OFFICE.

JOHN M. BROWNING, OF OGDEN, UTAH; JOHN BROWNING ADMINISTRATOR OF SAID JOHN M. BROWNING, DECEASED.

AUTOMATIC FIREARM.

Application filed July 31, 1923, Serial No. 654,955. Renewed May 15, 1926.

The invention relates generally to automatic machine guns of that description in which all operations of the mechanism are automatically effected by the energy of the recoil of the movable parts.

The invention relates particularly to novel improvements in recoil-operated machine guns, smilar to that disclosed in the Letters Patent of the United States granted to John M. Browning, No. 1,293,021, dated February 4, 1919, in which the barrel and breech closing block, while interlocked recoil together a limited distance, are then unlocked and the movement of the barrel is arrested; the breech closing block alone continues its recoil during which energy is stored in reaction springs or similar means by which all parts are finally returned to their forward firing positions.

The main object of the present invention is to produce a machine gun of this class specially adapted for modern military service. Experience during the war, and experiments since under actual field conditions, have led the United States War Department to adopt for use in certain branches of the service, such as the Anti-Air-Craft Service and for service in tanks, bullets or projectiles greatly increased in caliber, length and weight, and cartridge cases of increased size capable of holding correspondingly increased charges of most powerful explosives for driving said projectiles and for giving to them greatly increased ranges and power of penetration.

The machine gun of the present invention is adapted to fire these modern service cartridges; and while it has necessarily increased dimensions in diameter and length of certain of its parts, such as the barrel and breech mechanism, and of the lengthwise reciprocating movement of its breech opening and closing mechanism, these increases and the necessary strengthening of the entire structure of the machine gun are attained without a nearly proportional increase of the weight of said machine gun.

This object is attained by providing a composite brake or buffer in rear of the heaviest recoiling members of the breech mechanism, said brake consisting of the combination of a spring actuated recoil cushion combined with a brake chamber for holding a liquid by which any excess of energy of recoil is entirely absorbed; and by which even an excess of recoil, such as may possibly be caused by variations in the rate of speed of the ignition of the powder charges by the primers of the cartridges, will be absorbed without disastrous effect on the structure or the mechanism of said machine gun.

For furthering the attainment of this object there are also provided in rear of the breech closing block cushioning devices for absorbing any excess of energy of recoil of said breech block; as well as devices for strengthening the breech casing of the machine gun supporting said cushioning devices.

Other and further objects and advantages will appear from the following disclosure.

By the foregoing and other novel constructions which will be hereinafter fully described and pointed out in the appended claims, an improved machine gun is produced, adapted for firing the modern powerful military ammunition, reliable, accurate, strong and absolutely safe under all conditions.

In the accompanying drawings:

Fig. 1 is a side elevation of the left-hand side of the gun, the forward portion of the barrel and of the tubular barrel casing being broken away.

Fig. 2 is a top view of the gun, the greater portion of the barrel and of the barrel casing being broken away.

Fig. 3 is a front end view of the barrel, of the tubular barrel casing and of the internal fixed disk closing said barrel casing and guiding the muzzle of the barrel.

Fig. 4 is a longitudinal section of the foremost portions of the barrel and the barrel casing, and of the internal fixed disk.

Fig. 5 shows the pivoted switch lever, detached, respectively in a top view and in a left-hand side view; it also shows similar views of the switch lever spring.

Fig. 6 is a rear end view of the gun.

Fig. 7 is a rear end view of the gun with the rear plate removed, showing the breech casing and the mechanism therein.

Fig. 8 is a vertical transverse section through the breech casing on the line 8—8 of Fig. 12, seen from the rear.

Fig. 9 is a vertical transverse section through the breech casing in the plane indicated by the line 9—9 of Fig. 12, seen from the front and showing the forward end of

the breech block and parts of the cartridge feeding mechanism; members of the mechanism attached to the under side and to the top side of the top cover of the casing have been omitted.

Fig. 10 is a vertical transverse section through the breech casing in the plane indicated by the line 10—10 of Fig. 13, seen from the front and showing parts of the mechanism for feeding cartridges and for ejecting the cartridge shells in their lowest position; members attached to the top cover have been omitted, as in Fig. 9.

Fig. 11 shows a rear portion of the barrel extension, detached, respectively in a left-hand side view, in a top view and in a rear end view.

Fig. 12 is a central vertical longitudinal section through the breech casing, interior members of the mechanism and the rear plate of the casing being shown in elevation; the barrel, barrel extension, and breech block are in their forward closed positions, the forward portions of the barrel and of the tubular barrel casing being broken away.

Fig. 13 is a central vertical longitudinal section through the breech casing and some of the members of the interior mechanism, the rest of said members being shown in elevation; the barrel, barrel extension and breech block are in their rearmost open positions, the forward portions of the barrel and of the barrel casing being broken away.

Fig. 14 is a top view of the breech block, detached, and of parts carried thereby.

Fig. 15 is a left-hand side view of the breech block and other parts shown in Fig. 14.

Fig. 16 is a front end view of the breech block, detached, showing the feed extractor and the shell ejector mounted thereon.

Fig. 17 is a rear end view of the breech block, detached, showing the sear and the cocking lever.

Fig. 18 shows the sear detached from the breech block, respectively in a rear end view and in a left-hand side view.

Fig. 19 is a right-hand side view of the detached breech block.

Fig. 20 is a left-hand side view of the feed extractor, detached, and of the shell ejector pivotally attached thereto, on an enlarged scale; this figure also shows in connection with the side view of the feed extractor, a portion of the top cover of the breech casing in longitudinal section and with parts mounted thereon for co-operation with the feed extractor; the feed extractor cam is also shown in this figure, detached and in a rear view.

Fig. 21 is a front end view, on the same scale as Fig. 20, of the feed extractor, detached, and of the shell ejector pivotally attached thereto.

Fig. 22 is a top view of the combined breech block guide and brake body, with the rear portions of the adjacent side walls of the breech casing in horizontal section.

Fig. 23 is a left-hand side view of said combined breech block guide and brake body.

Fig. 24 is a rear end view of said combined breech block guide and brake body, with the rear portion of the adjacent right-hand side wall of the breech casing in a vertical section.

Fig. 25 is a vertical longitudinal section through said combined breech block guide and brake body, showing the interior mechanism and the interconnection of said mechanism with the barrel extension, the rear portion of which is shown in elevation.

Fig. 26 is a vertical transverse section, seen from the rear, of the brake tube, detached from the breech block guide, said section being taken slightly forward of the closed integral rear end of said tube, showing the interior of said tube and a rear view of the compound piston therein.

Fig. 27 is a side view showing the detached brake tube with the compound piston therein, the piston rod extending in front of said tube through the separated flanged diaphragm which normally serves to close the forward end of said chamber. The piston rod is surrounded by a helical buffer spring, the rear end of said spring resting against the face of said diaphragm with the forward end of said spring bearing against a front bearing washer.

Fig. 28 is a front end view of the combined guide and brake-body and associated parts.

Fig. 29 shows the spring-supporting washer, detached, respectively in a front view and in a bottom view.

Fig. 30 shows the rear disk of the compound piston, detached, respectively in a rear view and in a left-hand side view; this figure also shows one of the T-shaped pins carried by said disk, detached and in two views.

Fig. 31 shows the forward disk of said piston, detached, respectively in a rear view, in a central vertical longitudinal section, and in a left-hand side view.

Fig. 32 shows the piston rod, detached, respectively in a left-hand side view, in a front end view and in a partial top view.

Fig. 33 shows the flanged, threaded diaphragm, detached, respectively in a front view, in a left-hand side view, and in a central vertical longitudinal section.

Fig. 34 shows the stuffing box gland for said diaphragm, detached, respectively in a front view and in a central vertical longitudinal section.

Fig. 35 shows a washer for the compression of the packing in the stuffing box in views similar to those in Fig. 34.

Fig. 36 is a central vertical longitudinal section of the upper portion of the diaphragm and of a portion of the brake tube, showing the safety valve on an enlarged scale.

Fig. 37 shows the sear, detached and on a greatly enlarged scale, respectively in a left-hand side view, in a rear view, and in a top view.

Fig. 38 shows, on an enlarged scale, the vertical pin forming the rear abutment for the main spring and the integral horizontal arm carried at its upper end by said pin, detached from the breech block, in a top view and in a left-hand side view; the side view shows said vertical pin in its relation to the main spring and also shows the transverse pin forming the forward abutment for said spring.

Fig. 39 shows, on the same scale as Fig. 38, the compound firing pin, assembled, respectively in a longitudinal vertical section, in a front view, in a rear view and in several transverse sections.

Fig. 40 shows the rear part or body of said firing pin, detached, respectively in a top view, in a front view and in a rear view.

Fig. 41 shows the forward pointed portion of the firing pin, detached, in a top view, in a front view and in a rear view.

Fig. 42 is a front view of the rear part or body of said firing pin, detached, with the transverse pin seated in its position therein to serve as the forward abutment for the main spring.

Fig. 43 shows a flat spring in the same position in which it is shown in Fig. 22, but detached, and it also shows a top view of said spring.

Fig 44 shows the nut for limiting the rearward movement of the rear piston disk, detached, respectively in a rear view, in a side view and in a front view.

Fig. 45 shows, detached from the breech block guide, the spring pawl for holding the liquid brake in adjusted position, which pawl has an integral forward extension for co-operation with the accelerator, respectively in a left-hand side view and in a rear view.

Fig. 46 is a horizontal, longitudinal section of portions of the rear plate and of the right-hand side wall of the breech casing, showing the co-operative relation between these parts and the reaction spring guide rod, seen from above.

Fig. 47 shows the cocking lever pivot pin, detached, in a side view and in a rear view.

Similar numerals refer to similar parts throughout the several views.

The machine gun represented in the drawings comprises the following main parts.

The casing 1 enclosing the breech mechanism is rectangular in form or cross section; and its two strong vertical side plates are, at the front, firmly attached by rivets at a number of points to the front block 2 of the casing. To further unite the sides of the breech casing with said front block, a series of strong transverse rivets has been added in a plane parallel to the axis of the gun but a distance below it with their centers preferably distributed in said plane, the foremost rivet being some distance in rear of the face of said block 2, and the rearmost one being near the rear end of the rearward extension of said block. For some distance in rear of said block 2, the breech casing is downwardly open at 1^a for the ejection of the cartridge cases.

As shown in Figs. 1, 12, and 13, the rear half of the breech casing is offset, being extended downwardly, thereby providing a greater depth of said casing to accommodate certain elements of the novel improved construction. Beneath this downwardly extended portion of the casing, a strong bottom plate 3 is provided which extends on each side beyond the casing and carries on each side a strong upwardly projecting flange clasping the outside of the casing. On each of its flanges the bottom plate 3 is provided in its entire length with an inwardly projecting longitudinal rib, and the strong side plates of the casing 1 have each a corresponding longitudinal exterior groove near its bottom, so that the bottom plate can only be placed in position beneath the breech casing by being slid forwardly thereunder, thereby vertically interlocking said plate with said breech casing. In order to interlock them also longitudinally, the flanges are permanently tied to the casing by a series of strong rivets through each of the flanges and each of the side plates.

In a similar manner, the top of the casing 1 is closed, for some distance forward of its rear end, by a permanently fixed top plate 4 which extends on each side beyond the casing and carries on each side a strong downwardly projecting flange clasping the outside of the casing. On each of its flanges, the top plate 4 is provided in its entire length with an inwardly projecting longitudinal rib, and the side plates of the casing have each a corresponding longitudinal exterior groove near its top, so that the top plate can only be placed in position above said breech casing by being slid forwardly thereover, thereby vertically interlocking said plate with said breech casing. In order to interlock them also longitudinally, the flanges are permanently tied to the casing by a series of strong rivets through each of the flanges and each of the side plates.

As the best of steel is employed for its production, and with the construction hereinabove specified, the breech casing has been given the form of a very strong rectangular hollow steel beam, all parts of which are rigidly and permanently fixed together and

thus best adapted to resist the strains to which they are liable to be exposed by the firing of the powerful modern ammunition hereinbefore described. This construction makes the breech casing in this present case much superior in strength over those of machine guns as heretofore produced, because, in the latter, the parts composing the breech casing are but lightly interconnected and are liable to yield under the strains due to the firing of the modern powerful ammunition.

Though the strength of the breech casing has been greatly increased, as explained, its weight has been increased much less than proportionally.

The forward portion of the breech casing 1 is closed at the top by the cover 4ª which is pivoted at its forward end to the block 2 by a transverse pin 4ᵇ; this cover, when lowered to the closed position, rests upon the top of the casing and, extending on each side beyond the casing, has two downwardly projecting flanges which clasp the casing, as shown in Figs. 1, 2, 9 and 10. In Fig. 1, the forward portion of the top cover is shown, in dotted lines, turned fully forward; in Fig. 12 it is similarly shown turned forward, but, in addition, it is also shown in an intermediate position between its closed and its fully forward positions.

The top cover 4ª is locked in its closed position by the latch 12 carried thereby and rotatable in a forward direction on its horizontal transverse pivot pin located beneath the rear end of said cover, said latch being held in its cover-locking position with a shoulder thereon engaging under the forward end of the fixed top plate 4 by the spring 12ª. See Figs. 12 and 13. In Fig. 13, the forward portion of the latch 12 and its spring 12ª are represented by dotted lines, because said parts are covered by a longitudinal cam 51 located on the lower surface of the cover and on the left-hand side of said latch 12 and its spring 12ª. In Fig. 12, the forward portion of the latch 12 and the rear end of the spring 12ª are clearly shown in full lines, as the upper rear portion of the cam 51 has, for this purpose, been broken away.

