O. V. PAYNE.

FIREARM.

APPLICATION FILED MAR. 14, 1919.

1,363,809.

Patented Dec. 28, 1920.

3 SHEETS—SHEET 1.

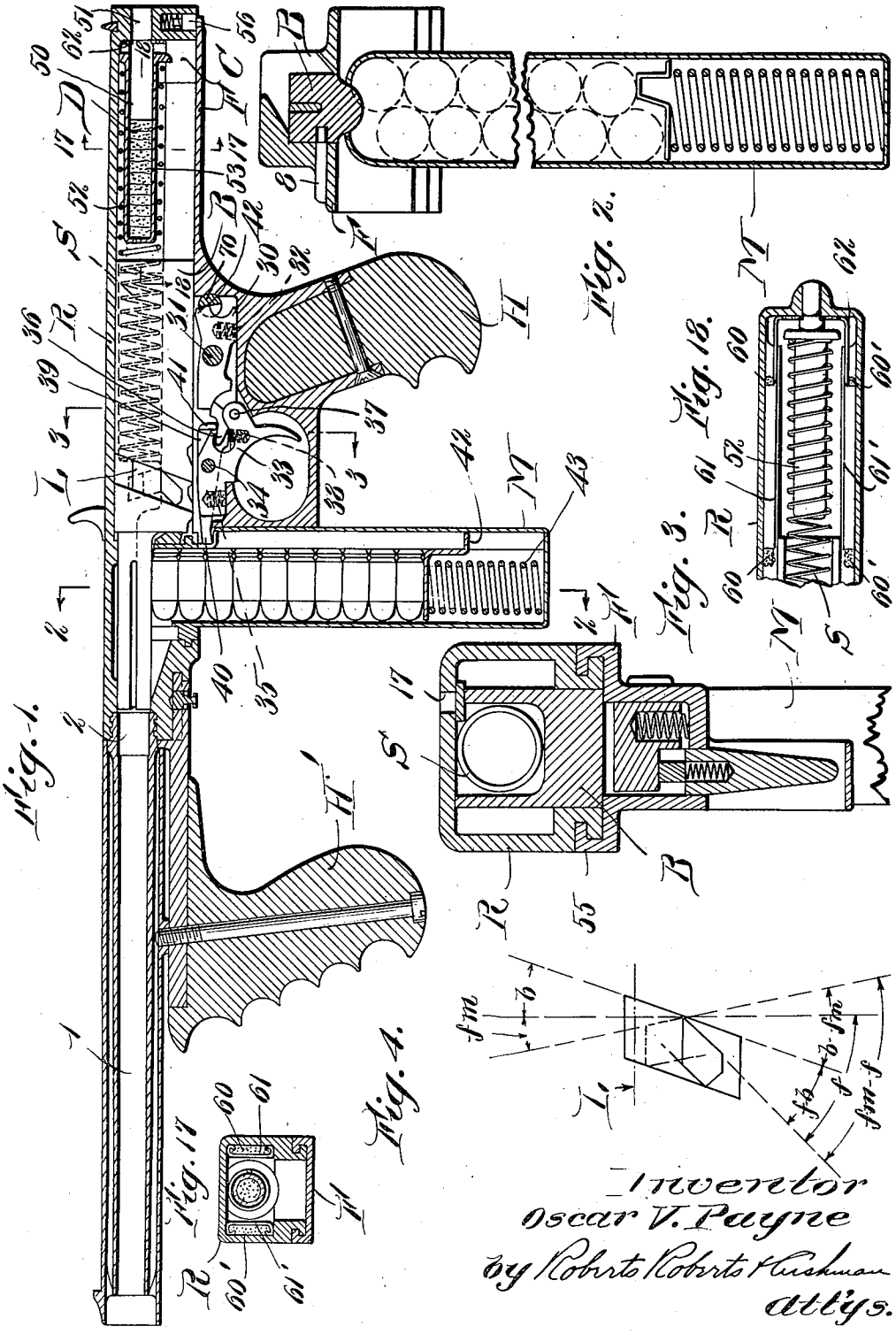

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 1a.