In the present case, the breech casing can be opened at its rear end only by the removal in upward direction of the rear plate 5 closing said casing. Said rear plate 5 slides downward in mounting it and upward in dismounting it, between the side plates of the casing 1, which are strengthened at their rear ends by outward reinforcements; during these movements the rear plate is guided by ribs 5ª, see Fig. 2, on its respective sides fitted into corresponding grooves in the respective side plates of the breech casing.

It must be obvious that the hereinbefore described fixed, rigid and permanent interconnection of the side plates of the casing 1 by means of the flanged bottom plate 3 and the flanged top plate 4 and by the rivets through said flanges and side plates, is of the greatest importance. In machine guns as heretofore produced in which the parts composing the breech casing are but lightly interconnected, the rear plate, which must perform the functions of securely supporting the recoiling members of the breech mechanism in their rearmost position and also of absorbing any strain due to an excess of recoil, cannot perform these most important functions if, by bending or laterally yielding outward, the side plates should fail to support the rear plate in its operative lowest position, thus making it and the recoiling members in the casing liable to be thrown violently rearward out of the gun.

By the present construction, such bending or lateral yielding of the side plates is positively prevented by the fixed, rigid and permanent interconnection hereinbefore described.

Centrally on the rear face of the plate 5 a strong circular hub is provided for supporting the tube 6 in which a shouldered plunger for cushioning the breech block is located; said plunger being forwardly supported by an inward shoulder in said hub. The tube 6 is closed at its rear end by a screw plug between which and said plunger is arranged an elastic packing, the effectiveness of which may be varied by adjusting said plug.

At the top the rear plate 5 has a forwardly projecting transverse flange which fits into a recess in the top plate 4, see Figs. 2 and 12, the upper surface of said flange lying in the same plane as that of said plate 4.

Projecting rearwardly from its rear face, the plate 5 has two strong transverse double flanges 5ᵇ, one at its top, the other near its bottom, see Figs. 1, 2, 6, 12 and 13. The spaces formed between the parts of the respective flanges are adapted for receiving respectively upper and lower handle plates 7, which, when thus located, are rigidly secured by suitable means to said flanges and extend laterally and rearwardly outward from the plate 5 and serve for the attachment to them of the two strong vertical handles 8. These handles 8 are adapted to be grasped by the operator of the machine gun for giving to the same the necessary elevations or depressions and the desired lateral training in aiming the gun.

Centrally between the handles 8 and just below the top portion of the upper double flange 5ᵇ of the rear plate 5, the trigger 9 of the gun is mounted upon a transverse pivot pin 9ª. Below and forward of said pivot pin 9ª a downward and forward extension serves to connect said trigger operatively with the firing mechanism to be described.

A small helical spring 10 is seated between a shoulder on said trigger extension and the under side of the forward flange on said rear plate 5, which spring serves to yieldingly keep said trigger in its inoperative position. The outside rearmost portion of the trigger 9 extends downward and is made of a sufficient width to adapt it for being operated, at will, for firing the gun by either thumb of the operator's hands grasping the handles 8 and by exerting downward pressure upon the top of the trigger.

As shown in Figs. 1, 6, 12 and 13, centrally at the bottom of the rear plate 5 the locking latch 11 is seated therein on a transverse pivot pin. The lower end of said latch has a hook-shaped forward extension which takes a positive and secure hold under the rear end of the bottom plate 3 of the casing, thereby locking the rear plate 5 vertically in its seat. Said latch 11 has also a rearward extension the under side of which is serrated and forms a finger piece by upward pressure against which the latch 11 may be turned rearward and upward, thereby releasing its hold on the casing and freeing the rear plate 5 for upward removal from the same. A small helical spring is seated within the latch 11, its lower end resting upon the bottom of its seat in said latch, its upper end bearing against the lower handle plate 7, thus serving to return said latch to its operative locking position whenever the rear plate 5 is returned to its lowest position; to permit such return of said plate the lowest forward portion of said latch is inclined forwardly and upwardly. It will be observed that the construction is such that the operator can release the latch and by continuing the upward movement of his hand remove the rear plate.

The barrel 13 is slidably supported near its rear end in the front block 2 and extends forwardly therefrom through the cylindrical tubular barrel casing 14, in which its forward end is lengthwise movably supported as shown in Figs. 3 and 4, by the disk 14[a] fixed in said barrel casing, preferably by indenting the metal of the barrel casing into an annular groove formed in the periphery of said disk. The tubular barrel casing 14 is secured at its rear end, preferably by screw threads, upon a correspondingly threaded forward projection of the front block 2; said barrel casing 14, throughout its length, is provided with numerous elongated openings for the free admission of air for cooling said barrel, said openings being in staggered relation to each other to insure the air to contact with the entire surface of said barrel, which, moreover, is divided into numerous alternating projections and recesses in order to increase its surface.

Directly in rear of said screw-threaded forward extension of the front block 2 to which the rear end of the barrel casing 14 is secured, is a second cylindrical threaded portion, of somewhat larger diameter, of the front block 2. This serves to provide the seat for a ring 2[a] which bears on each of its sides a trunnion projecting at right angles to the axis of the barrel and thus adapting this machine gun to be, at will, mounted upon a gun mount provided with suitable trunnion boxes.

In order to further adapt this machine gun to be, also at will, mounted upon another mount of different construction, a transverse pivot hole 2[b] is provided through the side plates and the front block 2 of the breech casing 1 adjacent to the front face and the bottom side of said casing and the bottom plate 3 has depending from it, adjacent its sides, lugs 3[a] provided with transversely aligned perforations adapted to receive a transverse pin of the mount (not shown).

For the same purpose for which the openings in the barrel casing are made, the front block 2 also is provided with large openings for the free entrance of the cooling air. As shown in Fig. 1, two circular air openings penetrate both the side plates and the block 2; and, as shown in Figs. 2, 12 and 13, a similar circular air opening is provided through the top of the block 2. A considerably larger opening is made downward through the block 2 below the barrel. The location of these vertical and transverse openings is such that it coincides with that portion of the barrel most exposed to become heated by the firing of the gun, being just forward of the firing chamber. Between the rear end of the said large downward opening through the front block 2 and the shell ejection opening of the breech casing hereinbefore described, an integral portion of said block 2 remains below the barrel to support and guide the same in its recoil and counter recoil.

The usual barrel extension 15 is adjustably secured to the breech end of the barrel 13. The barrel extension comprises two separated side members 15[b] with a transverse front connecting member 15[c] which receives and is connected to the end of the barrel and with a rear transverse connecting member 15[d]. The two side members at their outer surfaces are in contact with or at least immediately adjacent the side plates 1 of the casing. For some distance forward of their rear ends the said side members of said barrel extension have downward projecting portions of considerable length and depth, the offset rear half of the under side of the breech casing hereinbefore described providing space above the bottom plate 3 for receiving said portions, see Figs. 12 and 1[illegible]. The bottom plate 3 of the breech casing has on its upper surface in rear of the ejection

opening 1ª of said casing, a wide, central, upwardly projecting rib 16, and said rib is T-shaped, being widest at the top; the lowest part of said downwardly projecting portions of the side members of the barrel extension are slotted to fit over said rib 16 on the bottom plate 3. Said T-shaped slot extends lengthwise through the entire downward projecting portions of the side members of the barrel extension, and the T-shaped rib 16 on the bottom plate is as much longer than said projecting portions as is necessary to guide the latter in their entire lengthwise movement.

The breech block 17 is supported and guided between the side members of the said barrel extension 15 for longitudinal movement to open and close the breech of the barrel. The breech block 17 has longitudinal ribs 17ᵇ at its sides engaging corresponding grooves in the side members of said barrel extension. Said breech block is locked in its forward barrel-closing position by a vertically sliding locking block 58 which is located in a corresponding mortise in the rear portion of the barrel extension 15.

For effecting the upward locking movement of said block 58 a central longitudinal upward projection 16ª is provided on the top of the bottom plate 3 of the breech casing, the vertical forward end of said projection being some distance in rear of the forward end of the T-shaped rib 16. The said projection 16ª extends rearward some distance and ends in a cam formed by an incline in rearward and downward direction. During the last of the forward movement, or counter recoil, of the barrel 13 and barrel extension 15, with the breech block 17 therein, also in its forward position, the depending lower end of the locking block 58 is engaged by said inclined cam and forced upward, thereby positively locking said breech block in its forward position in said barrel extension and thus securely closing and locking the chamber in the breech of the barrel, see Fig. 12.

During the rearward movement or recoil of the barrel and barrel extension with the breech block therein, after firing a shot, the lower end of the locking block 58 is carried rearward beyond the inclined cam on the projection 16ª, in which position said locking block may be lowered from its breech block locking position to its inoperative position.

The lower portion of the breech block 17 in its forward locked position, see Fig. 12, is almost entirely contained between the side members of the barrel extension 15, but in its open rear position, see Fig. 13, the greater part of its length projects beyond the rear of the barrel extension, the rearmost downwardly projecting portion of the breech block then resting upon and being guided by suitable means supplemental to the barrel extension and carried directly by the casing. Preferably for this purpose I provide a breech block guide 18, said guide being located in the breech casing 1 in rear of the barrel extension 15 and having a plane top surface. It will be seen that, as in its rear position, Fig. 13, the under side of the breech block contacts only at its forward and its rear ends with guiding surfaces, the breech block may be moved to and from said position with a minimum expenditure of force, comparatively a small amount of friction having to be overcome.

In order to permit, by the lowering of the locking block 58, the unlocking of the breech block 17 for movement in the barrel extension 15, said locking block 58 is provided with a transverse pin, 58ª, the ends of which project from the sides of said locking block into corresponding vertical slots through the side members of the barrel extension, thereby keeping the locking block in its seat in the barrel extension while allowing it the necessary vertical movement. To effect the lowering of the locking block 58, the breech block guide 18 in rear of the barrel extension is provided with two horizontal arms 18ª projecting forwardly from its vertical side walls and rigidly connected therewith, said arms fitting into corresponding horizontal grooves in the outer sides of said barrel extension which cross the vertical slots therein. The breech block guide 18 and the arms 18ª thereof are stationary in the breech casing and the forward ends of the arms 18ª are provided with downward and rearward, inclined surfaces forming cams. These cams engage the laterally projecting ends of the transverse pin 58ª during the last portion of the recoil or rearward movement of the barrel extension 15 and force said locking block 58 downward from the locked to the unlocked position and keep the same therein. See Figs. 12, 13, 22, 23, 25 and 28.

In Fig. 11, the rear portion of the barrel extension 15 is represented, on a reduced scale, respectively in a top view, in a side view and in a rear view, the top view and the side view of this Fig. 11 clearly show the vertical mortise for the locking block, the top view, the side view and the rear view all show the vertical slots for the transverse pin, and the side view and the rear view also clearly show the horizontal grooves in the outer sides for receiving the projecting arms of the breech block guide.

Upon the firing of a shot, the heavy barrel 13 and barrel extension 15 together with the breech block 17 recoil under the pressure of the powder gases unbalanced in rearward direction exerted against the closed end of the cartridge shell and by it transmitted to the breech block 17. During the recoil of these parts interlocked, the locking block 58 is low-

ered by the action of the cams on the arm 18ª of the stationary breech block guide 18, thus releasing the breech block 17. The released breech block 17 then independently continues its movement in the barrel extension 15. Preferably in order to insure the movement of the breech block through a sufficient distance a supplemental impulse is transmitted to it by an accelerator 35, which is mounted on a stationary pivot at the rear of the barrel extension 15. The barrel extension, during its recoil, turns the accelerator 35 on its pivot, and thereby causes the tip of said accelerator to engage a projection on the bottom of the breech block 17 and to throw the same to the rear at an increasing rate of speed. Said increasing rate of speed is caused by the pressure of the rear face of the barrel extension 15 against the curved forward surface of the accelerator 35, the point of contact between said parts lying, at first, at said tip of the accelerator, but progressively moving nearer to the center of the accelerator's pivot, as clearly shown in Figs. 12 and 13. The impulse transmitted to the breech block 17 by the accelerator 35 carries it to its open rear position, any excess of energy of recoil of said breech block 17 being absorbed by the cushioning means hereinbefore described reinforced by the reaction spring 36, see Fig. 12.

The great length of the cartridges for the use of which the present machine gun is adapted necessitates a long breech block and an opening movement of the same somewhat longer than the cartridge, as obviously lengthwise movement of the breech block must include the clearance necessary for the downward movement of the cartridge following the lengthwise movement of the block. It is to insure this considerable lengthwise movement that the accelerator 35 is provided.

The cartridges are very powerful and the barrel, barrel extension and breech block must therefore be of considerable size and strength and of considerable weight in order to accommodate them. The cartridges fired in the regular manner cause a very strong recoil of the parts and the energy of this recoil, at least in so far as contained in the barrel and barrel extension, must be absorbed. Some of the energy must be not only absorbed but also dissipated, and I therefore provide a suitable braking device for absorbing and dissipating some of the energy. A part of the energy, however, must be stored for use in returning the barrel and barrel extension during the counter recoil movement, and I therefore combine with the braking device a suitable resilient device such as a spring.

The energy absorbing means or mechanism which is provided is located immediately at the rear of the barrel and barrel extension, and preferably below the path of movement of the breech block. This arangement of parts brings the energy absorbing mechanism close to the parts with which it is directly associated and also avoids any interference with the free movement of the breech block.

Preferably the energy absorbing mechanism is constructed as a self contained unit which is normally held in fixed position in the casing, but which is capable of being removed therefrom. The removal of this mechanism is preferably effected through the opening at the rear of the casing and the cover 5 preferably serves as a means for holding the energy absorbing mechanism in place. The energy absorbing mechanism while normally connected with the barrel extension is preferably detachable therefrom. In order that detachment may be readily effected I preferably provide a construction which permits these parts to be detached by a relatively lateral movement when they are removed from the casing.

The before-mentioned breech block guide member 18 is preferably made hollow or tubular and serves as a carrier or casing for the energy absorbing mechanism.

The said guide member 18 fits between the sides of the breech casing with its flat bottom resting upon the bottom plate 3 of the same, while its flap top guides and supports the breech block 17 and its rear end rests against the rear plate 5, see Figs. 12 and 13. The member 18 is preferably provided with a longitudinal bore which forms a liquid receiving chamber and a piston is provided which is longitudinally movable in the chamber. Connected with the piston is a piston rod 23 which is adapted to be connected at its front end with the barrel extension 15. Preferably as already stated, the connection is such that the parts can be readily disconnected by a relative lateral movement when they are removed from the casing.

As shown and as preferred the barrel extension has connected with the portion 15ᶜ thereof a central rearwardly projecting arm 26. The forward portion of said arm nearest the barrel extension corresponds in width with a central vertical opening in the accelerator 35, thereby allowing said accelerator to freely move independently of said arm. At the rear of said forward portion the arm 26 has a lateral downward shoulder, being considerably increased in width and height, and in front of its rearmost portion said arm 26 has a further downward extension which provides a means of connection with a head 23ª on the piston rod 23. The said head 23ª carries an upward projection which interlocks with the said downward projection on the arm 26, see Figs. 13, 25 and 32. It will thus be seen that the parts are connected for longitudinal movement but

that they can be readily disconnected by moving the piston rod 23 and the head 23ª transversely of the arm 26.

A washer 27, guided in the cylindrical bore of the breech block guide 18, surrounds the rear portion of the head 23ª of said piston rod 23, said washer being held against independent rotary or forward movement on the head 23ª by radial projections 28 on said head and corresponding recesses 28ª in the forward face of said washer 27, see Figs. 32 and 29.

In rear of said washer 27, the piston rod 23 is surrounded by a helical reaction spring 20, the forward end of which is supported by said washer 27, and the rear end by the forward face of a diaphragm 29. As shown in Figs. 25 and 27 the piston rod 23 passes rearwardly entirely through the diaphragm 29; and the rear portion of said diaphragm is threaded and screwed firmly into the correspondingly threaded forward end of a cylindrical brake tube 21 fitted in the somewhat enlarged rear portion of the bore of the breech block guide 18. A central flange on the diaphragm 29, having a diameter approximately equal to that of the outside of the brake tube 21, is located between the forward end of said brake tube 21 and the shoulder formed in the breech block guide 18 by the enlargement in the rear portion of the bore.

The front view of the diaphragm 29, see Fig. 33, shows two shallow holes on opposite sides of the axis of the diaphragm for the projections of a spanner wrench to serve for screwing said diaphragm into the forward end of the brake tube 21.

To insure a tight fit of the sliding piston rod 23 in the diaphragm 29, the diaphragm is counterbored and provided with a stuffing box 24. The front of the stuffing box 24 is closed in the usual manner by a gland, such, for example, as the one 24ª shown in Figs. 12, 22, 27 and 34, and the space in rear of said gland is occupied by a suitable packing forced into said stuffing box by the gland. At the rear of said packing a thick washer 24ᵇ is mounted on the piston rod 23, and in rear of said washer a strong helical spring 24ᶜ is seated, its forward end pressing against the washer and its rear end resting against the rear wall of the stuffing box 24 in said diaphragm 29, see Figs. 13 and 25. By this construction and arrangement of these parts, and by making the opening in the washer conical, inclining forwardly and outwardly, the pressure of the spring 24ᶜ causes the washer to compress the packing inwardly tightly against the piston rod 23.

The cylindrical brake tube is closed at the rear by an integral rear end, the forward end being closed by the plane rear wall of the diaphragm 29. The piston rod 23 extends through the diaphragm into this chamber and carries at its rear end a piston adapted to move longitudinally in the chamber within the tube 21.

In the operation of the device fluid is allowed to pass from one side of the piston to the other to retard the movement of the piston and connected parts, and provision is made for adjustably regulating the rate of flow. To this end the piston is preferably compound and comprises a forward disk 22 fixed against longitudinal as well as rotary movement upon said piston rod 23 and a rear disk 32 mounted for limited longitudinal as well as rotary movement on said rod, see Figs. 25 and 26.

In Fig. 31, the forward disk 22 is shown, detached, in a side elevation, in a central vertical section, and in a rear end view; and in Fig. 30, the rear disk 32 is shown, detached, in a side elevation and in a rear end view.

The forward disk 22 has a hub 22ª projecting from its rear face, and said hub is provided with a threaded bore adapted to be screwed upon the correspondingly threaded rear end of the piston rod 23, see Fig. 32. A pin 31 is driven into a transverse hole in said piston rod 23 leaving its ends projecting from said piston rod. The hub 22ª of the forward disk 22 has a slot 22ᵇ in its rear end for receiving the portions of the projecting pin 31 nearest to the piston rod 23 when said disk 22 is mounted on the piston rod 23, thereby preventing the disk 22 from either rotating or moving lengthwise on the piston rod 23; the projecting ends of said pin 31 extend beyond said hub 22ª. This disk 22 has two oppositely located segment-shaped recesses 22ᶜ.

As shown in Fig. 30, the rear disk 32 also has two oppositely located segment-shaped recesses 32ª in its periphery, and it has a smooth circular central opening, which is large enough to allow said disk 32 to be quite loosely mounted upon the hub 22ª of the forward disk 22. I provide means whereby relative rotation can be effected between the two disks so as to cause the said openings or recesses of one disk to overlap those of the other to a greater or less extent and thus vary the rate of flow of the liquid from one side of the piston to the other as the piston is moved. The means for effecting this relative rotation is preferably operable from the exterior of the chamber thus making it possible to effect the adjustment without opening the chamber and losing the liquid contained therein. The specific means which I prefer and have shown for effecting the relative rotation will now be described. On its rear surface the disk 32 has, near its edge, two oppositely located raised projections. Centrally in each of those parts in the edge of the disk 32 thickened by said projections,

a small radial hole is drilled and into each of these holes a corresponding pin is fitted projecting some distance beyond the edge of the disk and thereby adapted to prevent rotation of said disk; as represnted in Fig. 30, preferably each of said pins is provided at its outer end with a T-shaped flat head fitted into a corresponding longitudinal groove cut into the edge of said disk 32 transversely to the pin seat, thus forming a spline stronger for preventing rotation than the pin would be without the head; in Fig. 30 the pins provided with heads, 32^b, are shown seated in the disk 32, and one of said T-shaped pins 32^b is also shown detached.

In Fig. 26, the compound piston is represented, as seen from the rear, seated in the liquid chamber of the brake tube 21, said brake tube being shown in a vertical transverse section taken in a plane slightly forward of the integral rear end of said tube. The two pins 32^b on the rear disk 32 are there shown with their T-shaped heads seated in two corresponding grooves in the interior surface of the brake tube in which, therefore, said disk 32 is prevented from rotating independently; but when the brake tube 21 is rotated in the breech block guide 18, the rear disk 32 of the compound piston is compelled to rotate with said tube 21. It will thus be seen that when the tube is rotated in the manner to be described the rear disk 32 is also rotated, thus causing the openings 32^a to overlap the openings 22^c to a greater or less extent and thus vary the braking action. In Fig. 26, a nut 33 is shown screwed upon the threaded rear portion of the hub 22^a on the forward disk 22, said nut serving to limit the movement in rearward direction of the rear disk 32; this nut is locked in position against rotation and consequent longitudinal movement on said hub 22^a by the pin 31, the ends of which are received for the adjustment of said nut 33 in either of two corresponding grooves in the rear face of the nut, said grooves being semi-circular at their inner ends and slightly deeper than the radius of the pin 31.

In Fig. 25, and in the front and side views of Fig. 44 are shown two wide grooves 33^a cut into the forward surface of said nut 33. The forward movement of the piston simultaneously with the forward movement of the barrel and barrel extension, requires the free passage of the liquid from the front to the rear of the piston in the liquid chamber, and this free passage is attained by the co-operation of a series of holes 22^d in the forward disk 22, of the large central hole in the rear disk 32, of the grooves 33^a in the nut 33 and of the segment-shaped recesses 22^c and 32^a in said forward and rear disks, respectively.

It will be seen that during the rearward movement of the piston the disk 32 is in contact with the disk 22 thus entirely closing the holes 22^d, but that during the forward movement of the piston the disk 32 is slightly separated from the disk 22 thus permitting the liquid to pass freely through the said holes 22^d and between the disks and through the openings 22^c and 32^a.

As stated, the forward disk 22 of the compound piston is prevented from rotating on the piston rod 23, being fixed thereon, and said piston rod 23 and its head 23^a are non-rotatably connected with the washer 27 by the projections 28. As shown in Fig. 29, the washer 27 is provided with a raised projection on its forward face near its circumference, at right angles to the recesses 28^a, said forward projection providing a thickened portion carrying a spline 27^a. This spline may be integral with the washer 27, but, as shown in Fig. 29, it preferably comprises the T-shaped head of a pin fitted and fastened in a radial hole drilled into said thickened portion. In the same plane which passes through the axis of the washer 27 and the spline 27^a, the central hole in the washer which fits over the cylindrical head 23^a of the piston rod 23, has two opposite grooves, see Fig. 29. The grooves are necessary merely for the assembling of the washer 27 on said piston rod head 23^a to allow the washer to pass rearwardly on said head beyond the projections 28 thereon, whereupon a quarter turn of the washer 27 will bring the recesses 28^a into the position to receive said projections 28.

As shown in Fig. 22, the spline 27^a projects into a longitudinal groove 27^b in the adjacent right-hand side wall of the breech block guide 18, said groove 27^b being also shown, by dotted lines, in Fig. 23. By this construction the washer 27 is held against rotation and it prevents rotation of the piston rod head 23^a and of the piston rod 23; and, because the forward disk 22 of the compound piston is fixed upon the rod 23, said disk also is prevented from rotating. For convenience of manufacture, the groove 27^b is preferably cut clean through the wall of the breech block guide 18.

The integral rear wall of the brake tube 21 rests against the rear plate 5 of the casing, and is provided in its rear surface with a transverse slot 21^b to which a screw driver may be applied for rotating said tube, see Fig. 24.

In said integral rear wall of the tube 21 is also provided a hole for filling the liquid chamber, said hole being threaded and closed by a screw plug 30.

Connected with the liquid chamber and preferably located in the diaphragm 29 is a safety valve 25, see Figs. 25, 33 and 36. This safety valve consists of a conical valve

head fitted to close a valve seat which communicates with the liquid chamber and a guide stem which loosely fits into the central bore of a screw bushing which closes the forward end of the hole in the diaphragm. Between the rear of the bushing and the front of the valve head a spring 25ª is fitted, the tension of which keeps the valve closed under normal conditions of operation. However, should the brake chamber be filled with more liquid than is required for its proper operation, the safety valve will be opened and enough of the liquid will escape to permit the proper operation of the brake device.

Cut into the outer surface of the rear wall of the rotatable tube 21 near its circumference is an index mark pointing outward, and in the rear surface of the stationary breech block guide 18, two short radial lines are cut, marked respectively *o* and *c* and spaced apart slightly more than 90°, see Figs. 24 and 7.

From the foregoing description of the construction of the liquid brake, it will be seen that, by turning the brake tube 21 in a clockwise direction, see Figs. 7 and 26, the effective area of the openings permitting the liquid to pass from one side to the other of the compound piston 22, 32 is diminished, and by turning said tube in a counter-clockwise direction. the effective area of said openings is increased. This adjustment of the liquid brake provides for the proper braking action under widely varying conditions of operation, such as wide differences in the angles of elevation of the gun and a broad range of temperature changes; it also permits the control, within limits, of the rate of firing of the gun when firing automatically.

For yieldingly holding the brake tube 21 after adjustment, a portion of the cylindrical surface has cut in it shallow longitudinal serrations 21ª, see Figs. 24, 26 and 27, and a flat spring 34 seated in the breech block guide 18 is provided with an inward projection 34ª the inner surface of which is similarly serrated, whereby the spring and the projection on it yieldingly keep said tube 21 from rotation.

As already stated the member 18 and the parts associated therewith are normally held in place by the rear cover 5. In order to prevent the parts from prematurely moving rearward as soon as the cover is removed a latch is preferably provided as shown in Figs. 24 and 43. A flat latch spring 19 is carried by the member 18 and its rear end is normally seated in a recess in the side wall of the casing. A hole 19ª is provided in the casing adjacent the recess, and this allows inward pressure to be exerted on the spring to release it. The point of a bullet may be used for this purpose. When the latch 19 is released the member 18 and associated parts, including the barrel and barrel extension, may be removed.

The accelerator 35 has the additional function of locking the barrel and barrel extension in rearward position against the tension of the spring 20 as illustrated in Fig. 13. For this purpose the accelerator is provided with rearwardly projecting lugs 35ª which have rearward and downward inclined surfaces adapted to co-operate with correspondingly inclined shoulders on the opposite sides of the rearwardly projecting arm 26 of the barrel extension. It will be apparent that when the accelerator is in the position shown it serves to hold the barrel extension and barrel against the counter recoil movement until such time as the breech block has moved forward and engaged the accelerator to release it from engagement with the arm 26. The spring 34 already mentioned also serves to yieldingly hold the accelerator in one or the other of its extreme positions.

In Fig. 45, the spring 34 is shown, detached, in a side view and in a rear end view. The side view of the detached spring clearly shows that it is curved, the shorter rear portion being bent outward, but the longer forward portion having a double bend, its forward end 34ᵇ being bent inward; when in place in the breech block guide 18, said forward end rests in a shallow recess in the bottom of the accelerator 35, see Fig. 25. By this arrangement the spring 34 yieldingly holds the accelerator 35 in either of its two positions, shown in Figs. 12 and 13.

In Fig. 12, the breech block 17 is shown in its forward firing position to which it has been returned by the tension of a long reaction spring 36, said spring 36 being coiled around a guide rod 37 which is seated in a longitudinal hole located in the right-hand side portion of the breech block near the top, said hole and rod extending entirely through said breech block so that the ends of the rod 37 protrude from the breech block in front and in rear. This lengthwise hole for the rod 37 is counterbored or enlarged from its rear end to a point near the forward end of the breech block thus forming a shoulder against which the end of the spring 36 rests and transmits its tension in forward direction directly to the breech block 17, while the rear end of said spring 36 on the rod 37 rests against a shoulder formed by an enlarged head 37ª provided on the rod 37 near its rear end and transmits its tension in rearward direction through said head 37ª to the rear plate 5.

The rear surface of said enlarged head 37ª of the rod 37 is provided with a narrow central rib 37ᵇ and the inner surface of the rear plate 5 has cut in it a correspondingly nar-

row vertical groove extending downwardly through and out of said plate 5. This arrangement of the groove in the rear plate 5 and the rib 37^b on the rod head 37^a positively prevents lateral movement, to either side, of the rod head 37^a as long as the rear plate 5 is in its normal position. The head 37^a of the rod 37 is also provided with a lateral projection 37^c which extends into a hole slightly larger than said projection in the adjacent right-hand side wall of the breach casing 1. The withdrawal of this projection 37^c is positively prevented, when the rear plate is in its normal position, by the engagement of the rib 37^b on the rod head 37^a in the groove in the rear plate 5. Vertical movement of the rod head 37^a is thus positively prevented by the projection 37^c. After the rear plate has been upwardly withdrawn in the manner hereinbefore described, the guide rod 37 with its head 37^a is held by the projection 37^c resting against the rear of the hole in the side wall of the breech casing 1 under the tension of the reaction spring 36, thereby preventing the rod 37 and the spring 36 from being projected rearwardly out of the breech casing. Such rearward ejection of said rod and spring would even be prevented should the breech block 17 happen to be at the rear and, therefore, the reaction spring 36 be under its maximum tension.

However, it is to be understood that normally the rear plate 5, is to be removed only when the breech block is in its forward position, as then the reaction spring 36 is not under its maximum tension, so that the rod 37, if then freed, will not be thrown rearward with dangerous violence. In this forward position of the breech block 17, the lateral play of the long reaction spring guide rod 37 and of the only partly compressed reaction spring 36 in their seat in the breech block 17 allows the rear end of the rod 37 and the projection 37^c thereon to be easily moved to the left sufficiently to withdraw said projection from the hole in the breech casing 1, after which the rod 37 and the spring 36 may be rearwardly removed. In contrast to the easy removal of the rod 37 and spring 36 with the breech block forward, their removal becomes so difficult as to be almost impossible when the breech block is in rear and the spring fully compressed. There are several reasons for this difficulty. The maximum tension of the compressed spring 36 holds the projection 37^c of the rod 37 very securely in its seat in the side wall of the casing, but in addition to this, the compression of the spring 36 within its seat in the breech block 17 causes said spring to expand radially so as to become almost rigid in said seat and thereby diminish the play of the rod 37 and its projection 37^c so much that said projection cannot be moved out of its seat in the wall of the breech casing without the use of great force.

The forward end of the spring 36 has been described hereinbefore as resting against the shoulder formed by the counterbore in the breech block 17 and as thus transmitting the tension of said spring directly to said breech block; but in Figs. 12 and 14 I have shown, merely for the purpose of assembly and disassembly, a strong washer, which is inserted between said shoulder and the forward end of the spring 36 and which serves to transmit the tension of said spring to the breech block. A removable lateral projection 37^d is provided on the rod 37 forward of the washer and within the breech block when the latter is in forward position. The projection 37^d extends laterally from the rod 37, only for a distance equal to the difference between the radius of the counterbore and the radius of the rod. With the breech block in the forward position, the projection 37^d extends into a short longitudinal slot cut in the breech block rearwardly far enough to allow said projection to enter the counterbored seat beyond the shoulder against which the washer rests, see Figs. 9, 10, 16 and 19. In this condition the rod 37 with the spring 36, washer, and projection 37^d thereon may be rearwardly withdrawn from the breech block. In order to separate these parts, the projection 37^d is removed from the rod and the washer and spring are dismounted in forward direction from the same.

For assembling, the spring 36 and the washer are remounted on the rod 37 and the projection 37^d is replaced to hold them on the rod, and then these parts together are replaced in the breech block and the projection 37^d is entered into the lateral slot in the forward portion of said breech block. With the breech block in the forward position in the breech casing 1, the projection 37^c is easily entered into the hole in the side wall of the breech casing where it is yieldingly held by the tension of the spring 36 as hereinbefore described. This permits the rear plate 5 to be entered in the top of the casing 1 and moved downward to its normal position, the lower ends of the two side walls of the groove in the rear plate 5 being beveled to incline outwardly, Fig. 6, to readily slide over the rib 37^b on the rear end of the rod head 37^a, and the upper rear corners of the head 37^a and the ribs 37^b being beveled upwardly and forwardly for the same purpose, see Figs. 12 and 46.

Fig. 17 represents a rear end view of the breech block 17 and Fig. 19 a right-hand side elevation of the same, and in both of these figures is shown a slot 38 cut through the right-hand side wall of the breech block and extending inwardly into the counterbored seat therein and forwardly a distance

sufficient to insure clearance for the projection 37c on the rod head 37a when the breech block is in its rearmost position.

It will be understood that during the rearward movement of the breech block the empty cartridge is ejected from the firing chamber and a cartridge to be fired is extracted from the feed belt. During the return forward movement of the breech block the extracted cartridge is moved into the firing chamber in position to be fired by the firing mechanism. The ejecting and extracting mechanism will hereinafter be described in detail but the description of the firing mechanism will next follow.

The breech block 17 is provided with a longitudinal seat therein which is so located that its axis coincides with the prolongation of the longitudinal axis of the barrel. Positioned in the said recess is a firing pin made in two parts 39, 39a, and its main spring or firing spring 40, see Figs. 13, 14, and 15.

This two-part firing pin and co-operating parts are shown, detached and on an enlarged scale, in Figs. 38 to 42, inclusive. In Fig. 38 are shown the main spring or firing spring and its co-operating abutments. Fig. 39 shows the two-part firing pin assembled, in a front end view, in a rear end view, and in a side view, in said side view, the rear tubular part is shown in a vertical longitudinal section. Beneath said longitudinal section are also shown four transverse sections taken, respectively, at the places of the longitudinal section directly above them. Figs. 40 and 41 show, respectively, the two parts of the firing pin separated from each other. Fig. 41 shows a front view, a side view and a rear view of the forward part 39 of the firing pin. Fig. 40 shows a front end view, a top view, and a rear end view of the tubular rear part of said firing pin, the inner bore of which is indicated in dotted lines in said top view, but the vertical longitudinal slot 39b is clearly shown in full lines; also indicated in dotted lines is the horizontal transverse hole for receiving the pin 43, as clearly shown in Figs. 38 and 39, to serve for the abutment of the forward end of the main spring 40. Fig. 42 represents also a front view of the rear tubular part of the firing pin in which the transverse pin 43 is more clearly shown as seated in the hole provided for it in said part.

In assembling, the main spring 40 is inserted from the front into its seat in the rear tubular part 39a of the firing pin and is then fixed therein by placing the transverse pin 43 in front of it. Forward of said pin 43, the bore of the tubular rear part 39a is, for some distance, increased in diameter to correspond with the shouldered rear end of the forward part 39 of said firing pin, and the top portion of the tubular part is cut away upwardly, thereby providing the opening for entering said shouldered end of the part 39 into the tubular part 39a to connect and interlock these two parts of the firing pin longitudinally. When the two-part firing pin, in this condition, is inserted into its longitudinal seat in the breech block 17, the inner surface of said seat fits over the shouldered end of the forward part 39 and thereby prevents the same from moving transversely and the two parts of the firing pin from separating.

As clearly shown in the transverse sections which are parts of Fig. 39, and in the top view, Fig. 40, the vertical slot 39b is only as wide as is necessary to admit into it the pin 45 clearly shown in Fig. 38, and both the pin 45 and the slot 39b are considerably smaller than is the bore or seat for the main spring 40 in the tubular part 39a of the firing pin. The forward end of this vertical slot 39b lies somewhat forward of the rear end of said bore or seat, and said slot extends from there rearward to a point some distance forward of the rear end of the firing pin. Said rear end of the tubular part 39a of the firing pin and the forward end of the same are both increased in dimension to fit the seat in the breech block 17, but the extreme rear end is neither tubular, nor cut away upwardly, nor slotted, but its under side is flattened and has an upward recess cut in it thereby forming the cocking shoulder slightly forward of the rear end, for its engagement by the sear.

The pin 45 has at its upper end an integral arm 45a, and, with said pin and arm placed in the breech block 17, said arm lies in a central vertical longitudinal recess in the top of the rear portion of said breech block; said pin and integral arm may be turned, thereby moving the projection 45c, see Fig. 38, to the left to cause it to enter into a lateral recess 17b, see Fig. 17, thus locking the pin and arm against vertical movement.

The cocking lever 42 is pivotally mounted in said vertical recess on the removable transverse pin 42a, shown detached in Fig. 47. The head of said pin is approximately triangular in shape and is located within a recess provided for it in the left-hand side of the breech block, as shown in Figs. 12, 13 and 15. The upper cocking lever arm 42 lies to the right of the integral arm 45a thereby preventing movement of the latter in that direction, which would withdraw its projection 45c from the recess 17b; the lower arm of the cocking lever projects downwardly into the vertical slot 39b in the firing pin. A projectior 45b on the right-hand side of the integral arm 45a, see Fig. 38, lies, when these parts are assembled in the breech block, in the path of the cocking lever 42 and thus limits the rearward movement of its upper arm.

The sear 41, shown detached in Fig. 18

and, on a greatly enlarged scale to more clearly show its construction, in Fig. 37, and also in its position in the breech block in Figs. 7, 8, 13, 14, 15 and 17, is slidably mounted in a central vertical seat at the rear end of the breech block. At its lower end said sear has a forward extension 41ª with an upward projection at its forward end; this upward projection is beveled at the front to permit the rear end of the firing pin to ride over it and depress the sear, after which its rear surface engages the cocking shoulder of the firing pin to hold the same in cocked position until the sear 41 is depressed. In the flat lower surface of the sear an upward recess is provided to receive the upper end of the short helical sear spring 44, the lower end of said spring 44 resting in a similar recess provided for it in the breech block 17 under the seat of the sear, whereby the sear spring 44, when in its seat, yieldingly holds the sear 41 in its raised position. The upward movement of the sear 41 under the tension of its spring 44 is limited by a shoulder 41ᶜ in the front surface of the sear meeting the under side of the integral arm 45ª. The length of the sear 41 permits its vertical operation without interfering with the cocking lever; but, on its right-hand side, said sear 41 carries a narrow upward projection 41ᵇ which serves for the depression of the sear by the trigger mechanism.

The trigger mechanism for actuating the sear is located above the path of movement of the breech block. One of the advantages of the location is that it leaves the space below the path of movement of the breech block available for the mechanism for absorbing the energy of recoil as already described.

As hereinbefore described, the trigger 9 has a forward and downward extension adapted, when raised by the depression of the outside rear portion of the trigger, to actuate the sear through a suitable connecting member. This member is shown as being a lever 46 pivotally supported from the top plate of the casing. This lever is of considerable length and extends forward far enough to transmit the movements of the trigger 9 to the sear 41 when the breech block 17 is in the forward position. This lever 46 is pivotally attached near its center to the fixed lug 47 projecting downward from the top plate 4 of the casing by the pivot pin 46ª. The pin passes transversely through said lever 46, and through the fixed lug 47 and out through the left-hand side plate of the casing 1, as clearly shown in Figs. 1 and 7. The pin 46ª has on the outside of said side plate an integral handle extending rearwardly and downwardly when it and the pin 46ª are in their locked position. The handle is of uniform width, but sufficiently thin to be flexible, and carries at its end a slight inward projection which engages in a corresponding recess in the outer surface of the side plate of the breech casing, thus yieldingly holding the pin and handle in their locked position. On the inside of the side plate, the pin 46ª carries a short spline, the radial center line of which coincides with that of the handle; at an angle preferably of 90° from the position of the handle and pin shown in Fig. 1, a groove is cut in the side plate of the breech casing corresponding in width and depth with said spline on the pin 46ª. By this arrangement, the pin and handle are yieldingly locked in position when the handle extends rearward, while, with the handle and pin turned until the handle extends forward. they are unlocked and may be withdrawn from the breech casing, thereby releasing the trigger lever 46, which may then be removed downwardly from its seat in the breech casing.

The cocking lever 42, above its central part, its pivot and its lower arm, extends upward and projects a considerable distance from the top of the breech block 17. The right-hand surface of the fixed lug 47 depending from the top plate 4, is perfectly plane and the trigger lever 46 rests on this plane surface. However, the under side of said lug 47 has just in rear of its front end a downwardly projecting shoulder, and in rear of it an opening which is produced by a recess 47ª cut into the right-hand surface of said lug 47, and laterally of a depth slightly greater than the thickness of the cocking lever 42. The forward and rear walls of this recess 47ª incline, respectively, in forward and upward direction and in rearward and upward direction, and, at their intersection with the under side of the lug 47, produce said opening and the shoulder in front of it.

When the breech block is moved by the reaction spring 36 from its rear position, see Fig. 13, in which the cocking lever 42 projects above the top of the breech block and inclines forward, to its forward position, the projecting end of the cocking lever is carried, during the latter part of said forward movement, against the shoulder on the under side of the fixed depending lug 47, and by the continued movement of the breech block, said end of the cocking lever is forced to turn from its forwardly inclined position to the rearwardly inclined position, see Fig. 12.

By this arrangement, the lower arm of the cocking lever is forwardly removed from its contact with the cocked firing pin and leaves said firing pin held cocked solely by the sear 41; therefore, if then the trigger is depressed, a shot is fired.

On the now following rearward opening movement of the breech block 17, the cock-

ing lever is carried with it and during the first part of such movement, the upper end of said cocking lever is, by reason of its engagement with the rear wall of the recess 47ª in the fixed lug 47, moved from the rearwardly inclined position to the forwardly inclined position, thereby again cocking the firing pin. The lever is kept in this position during the further rearward movement, and during the greater portion of the succeeding forward movement of the breech block, by the plane under side of said lug 47 in rear of the opening therein. Thus the entire cocking operation is concluded.

When the parts are in the position shown in Fig. 12, with the breech block closed, a single shot may be fired by depressing the trigger 9 and at once releasing it; thereby the sear is lowered by the lever 46 and it releases the firing pin, which fires one shot. By the resulting recoil, the parts are changed from their positions shown in Fig. 12 to their positions shown in Fig. 13, with the breech open, from which position they are at once returned forward again by the reaction spring 36, see Fig. 12. During the last of this forward movement of the sear 41, being yieldingly held by its spring in its raised position, engages and lifts the forward end of the lever 46 and lowers its rear end ready to be again operated by the trigger 9.

If it becomes necessary to fire, instead of single shots, a volley, that is numbers of shots in rapid succession, the operation is as follows: the trigger is depressed and kept depressed, thereby the rear end of the trigger lever is raised and kept raised and the forward end of said trigger lever is kept in its lowered position and in the path of the top of the sear. In order to insure that the sear will not be lowered until the very last of the forward movement of the breech block closing the breech, the trigger lever 46 is provided at the forward end with a projection inclining in forward and downward direction, which serves to depress the sear at the proper time. These operations are automatically repeated as long as the trigger is kept depressed and cartridges are supplied.

In the embodiment of the invention shown in the drawings, the cartridges are fed into a horizontal transverse feed channel provided in the front block 2 of the breech casing above the barrel seat therein, and, since this channel is closed at the top only by the hinged cover 4ª hereinbefore described, by raising said cover a cartridge belt is readily placed in position in the gun or removed therefrom as required. With the loaded cartridge belt placed in position and the cover closed down thereon the belt is fed with a step by step movement preferably from the left to the right side in the usual manner in machine guns of this class, to bring the cartridges successively to a central position over the barrel. This movement is effected by the feed slide 55 with its depending pawl, said slide being supported and guided for transverse reciprocating movement in the under side of the top cover 4ª. A stop is provided on the left-hand side of the gun below the feed channel, which prevents movement of the belt in the wrong direction. In its rear surface the slide 55 has a recess adapted to receive the forward end of the two-armed feed lever 56, which lever is pivoted on a vertical pivot projecting downward from the top cover 4ª. The upwardly flexible rear arm of this lever is provided at its end with a downwardly projecting stud, which normally extends into the cam groove 57 in the top of the breech block 17, see Figs. 12, 13 and 14, whereby the longitudinal reciprocating movement of said breech block produces a lateral movement of said lever and this causes a transverse reciprocating movement of said slide 55, thus moving the cartridge belt stepwise through the feed channel.

The feed extractor 48 is pivotally attached to the left-hand side of the breech block 17 some distance in rear of the face of the same, and extends forward beyond said face, see Figs. 12, 13 and 15. At its forward end, said feed extractor 48 carries on its right-hand or inner side a lateral projection extending inward some distance beyond the longitudinal axis of the breech block 17.

Its rear end is party-circular and has extending beyond it a projecting concentric rib, a corresponding under-cut recess in the rear side of the seat in the breech block being provided for said rib. By this construction, the feed extractor 48 may be readily attached to and detached from the side of the breech block 17, which, for receiving said feed extractor 48, is reduced in width and forms a shoulder in rear of the seat, party-circular with an under-cut recess. For mounting and attaching the feed extractor 48, its pivot is partly inserted into the pivot hole, then said extractor 48 is turned upward until its body stands at an angle of substantially 90° above the top of the breech block, then pivot and body of the extractor 48 may be fully pressed inwardly home and turned to their normal position, by which they will be properly mounted on and locked to the breech block, and said extractor 48 will extend forward beyond the face of said breech block. The lower side of this inwardly projecting part of the feed extractor 48 is provided with a downward projection 48ª, the lower edge of which is curved to correspond substantially with the curvature of the cartridge just forward of its head.

Just before the breech block 17 reaches the end of its forward closing movement, the rounded top of the head of the feed extractor 48 has been raised against the flat spring 50 above it attached to the top cover 4ª, and the depending part 48ª of said feed extractor is brought into contact with the top of the head of the cartridge in the feed belt central above the barrel. Then the last of the forward movement of the breech block causes the upper edge of the central cartridge to co-operate with the forward, rearwardly and downwardly inclined, surface of the projection 48ª, thereby allowing said projection to pass over the cartridge head. Thereupon the top of the feed extractor 48 will be depressed by the spring 50 and the projection 48ª will be entered into the groove in the cartridge forward of its head, the projection, being inclined downward and rearward thus secures a firm hold upon the cartridge. By the ensuing rearward movement of the breech block, the cartridge is withdrawn from the feed belt; at the very first part of such movement, the feed extractor 48 is kept down with its projection 48ª extended into the groove forward of the cartridge head, by the spring 50, then the rounded top of said feed extractor 48 is carried under the horizontal forward portion of the depending feed extractor cam 51, thereby positively keeping said extractor from upward movement. With the further rearward movement of said breech block, the top of the feed extractor is carried below the downwardly and rearwardly inclined under side of the cam 51, which serves, during the continued rearward movement of the breech block and feed extractor, to partly depress the feed extractor, and the cartridge to the position in which they are shown in Fig. 13. In this position, the cartridge head and groove have been introduced into the vertical flange-way on the front face of the breech block, the top opening of which is flaring to facilitate the entrance of them.

It must be understood that during the entire operations of the gun mechanism hereinafter described, the head and the groove of each cartridge, after it has been drawn out of the feed belt and has been introduced into the flange-way, remains firmly and securely held in the grasp of said flange-way and even after each of the cartridges has been fired, the head and groove of its emptied shell still remain held in the flange-way till, at last, it is downwardly ejected from the gun.

Having now described the longitudinal rearward movement of the breech block and also its return movement forward, there remains, to be explained the difference of action of the feed extractor during its forward movement, from its action during its rearward movement.

This difference in the action of the feed extractor 48 during its forward movement is mainly due to three features of construction, two of which are entirely novel important improvements.

The switch-lever 52 is pivotally attached to the inside surface of the left-hand side wall of the breech casing 1; said switch lever has an integral, shouldered pivot stud 52ª and, beyond said shoulder, said stud is smaller in diameter and screw threaded. When in position in the breech casing, see Fig. 1, the threaded portion of the stud 52ª extends beyond the outside surface of said breech casing 1, and on this outside end of the stud is fitted a nut which removably fastens the switch lever 52 in its place, without, however, interfering with the free vibrating movement of lever, stud and nut, because the stud, between its shoulder and the surface of the switch lever, is slightly longer than the thickness of the side wall of the casing. Said switch lever 52 is clearly shown, detached, in a side elevation and in a top view, in Fig. 5 above Fig. 1.

On the left-hand or outer surface of its rear arm the switch lever 52 has a projecting longitudinal rib 52ᵇ below its upper edge, and, in the inner surface of the side wall of the casing, a recess is cut into which said rib 52ᵇ enters; besides making room for said rib 52ᵇ, said recess also serves for the reception of a two-armed spring 53, the longer lower arm of which rests upon the horizontal lower side of said recess, and the shorter upper arm of the spring bears upwardly against the under side of the rib 52ᵇ, see Figs. 1 and 5.

A short distance in front of the forward end of the switch lever 52 a flat piece 54 is fixed by two rivets to the inside surface of the side wall of the breech casing, therefore lying in the same vertical plane with the switch lever 52; the rear surface of said piece 54 inclines upward and forward, see Fig. 1.

On its left-hand or outer surface, the pivoted feed extractor 48 has, near its head, an integral lateral projection 48ᵇ, see Figs. 12, 13, 15, 9 and 10; this projection is more clearly represented in Figs. 21 and 20, where the feed extractor 48 is shown, detached, and on a much enlarged scale. This integral projection 48ᵇ is of considerable horizontal length, narrow in height, and projects laterally from the surface of the feed extractor almost to the inside surface of the side wall of the breech casing, thereby insuring its engagement by the switch lever 52 and the piece 54.

During the last of the rearward movement of the breech block, the head of the feed extractor 48 is depressed, and carried rearwardly beyond the rear end of the switch lever 52; while the feed extractor is being

so depressed, the lateral projection 48[b] thereon engages the top of the rear arm of the switch lever 52 to lower it against the action of its spring 53 which returns the lever again to its normal position after said projection has been carried rearwardly beyond said lever. On the succeeding forward movement of the breech block, the lateral projection 48[b] on the head of the feed extractor strikes the downward and forward inclined end of the lever 52 and said feed extractor head is thereby depressed to its lowest position, indicated in Fig. 10, with the cartridge substantially in line with the axis of the barrel. By the continued forward movement of the breech block and feed extractor, the integral lateral projection 48[b] on said extractor is carried through the opening beneath the straight lower edge of the switch lever 52 and above the straight top surface of the barrel extension 15. Thereby the feed extractor head is kept in its lowest position and the cartridge is being inserted into the barrel; nearing the last of the forward movement, the front end of the lateral projection 48[b] on the feed extractor head strikes against the upward and forward inclined edge of the fixed piece 54, whereby said feed extractor head is raised.

While the feed extractor head is thus being raised, the rear end of the integral lateral projection 48[b] engages the under side of the forward arm of the switch lever 52, and thereby also raises said lever arm against the tension of the spring 53, until, by the last of its forward and upward movement, the rear end of said projection 48[b] is carried above and forward of said lever arm and thus releases said lever arm, which is at once returned to its lowered normal position by the spring 53. By this return of the lever arm, it assumes a position below the rear end of the integral lateral projection 48[b] of the feed extractor, and thereby closes the opening between the fixed piece 54 and the forward end of the lever arm in such a manner that the integral lateral projection 48[b] cannot possibly return downward into said opening, but must move above the upper edge of the switch lever during the ensuing rearward movement.

A vertical longitudinal slot is cut in the head of the feed extractor 48 some distance below its highest portion and laterally some distance to the left of the downward projection 48[a] in the vertical plane through the axis of the gun barrel, hereinbefore referred to, said slot forming the seat for the upper portion of the depending ejector 49. This upper portion of the ejector is considerably thinner than the width of said slot, it being clearly shown in Fig. 21 that the left-hand side of said upper portion is reduced in thickness, down to a shoulder formed on said left-hand side of the ejector below its seat in the feed extractor head. Said ejector 49 is pivotally mounted in said seat on a transverse pin 49[a], which passes through said feed extractor head from the left to the right side thereof. The said pin 49[a] is shown in Figs. 21 and 20, with a thin head seated in a recess provided for it, and at its other end split for some distance, so that it may be readily placed in position in, or removed from said feed extractor head, but is frictionally held in place therein. The hole in the ejector 49 which receives the pivot pin 49[a] is slanting and the bottom of said hole is inclined downward towards the left to allow the lower end of the ejector to swing to the left side. The said ejector is normally kept yieldingly in its substantially vertical position by a small helical spring 49[b] seated in the head of the feed extractor 48 and bearing on the ejector in rear of the pivot pin 49[a]. While the ejector 49 is shown in Fig. 21 in its laterally substantially vertical position, in Fig. 16 it is represented with its lower end moved to the left against the tension of the spring 49[b].

When the feed extractor 48 is raised, see Figs. 12, 15 and 20, the front edge of the long lower arm of the ejector 49 is substantially vertical and is chamfered to both sides in its entire length, and thus has a wedge-shaped form. This wedge-shaped form of the edge of the ejector 49 adapts it, at the end of its forward movement, to enter between the heads of two cartridges in front of it, to wedge said cartridge heads apart, and thereby to insure that the downward projection 48[a] of the feed extractor will grasp and, on the ensuing rearward movement, withdraw only one of said cartridges from the belt.

At its lower end the ejector 49 has an inward or right-hand projection, see Fig. 16, which extends laterally beneath the cartridge when the same is grasped by the feed extractor, and below said inward projection, the end of the ejector is inclined downward and to the left, until said incline meets the vertical longitudinal plane through the center of the ejector. On the left side of said plane the end of the ejector is rounded off.

When the head of the feed extractor 48 and the ejector 49 are being lowered from the position shown in Fig. 9 to the position shown in Fig. 10, if the ejector happens to be swung outwardly as shown in Figs. 9 and 16, the rounded outer end of said ejector strikes the inclined upper corner 15[a] on the left-hand side of the central ejection opening through the barrel extension 15, whereby the end of the ejector is forced inward and kept in that position until, during its further descent, the end of the ejector strikes the empty cartridge shell and expels it from the gun, see Fig. 10. In Figs. 9 and

10 is shown, forward of the inclined upper corner 15ª, a lateral and vertical recess in the left-hand wall of the ejection opening in the barrel extension 15. The recess allows the ejector, on its upward movement, to swing laterally sufficiently for, allowing its inward projection to pass upwardly by the body of the cartridge.

For the initial opening of the breech of the gur, the breech block must be once drawn to the rear; for this purpose the usual handle, such as 59, is removably attached to the breech block, and a longitudinal slot registering with said handle is cut through the right-hand side plate of the breech casing 1 of a sufficient length to permit the necessary full rearward movement of the handle and breech block. Said handle 59 has a cylindrical stem which is fitted into a corresponding seat extending a considerable distance into the body of the breech block. Inside of the breech casing, said handle has a concentric circular collar which occupies a corresponding recess in the side of the breech block, and, as said collar has a diameter much larger than the width of the slot, it prevents the detachment of the handle 59 from the breech block. At a point some distance forward of the rear end of said slot, concentric segmental recesses of the same diameter as the collar on the handle are formed in the edges of the slot, thereby providing at that point an opening for, at will, attaching said handle to the breech block or detaching it therefrom. Accidental detachment of the handle at this place during the automatic operation of the gun is impossible, because such detachment would require a pause or stoppage in the longitudinal movement of the breech block and handle on account of the close fit of the collar in said opening and the necessary transverse movement of the handle; whereas, the breech block and the handle are automatically moved rearward at such a rate of speed that nothing like a pause could possibly take place until they reach their rearmost position. During the automatic forward movement under the tension of the reaction spring, accidental detachment of the handle is likewise impossible.

The procedure to be followed in disassembling the gun will now be described.

It will be understood that the handle 59 may be, at will, detached from the breech block without previously removing the rear plate 5 from the casing; but for the insertion into or withdrawal from the breech casing of the lengthwise movable members of the breech mechanism, it is, of course, necessary previously to remove said rear plate.

Preparatory to the withdrawal of the breech block, the same is first moved to its forward position in the casing, then the reaction spring 36 and the guide rod 37 are withdrawn from the breech casing.

The top cover 4ª is then raised and the breech block is pushed rearwardy out of the casing.

The combined breech block guide and energy absorbing mechanism is released by pressing the spring latch 19 inward as already described. With the mechanism thus released for rearward removal, pressure is exerted against the muzzle of the barrel and thereby the barrel 13, the barrel extension 15 and the breech block guide 18 with associated parts are pushed rearwardly out of the breech casing, where they may be properly adjusted and, thereafter, may be returned to their position in the breech casing, in which the stop spring 19 will again hold them.

In this position and with the rear plate 5 still removed, the rear face of the brake tube 21 is uncovered and, by removing the plug 30, the brake tube may be filled with liquid and then closed again. Should the brake mechanism require adjustment this may be accomplished by turning the tube 21 as already described.

With the foregoing description of the construction and operation of the parts of the gun, the operation of the gun as a whole may be readily understood.

After a filled cartridge feed belt has been placed in position in the feed channel and the top cover 4ª closed, thereby insuring the transverse movement of the feed belt, the breech block is once moved by hand to the rear, thereby withdrawing from the feed belt the first cartridge and, at last, lowering it to the axis of the barrel for its insertion therein, on the ensuing forward movement of the breech block by the tension of the reaction spring 36.

If the gun has been previously fired and an empty shell has remained in the chamber of the barrel, said shell is withdrawn and, by the downward movement of the extractor is ejected from the gun casing. On depressing the trigger 9 and releasing the same, the first cartridge is fired and the operation of the breech mechanism is then automatically repeated thereby seating another cartridge in the barrel ready for firing.

While a specific embodiment of what is considered the best reduction of the invention to practice has been disclosed in the specification, it is to be understood that various changes in the form and arrangement of parts may be made without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. In an automatic firearm, the combination of a breech casing, a recoiling member supported and guided for longitudinal

movement in said casing, means within said casing for absorbing a portion of the energy of recoil of said member, said member and means being removable rearwardly from the casing, and a connection between said member and said means which positively keeps them operatively connected while in the breech casing but permits them to be readily disconnected by relative movement in a transverse direction after said means has been withdrawn from the breech casing.

2. In an automatic firearm, the combination of a breech casing, a recoiling member supported and guided for longitudinal movement in said casing, mechanism within the casing for absorbing a portion of the energy of recoil of said member, said mechanism being bodily removable as a unit rearwardly from the casing, a removable rear plate normally closing the rear end of the casing and normally engaging the said mechanism to hold it against rearward movement, and a manually releasable flat spring latch normally serving to hold the energy absorbing mechanism against immediate rearward movement when the rear plate is removed.

3. In an automatic firearm, the combination of a breech casing, a barrel and barrel extension supported and guided for longitudinal movement in said casing, a breech block supported and guided for longitudinal movement in said barrel extension, a removable tubular breech block guide in said casing, said casing having a removable rear plate for locking said movable members and the breech block guide in said casing, and means in said tubular breech block guide for absorbing a portion of the energy of recoil of said longitudinally movable member.

4. In an automatic firearm, the combination of a breech casing, a barrel and barrel extension supported and guided for longitudinal movement in the casing, a unitary mechanism including an energy dissipating brake detachably connected with the barrel extension for absorbing a part of the energy of recoil, the said mechanism being centrally located within the casing at the rear of the barrel extension and being removable rearwardly from the casing, and means removably engaging the said mechanism to hold it against rearward movement.

5. In an automatic firearm, the combination of a breech casing, a barrel and barrel extension supported for longitudinal movement in said casing, a breech block supported for longitudinal movement in said barrel extension, a mechanism including a liquid brake connected with the barrel extension for absorbing a part of the energy of recoil, the said mechanism being located within the casing at the rear of the barrel extension and below the path of movement of the breech block and being removable rearwardly from the casing, and means removably engaging the said mechanism to hold it against rearward movement.

6. In an automatic firearm, the combination of a breech casing, a barrel and barrel extension supported and guided for longitudinal movement in said casing, a breech block supported and guided for longitudinal movement in said barrel extension, a removable breech block guide in said casing, said casing having a removable rear plate for locking said movable members and the breech block guide therein, and means comprising a liquid brake in said breech block guide for absorbing a portion of the energy of recoil of said longitudinally movable members.

7. In an automatic firearm, the combination of a breech casing, a barrel and barrel extension supported for longitudinal movement in said casing, a breech block supported for longitudinal movement in said barrel extension, and a mechanism connected with the barrel extension for absorbing a part of the energy of recoil, the said mechanism being located within the casing and comprising a composite spring buffer and liquid brake.

8. In an automatic firearm, the combination of a breech casing, a barrel and barrel extension supported and guided for longitudinal movement in said casing, a breech block guide within said casing in rear of the barrel extension, a breech block supported and guided for longitudinal movement by said barrel extension and said guide, and a composite spring buffer and liquid brake in said guide and operatively connected to said barrel extension for absorbing a portion of the energy of recoil of said longitudinal members.

9. In an automatic firearm, the combination of a breech casing having a removable rear plate, a barrel and barrel extension supported and guided for longitudinal movement in said casing, a breech block supported and guided for longitudinal movement in said barrel extension, a breech block guide in rear of said barrel extension and resting against said rear plate, and a composite spring buffer and liquid brake in said guide and connected with said barrel extension for absorbing a portion of the energy of recoil of said longitudinally movable members.

10. In an automatic firearm, the combination of a casing, a barrel and barrel extension supported and guided for longitudinal movement in said casing, a breech block supported and guided for longitudinal movement in said barrel extension, a removable breech block guide in said casing, said casing having a removable rear plate for locking said movable members and the breech block guide in said casing,

and means carried in said breech block guide for absorbing a portion of the energy of recoil of said barrel and barrel extension, the said means comprising a combined resilient device and liquid brake.

11. In an automatic firearm, the combination of a casing, a barrel and barrel extension supported and guided for longitudinal movement therein, a breech block supported and guided for longitudinal movement in said barrel extension, and a combined breech block guide and cushioning device for aiding in guiding the breech block and for absorbing a portion of the energy of recoil of said longitudinally movable members, said combined guide and cushioning device comprising an outer tubular part together with a buffer spring within the forward portion thereof and a liquid brake within the rear portion thereof.

12. In an automatic firearm, the combination with a breech casing and a heavy recoiling member supported and guided for longitudinal movement therein, of means within the casing for absorbing a portion of the energy of recoil of said member comprising a brake chamber containing a liquid, and a piston connected with said recoiling member and guided in said chamber, the said piston including two disks provided with corresponding openings and so arranged that one disk may be rotated relatively to the other to vary the amount of overlapping of the openings and correspondingly vary the action of the liquid brake.

13. In an automatic firearm, the combination with a breech casing and a heavy recoiling member supported and guided for longitudinal movement therein, of means within the casing for absorbing a portion of the energy of recoil of said member comprising a brake chamber containing a liquid, a piston connected with said recoiling member guided in said chamber, the said piston including two disks provided with corresponding openings and so arranged that one disk may be rotated relatively to the other to vary the amount of overlapping of the openings and correspondingly vary the action of the liquid brake, and means operable from the exterior of the chamber for rotating the rotatable disk.

14. In an automatic firearm, the combination with a breech casing and a heavy recoiling member supported and guided for longitudinal movement therein, of means within the casing for absorbing a portion of the energy of recoil of said member comprising a rotatably mounted brake tube containing a liquid, a piston connected with said recoiling member and guided in said tube, said piston including a disk fixed against rotation and a second disk rotatable relative to the first disk and connected to said tube to rotate therewith, said disks having corresponding openings with those of one disk overlapping those of the other, and means for rotating said tube and said second disk, whereby the amount of overlapping of the openings is varied and the action of said liquid brake is correspondingly varied.

15. In an automatic firearm, the combination with a breech casing and a heavy recoiling member therein, of means for absorbing a portion of the energy of recoil of said member comprising a chamber containing a liquid, a piston connected with the recoiling member and guided in said chamber, adjustable means for restricting and regulating the flow of liquid in one direction from one side of the piston to the other when the piston is moved in one direction, and means automatically operable to permit the fluid to pass freely in the other direction when the piston movement is reversed.

16. In an automatic firearm, the combination with a breech casing and a heavy recoiling member therein, of means for absorbing a portion of the energy of recoil of said member comprising a rotatably mounted brake tube containing a liquid, a piston connected with said recoiling member and guided in said tube, said piston comprising a disk fixed against rotation and a second disk rotatable relative to said first disk and connected to said tube to rotate therewith, said disks having corresponding openings with those of one disk overlapping those of the other, and means for rotating said tube and said second disk whereby the action of the liquid brake is varied, said second disk having a limited longitudinal movement relative to said first disk whereby the disks are allowed to separate longitudinally on the return forward of said piston and thereby permit the fluid to pass freely from the front to the rear of said piston.

17. In an automatic firearm, the combination with a breech casing and a heavy recoiling member supported and guided for longitudinal movement therein, of means for absorbing a portion of the energy of recoil of said member comprising a chamber adapted to be filled with a liquid, a piston co-operating with said chamber and connected to said recoiling member to move with the same, one of said co-operating parts being provided with a channel or channels to permit the gradual passage of the liquid from one side of the piston to the other, and a safety device for relieving excessive pressure within said chamber.

18. In an automatic firearm, the combination with a breech casing and a heavy recoiling member supported and guided for longitudinal movement in said casing, of means for absorbing a portion of the energy of recoil of said member comprising a chamber adapted to be filled with a liquid, a piston

co-operating with said chamber and connected with said recoiling member to move therewith, one of said co-operating parts being provided with a channel or channels to permit the gradual passage of the liquid from the rear to the forward side of said piston during the recoil of said member, and a safety valve in a wall of said chamber for relieving excessive pressure within the same.

19. In an automatic firearm, the combination with a breech casing and a heavy recoiling member supported and guided for longitudinal movement therein, of means for absorbing a portion of the energy of recoil of said member comprising a chamber containing a liquid and having a forward end wall, a piston guided in said chamber and having a rod extending through and some distance forward of said wall, a buffer spring bearing at its rear end against said wall, and means on said piston rod for receiving the thrust of the forward end of said spring.

20. In an automatic firearm, the combination with a breech casing and a heavy recoiling member supported and guided for longitudinal movement in said casing, of means for absorbing a portion of the energy of recoil of said member comprising a chamber containing a liquid and having a forward end wall, a piston guided in said chamber and having a rod extending through a stuffing box in said wall and projecting some distance beyond said wall, a spring surrounding said projecting portion of the piston rod and resting with its rear end against said wall, and detachable means at the forward portion of said piston rod for receiving the thrust of the forward end of said spring.

21. In an automatic firearm, the combination of a breech casing, a barrel and barrel extension supported and guided for longitudinal movement in said casing, means comprising a resilient device for absorbing a portion of recoil of said barrel and barrel extension, a lever constructed and arranged to lock the barrel and barrel extension in rearward position against the tension of said resilient device, said lever being yieldingly kept in locking position by the tension of said resilient device, and additional means for yieldingly opposing movement of said lever from either of its extreme positions.

22. In an automatic firearm, a casing, a barrel and barrel extension supported and guided for longitudinal movement in said casing, a rocking lever having an operative connection with said barrel extension to lock said barrel and barrel extension in rearward position, and means for yieldingly holding said lever in locking relation with said barrel extension, said means comprising a flat spring co-operating with a recess in the hub of said lever.

23. In an automatic firearm, a casing, a barrel and barrel extension supported and guided for longitudinal movement in said casing, means comprising a brake for absorbing a portion of the energy of recoil of said barrel and barrel extension, a rocking lever for locking the barrel and barrel extension in rearward position, means for adjusting said brake to vary its action, and a device common to said brake adjusting means and said rocking lever for yieldingly holding the adjusting means in adjusted position and the rocking lever in locking position, respectively.

24. In an automatic firearm, a casing, a barrel and barrel extension supported and guided for longitudinal movement in said casing, means comprising a brake for absorbing a portion of the energy of recoil of said barrel and barrel extension, a rocking lever for locking the barrel and barrel extension in rearward position, means for adjusting said brake to vary its action including a rotatable member, and resilient means for frictionally holding said member against rotation and said rocking lever in locking position.

25. In an automatic firearm, the combination of a breech casing, having a removable rear plate, a member mounted for longitudinal reciprocatory movement in said casing, a reaction spring for returning said member to its forward position after each recoil thereof, a guide rod for said spring resting against said rear plate, and means whereby said spring and its guide rod may be together withdrawn as a unit from the breech casing after the rear plate has been removed, said means comprising abutments carried by said rod and limiting the movement of the respective ends of said spring and thus retaining the spring on the rod.

26. In an automatic firearm, the combination of a breech casing, having a removable closure at its rear end, a member mounted for longitudinal reciprocatory movement in said breech casing, a reaction spring for returning said member after each recoil thereof, said spring being normally under some tension, a guide rod for said spring having its rear end resting against said closure, the forward end of said rod projecting beyond the forward end of said spring, and means carried by said rod whereby the spring is held substantially at its normal tension after said closure has been removed, thereby preventing rearward projection of said rod and said spring.

27. In an automatic firearm, the combination of a breech casing, having a removable rear plate, a member mounted for longitudinal reciprocatory movement in said casing, a guide rod resting against said rear plate and extending forwardly into a longitudinal seat in said member, a reaction

spring surrounding said rod and bearing at its rear end against an abutment on said rod and at its forward end against a shoulder in said seat, and a lateral projection on the rod normally located forward of said shoulder and adapted to receive the thrust of the forward end of said spring after said rear plate has been removed, thereby preventing violent rearward projection of said rod and said spring and permitting the manual withdrawal of said rod and said spring as a unit from said member and the casing.

28. In an automatic firearm, the combination of a breech casing, having a removable rear plate, a member mounted for longitudinal reciprocatory movement in said casing, a rod resting at its rear end against said rear plate and supported and guided at its forward end in a longitudinal seat in said member, a reaction spring coiled about said rod, the rear end of said spring bearing against an abutment on said rod and the forward end of said spring against a shoulder in said member, and lateral projection on the rod forward of the said shoulder, whereby after the rear plate has been removed said rod and said spring can be together withdrawn from the said member.

29. In an automatic firearm, the combination of a breech casing, having a removable rear plate, a member mounted for longitudinal movement in said casing and having a longitudinal seat extending therethrough, said seat being counterbored from its rear end to a point near its forward end thus forming a shoulder, a guide rod resting against the rear plate and extending forwardly through said seat in said member, a reaction spring coiled about said rod and transmitting its tension at its forward end to said shoulder and at its rear end to a shoulder on the guide rod, and means on said rod forward of the shoulder in said member for receiving the thrust of the forward end of said spring to permit the easy withdrawal of said rod and spring as a unit after the rear plate has been removed.

30. In an automatic firearm, the combination of a breech casing having a removable rear end closure, a member mounted for reciprocating movement in said casing, a reaction spring for returning said member after each recoil of the same, a guide rod for said spring resting against said rear end closure of the casing, the forward end of said spring transmitting its tension to said member and the rear end transmitting its tension to the rear closure, and means whereby the spring and its guide rod are kept together after the rear closure has been removed, thus permitting their ready withdrawal as a unit from the casing independently of said member.

31. In an automatic firearm, a casing having side walls and a removable rear plate, a member supported and guided for longitudinal movement in said casing, a reaction spring and a guide rod therefor arranged adjacent a side wall of said casing and supported by said member at their forward portions, a rear portion of said rod being formed with a shoulder to take the thrust of said spring, a lateral projection on said rod near its rear end arranged to extend into a recess therefor in the adjacent side wall of the casing, and co-operating means on the rear end of said rod and on said rear plate for preventing lateral movement of the rear end of said rod and the lateral projection thereon but permitting the removal of said rear plate, said lateral projection when the rear plate is removed being frictionally held in said recess by the tension of the reaction spring.

32. In an automatic firearm, a casing having side walls and a rear plate slidably removable in a vertical direction, a member supported and guided for longitudinal movement in said casing, a reaction spring and a guide rod therefor arranged adjacent a side plate of said casing and supported at their forward portions by said member, the rear portion of said rod being formed with an abutment to take the thrust of said spring, a lateral projection on said rod near its rear end arranged to extend into a recess therefor in the adjacent side wall, and a rib at the rear end of said rod co-operating with a groove in said rear plate for preventing lateral movement of the rear end of said rod and the lateral projections thereon but permitting the removal of said rear plate, said lateral projection when the rear plate is removed being frictionally held in said recess by the tension of said reaction spring.

33. In an automatic firearm, a casing having side walls and a removable rear plate, a member supported and guided for longitudinal movement in said casing, a reaction spring and a guide rod therefor arranged adjacent a side wall of said casing and supported at their forward portions by said member, the rear portion of said rod being formed with a shoulder to take the thrust of said spring, a lateral projection near the rear end of said rod and extending into a recess therefor in the adjacent side plate, and co-operating means on the rear end of said rod and on said rear plate for preventing lateral movement of the rear end of said rod and the projection thereon, said projection when the rear plate is removed being frictionally held against the rear wall of said recess by the tension of the reaction spring.

34. In an automatic firearm, the combination with a breech block, a firing pin carried thereby, and a main spring having one end thereof bearing against an abutment on said firing pin, of means in said breech

block to take the thrust of the other end of said spring, said means comprising a removable pin, an arm attached to said pin, a lateral projection on said arm adapted to engage in a recess in said breech block, and means for holding said arm against lateral movement whereby the pin is secured in its operative position.

35. In an automatic firearm, the combination with a breech block, a firing pin carried thereby, a main spring having one end thereof bearing against an abutment on said firing pin, and a cocking lever mounted in said breech block, of means in said breech block to take the thrust of the other end of said spring, said means comprising a removable pin, an arm attached to said pin, and a lateral projection on said arm co-operating with a recess in the breech block to hold said pin against removal, said cocking lever locking said arm against lateral movement in a direction to withdraw said projection from said recess.

36. In an automatic firearm, the combination of a breech block, a firing pin carried thereby, a main spring having one end thereof bearing against an abutment on said firing pin, a cocking lever mounted in said breech block for limited swinging movement, a removable pin in said breech block to take the thrust of the other end of said spring, an arm extending at a right angle from said pin, and projections at opposite sides of said arm, one of said projections normally underlying a shoulder on the breech block to hold said pin against removal and the other of said projections limiting the movement of the cocking lever in one direction.

37. In an automatic firearm, the combination of a breech block, a firing pin carried thereby, a main spring having one end thereof bearing against an abutment on said firing pin, a sear movably mounted in said breech block, a spring for moving said sear in one direction, and a unitary means carried by said breech block for taking the thrust of the other end of said main spring and for limiting the movement of said sear under the action of its spring.

38. In an automatic firearm, the combination of a breech block having a vertical seat near its rear end, said seat being open at the top and closed at the bottom, a sliding sear adapted to be inserted into said seat, a sear spring arranged between the sear and the bottom of said seat in the breech block, an upward shoulder on said sear, and removable means in the path of said shoulder for limiting the upward movement of said sear.

39. In an automatic firearm, the combination of a breech block, a firing pin carried thereby, a spring for actuating said firing pin, an abutment on said firing pin for one end of said spring, a cocking lever mounted in said breech block, a sear also carried by said block, and unitary means for performing the functions of taking the thrust of the other end of said spring and limiting the movement in one direction of both the sear and the cocking lever.

40. In an automatic firearm, the combination of a breech block, a firing pin and a main spring carried by said breech block, an abutment on said firing pin for one end of said spring, a cocking lever pivotally mounted in said breech block, a sear also carried by said breech block, a removable pin in said breech block forming an abutment for the other end of said spring, and an arm fixed to said pin and co-operating with a recess in said block, with said cocking lever and with said sear respectively, whereby the pin is held in its operative position, the cocking lever is limited in its movement in one direction and the sear is also limited in its movement in one direction respectively.

41. In an automatic firearm, the combination of a breech casing, a barrel and barrel extension supported and guided for longitudinal movement in the casing, a breech block supported for longitudinal movement in said barrel extension, an energy absorbing mechanism connected with the barrel extension at the rear thereof and below the path of movement of the breech block, a spring-actuated firing pin carried by said breech block, a sear on said breech block co-operating with the firing pin, and trigger mechanism carried by the casing and located above the path of movement of the breech block for engaging the sear to release it.

42. In an automatic firearm, the combination of a breech casing, a breech block supported and guided for longitudinal movement in said casing, and removable rearwardly therefrom, a spring-actuated firing pin carried by said breech block, a sear on said breech block co-operating with the firing pin, and a member carried by the casing and located above the path of movement of the breech block for engaging the sear to release it, the said member being held against bodily movement with the breech block and permitting the free rearward removal thereof.

43. In an automatic firearm, the combination of a breech casing, a breech block supported and guided for longitudinal movement in said casing and removable rearwardly therefrom, a removable rear cover plate normally preventing rearward removal of the breech block, a spring-actuated firing pin carried by said breech block, a sear on said breech block cooperating with the firing pin, and mechanism carried by the casing and located above the path of movement of

the breech block for engaging the sear to release it, the said mechanism including a trigger projecting rearward beyond the rear face of the cover plate and being arranged to permit the removal of said plate in a direction transverse to the line of movement of the breech block.

44. In an automatic firearm, a breech casing having a vertically removable rear plate and a fixed top plate, a breech block supported and guided for longitudinal movement in said casing, a spring-actuated firing pin carried by said breech block, a sear cooperating with said firing pin, a trigger mounted on said rear plate, and a member supported from said fixed top plate and operatively connecting said trigger and sear but permitting the removal in upward direction of said rear plate and said trigger in their assembled relation.

45. In an automatic firearm, a breech casing having a removable rear plate and a fixed top plate, a breech block supported and guided for longitudinal movement in said casing, firing mechanism including a sear carried by said breech block, a trigger carried by said rear plate, and a trigger lever pivotally supported beneath said fixed top plate and operatively connecting said sear and said trigger.

46. In an automatic firearm, a breech casing having a removable rear plate and a fixed top plate, a breech block supported and guided for longitudinal movement in said casing, a spring-actuated sear carried by said breech block, a trigger carried by said rear plate, and a trigger lever operatively connecting said trigger and said sear, said trigger lever being pivoted under said fixed top plate and returned to its normal position by the tension of said sear spring after it has been operated to depress the sear.

47. In an automatic firearm, a breech casing having a fixed top plate and a removable rear plate, a breech block supported and guided for longitudinal movement in said casing, a trigger mounted on said rear plate, a sear carried by said breech block, and a trigger lever forming the operative connection between said trigger and said sear and pivoted to a bracket depending from said top plate, said trigger lever having an inclined surface at its forward end to engage and actuate the sear automatically when the trigger is in its operative position as the breech block nears its forward position.

48. In an automatic firearm, a breech casing having a fixed top plate, a lug depending from said top plate, a trigger lever lying along the side of said lug and being pivoted on a transverse pin passing through said lever and also through said lug and a side wall of the casing, and means for releasably locking said pin in its operative position.

49. In an automatic firearm, a breech casing having a fixed top plate, a lug depending from said top plate, a trigger lever lying along the side of said lug and pivoted on a transverse pin passing through said lever and also through said lug and a side wall of the casing, and means for locking said pin in its operative position or removing it therefrom comprising a projection on said pin resting against the inside surface of the side wall of the casing and an integral resilient handle on said pin resting against the outside surface of said wall, said handle being provided with an inward projection co-operating with a corresponding recess in the side wall of the casing to yieldingly hold said handle and pin against rotation, and a groove angularly removed from said locking position of the handle to permit the passage of said projection on the pin for withdrawing or inserting it after the handle and pin have been rotated through said angular distance from their normal locking position.

50. In an automatic firearm, the combination of a breech casing including a rear cover plate which is removable in a direction transverse of the longitudinal lines of the gun, a recess being formed in a wall of the casing adjacent the said rear plate, and a trigger mounted on the rear plate and having a portion thereof projecting forwardly of said plate and registering with the said recess whereby the forward projecting portion may pass through the recess when the cover plate is removed.

51. In an automatic firearm, a breech casing having a top plate and a vertically removable rear plate, said rear plate having a forwardly projecting flange at its upper end and said top plate being formed with a recess to receive said flange, and a trigger mounted on said rear plate and having a portion thereof projecting forwardly of said plate but not beyond said flange, whereby the rear plate and the trigger can be upwardly removed in their assembled relation without interference by said top plate.

52. In an automatic firearm, a breech casing having a bottom plate and a vertically slidable rear plate adapted to be removed in an upward direction, and a latch carried by said rear plate and constructed and arranged to interlock with said bottom plate for keeping the rear plate in its assembled position, said latch having a rearwardly directed portion in position to be lifted by the hand of the operator to release the latch and by continuing the upward movement of the hand to remove the rear plate.

53. In an automatic firearm, the combination of a casing having a rear plate, rearwardly projecting transverse flanges at the upper and lower portions of said rear plate, handle plates separately formed from but

attached to said upper and lower flanges respectively, and a handle extending between and supported by said handle plates.

54. In an automatic firearm, the combination of a casing having a rear plate, transverse rearwardly projecting flanges at the upper and lower portions of said rear plate, upper and lower handle plates separately formed from but attached to said flanges respectively, said handle plates extending laterally and rearwardly at the opposite sides of their points of attachment to said flanges, and handles extending between and supported by the free ends of said handle plates at opposite sides of the gun respectively.

55. In an automatic firearm, a breech casing having a top plate, a breech block supported and guided for longitudinal movement therein, a spring-actuated firing pin carried by said breech block, a cocking lever also carried by said breech block, and a lug depending from the under side of said top plate and having a cocking recess therein, that portion of the top plate above said recess being imperforate, said recess having a rear wall for engaging said cocking lever and moving it into position to hold the firing pin retracted and having also a downwardly projecting front wall for engaging the cocking lever during the last portion of the forward movement of the breech block, thereby positively moving said cocking lever to its initial position.

56. In an automatic firearm, a breech casing having a fixed top plate, a breech block supported and guided for longitudinal movement therein, a firing pin and a main spring carried by said breech block, a cocking lever also carried by said breech block, and a lug connected to the underside of said top plate and having a cocking recess therein, that portion of the top plate above said recess being imperforate, said recess having a rear wall for engaging said cocking lever and moving it into position to hold the firing pin retracted and the under side of said lug having a surface for thereafter engaging said cocking lever and holding it in said position during the further rearward and the greater portion of the forward movements of said breech block, and the said recess also having a downwardly projecting front wall for engaging said cocking lever during the last portion of the forward movement of said breech block and positively moving said cocking lever to its initial position out of the reach of said firing pin.

57. In an automatic firearm, the combination of a breech casing having a top plate, a breech block supported and guided for longitudinal movement in said casing, a spring actuated firing pin and its co-operating sear carried by said breech block, a cocking lever mounted on said breech block, a member for actuating the sear, and a depending lug carried by said top plate and serving as a support for said member and comprising means for actuating a cocking lever in the movement of the breech block.

58. In an automatic firearm, a breech casing having a top plate, a breech block supported and guided for longitudinal movement in said casing, a spring-actuated firing pin and its cooperative sear carried by the breech block, a cocking lever mounted on said breech block, a trigger, a member operatively connecting said trigger and said sear, and a depending lug carried by said top plate and serving as a support for said member and comprising means for moving the cocking lever into position to hold the firing pin retracted during the rearward movement of the breech block.

59. In an automatic firearm, the combination of a barrel, a longitudinally movable member to open and close the breech of the barrel, means for feeding cartridges transversely of the arm, and means for transferring a cartridge from the said feeding means into the barrel chamber during the movements of said member, the said transferring means comprising an element with a lateral projection thereon both movable transversely of the movement of said member and in planes parallel with the direction of the said movement, the said element and projection being restrained against movement transversely of the said planes, a cam engaging and cooperating with the said projection, and means for causing the said projection to move over and under the cam at its respective rearward and forward movements.

60. In an automatic firearm, the combination of a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor carried by said breech block, means for feeding cartridges into position to be engaged by said extractor, whereby upon the rearward movement of the breech block a cartridge is withdrawn from the feeding means, and means for moving said extractor to bring a cartridge into substantial alignment with the barrel axis, said moving means comprising a movable switch lever and a lateral projection on said extractor co-operating with said lever, said lever preventing the return of said lateral projection on the same side of the switch lever after the projection has passed rearwardly beyond the switch lever in the recoil of the breech block.

61. In an automatic firearm, the combination of a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor carried by said breech block, means for feeding cartridges into position to be

engaged by said extractor, whereby upon the rearward movement of the breech block a cartridge is withdrawn from the feeding means, and means for moving said extractor to bring a cartridge in substantial alignment with the barrel axis, said moving means comprising a movable switch lever and a lateral projection on said extractor co-operating with said lever, said lateral projection, in its rearward movement with the breech block passing over said switch lever but in its forward movement being constrained to move under the switch lever.

62. In an automatic firearm, the combination of a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor carried by said breech block, means for feeding cartridges into position to be engaged by said extractor, whereby upon the rearward movement of the breech block a cartridge is withdrawn from the feeding means, and means for moving said extractor to bring a cartridge into substantial alignment with the barrel axis, said moving means comprising a movable switch lever pivoted between its ends, a lateral projection on said extractor co-operating with said lever, and two fixed cams serving during the respective rearward and forward movements of the extractor to cause the pivotal movement of said movable cam, said movable cam automatically returning to normal position after each such movement and thereby causing the projection to successively move over and under it.

63. In an automatic firearm, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor pivoted to said breech block and having cartridge-engaging means, feed mechanism for successively feeding cartridges to a position for engagement by said extractor, whereby upon rearward movement of said breech block a cartridge is withdrawn from said feed mechanism, means for depressing the free end of said extractor to lower the cartridge engaged thereby during the rearward movement of said breech block, and means for further depressing said free end of the extractor during the return movement of said breech block, said last-mentioned means comprising an integral lateral projection on said extractor and a switch lever yieldingly held in the path of said projection on its rearward stroke.

64. In an automatic firearm, a casing having side plates, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor on said breech block, means for feeding cartridges into position to be engaged by said extractor, whereby on the rearward movement of the breech block a cartridge is withdrawn from the feeding means, and means for moving said extractor to bring a cartridge in substantial alignment with the barrel axis, said means comprising a switch lever pivoted to a side plate of said casing and a lateral projection on said extractor for operative engagement with said switch lever to move the extractor toward the barrel axis in the forward movement of said breech block.

65. In an automatic firearm, a casing having side plates, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of the barrel, a feed extractor on said breech block, means for feeding cartridges into position to be engaged by said extractor, whereby, on the rearward movement of said breech block, a cartridge is withdrawn from the feeding means, and means for moving said extractor to bring a cartridge into substantial alignment with the barrel axis, said means comprising a switch lever pivoted to a side plate of said casing, a recess on the inner side of said side plate, a projection on said switch lever extending into said recess, a spring in said recess bearing against said projection to hold the switch lever yieldingly in its normal position, and a lateral projection on said extractor co-operating with said switch lever during the movement of said breech block.

66. In an automatic firearm, a breech casing, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor movably mounted on said breech block and having cartridge-engaging means thereon, feed mechanism for successively feeding cartridges into position for engagement by said extractor, whereby, upon rearward movement of said breech block, a cartridge is withdrawn from the feed mechanism, and means for moving said extractor with the cartridge engaged thereby towards the axis of the barrel comprising an integral lateral projection on said extractor, an arm mounted for swinging movement along the inner face of the breech casing wall and substantially covering a recess formed in said face, a projection on said arm extending into said recess, a spring housed in said recess and confined therein by said arm, said spring operating to hold said arm yieldingly in its normal position where it lies in the path in which said integral lateral projection is positively constrained to move during a portion of the rearward movement of the breech block, whereby the arm is pressed aside during said movement but released to be returned to its normal position by said spring during the remaining portion of the rearward movement of

said breech block, and a cam surface on said arm for engaging said lateral projection to move the extractor and a cartridge engaged thereby toward the axis of the barrel during the forward movement of said breech block.

67. In an automatic firearm, the combination of a breech casing, a barrel, a breech block mounted for reciprocatory movement to open and close the breech of the barrel, a feed extractor pivotally carried by said breech block and projecting forwardly beyond the face of the same, means for feeding cartridges transversely into position to be engaged by said extractor when the breech block is in its forward position, whereby, when the breech block moves rearward, a cartridge is withdrawn from the feeding means, and means for controlling the path of movement of the free end of said feed extractor during the movements of the breech block comprising an integral lateral projection on said feed extractor and a two-armed switch lever extending substantially horizontally and pivoted to a side wall of the breech casing, said lever cooperating with said projection to cause the same, on its rearward and return movements, to move, respectively, over and under said lever.

68. In an automatic firearm, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor pivoted to said breech block and having a cartridge-engaging projection near its free end, feed mechanism for successively feeding cartridges into position for engagement by said extractor, whereby, upon rearward movement of the breech block, a cartridge is withdrawn from said feed mechanism, and a shell ejector pivoted near the free end of said extractor, said shell ejector having a limited swinging movement longitudinally of the gun.

69. In an automatic firearm, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor pivoted to said breech block and having a cartridge-engaging projection near its free end, feed mechanism for successively feeding cartridges into position for engagement by said extractor, whereby upon rearward movement of the breech block, a cartridge is withdrawn from the feed mechanism, and a shell ejector pivotally mounted near the free end of said extractor for limited movement in two directions.

70. In an automatic firearm, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor pivoted to said breech block and having a cartridge-engaging projection near its free end, feed mechanism for successively feeding cartridges into position for engagement by said extractor, whereby, upon rearward movement of the breech block, a cartridge is withdrawn from the feed mechanism, and a shell ejector pivotally mounted on a transverse pin near the free end of said extractor, said ejector being constructed and arranged to have a limited movement both transversely and longitudinally of the gun.

71. In an automatic firearm, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor pivoted to said breech block and having a cartridge-engaging projection near its free end, feed mechanism for successively feeding cartridges into position for engagement by said extractor, whereby, upon rearward movement of said breech block, a cartridge is withdrawn from the feed mechanism, a shell ejector loosely pivoted on a transverse pin near the free end of said extractor, whereby said ejector has a limited movement in two directions, and a yielding means for normally holding said ejector at one limit of its movement in both directions.

72. In an automatic firearm, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor pivoted on said breech block and having a cartridge-engaging projection near its free end, means for feeding cartridges transversely of the gun into position for engagement by said extractor, whereby, upon rearward movement of said breech block a cartridge is withdrawn from said feeding means, and an ejector depending from the free end of said extractor on that side of said cartridge-engaging projection from which the cartridges are supplied by the feeding means, said ejector having its forward face so formed as to facilitate entry of the ejector between the first two cartridges of the feeding means on the return movement of the breech block.

73. In an automatic firearm, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor pivoted on said breech block and having a cartridge-engaging projection near its free end, means for feeding cartridges transversely of the gun into position for engagement by said extractor, whereby, upon rearward movement of said breech block, a cartridge is withdrawn from said feeding means, and an ejector depending from the free end of said extractor on that side of said cartridge engaging projection from which the cartridges are fed by said feeding means, said ejector having a wedge-shaped forward face, whereby the first two cartridges in the feeding means may be positively separated

to permit entry of the ejector therebetween on the return movement of the breech block.

74. In an automatic firearm, a barrel, a breech block supported and guided for longitudinal movement to open and close the breech of said barrel, a feed extractor pivoted on said breech block and having a cartridge-engaging projection near its free end, means for feeding cartridges transversely of the gun into position for engagement by said projection, whereby, upon rearward movement of said breech block, a cartridge is withdrawn from said feeding means, an ejector depending from the free end of said extractor on that side of said cartridge-engaging projection from which the cartridges are fed by said feeding means, said ejector having a wedge-shaped forward face and being pivotally mounted near its upper end for limited longitudinal movement, and means for yieldingly holding it in its forward position whereby it can yield rearwardly when its lower portion comes into engagement with the first two cartridges in the feeding means on the return movement of the breech block, thus presenting its wedge-shaped face to the cartridge heads at an inclination to the vertical and thereby facilitating the entry of the ejector between said cartridges.

75. In an automatic firearm, the combination of a breech casing closed at its forward end by a block located between the sides of the casing and rigidly and permanently connecting the two sides, a forward projection on said block, and a trunnion ring secured to said projection.

76. In an automatic firearm, the combination of a breech casing closed at its forward end by a block located between and rigidly and permanently secured to the sides of the casing, said block having an annular forward projection, and a trunnion ring carrying trunnions on its opposite sides and removably connected to said projection.

77. In an automatic firearm, the combination of a breech casing having a front block closing the forward end of said casing, a longitudinally movable barrel, said block having a seat for supporting and guiding the rear portion of said barrel and having also an annular forward projection, a barrel casing secured to said forward projection, and a disk secured in the forward portion of said barrel casing for supporting and guiding the forward end of the barrel.

This specification signed this 18th day of July, A. D. 1923.

JOHN M. BROWNING.