Fig. 1b.

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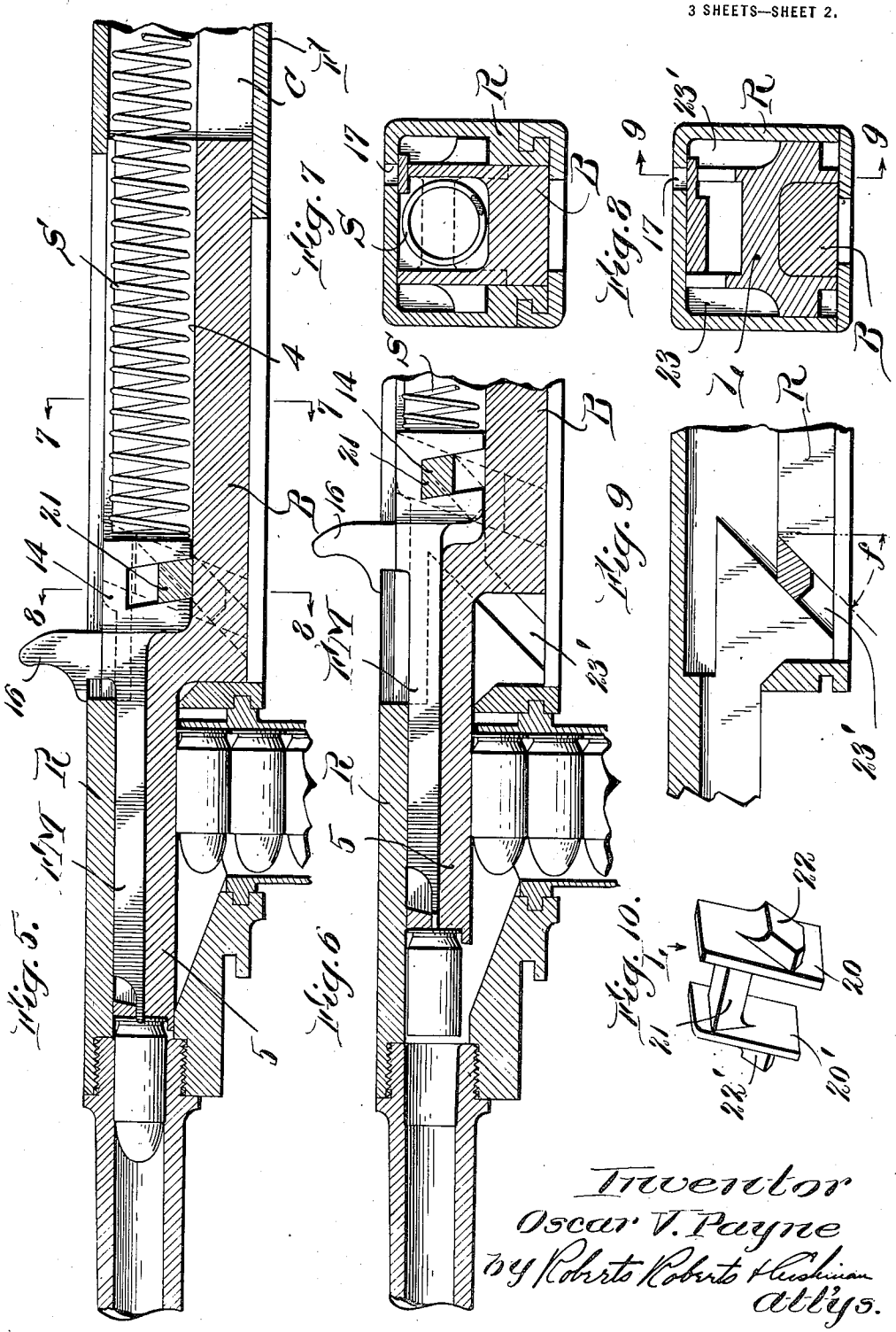

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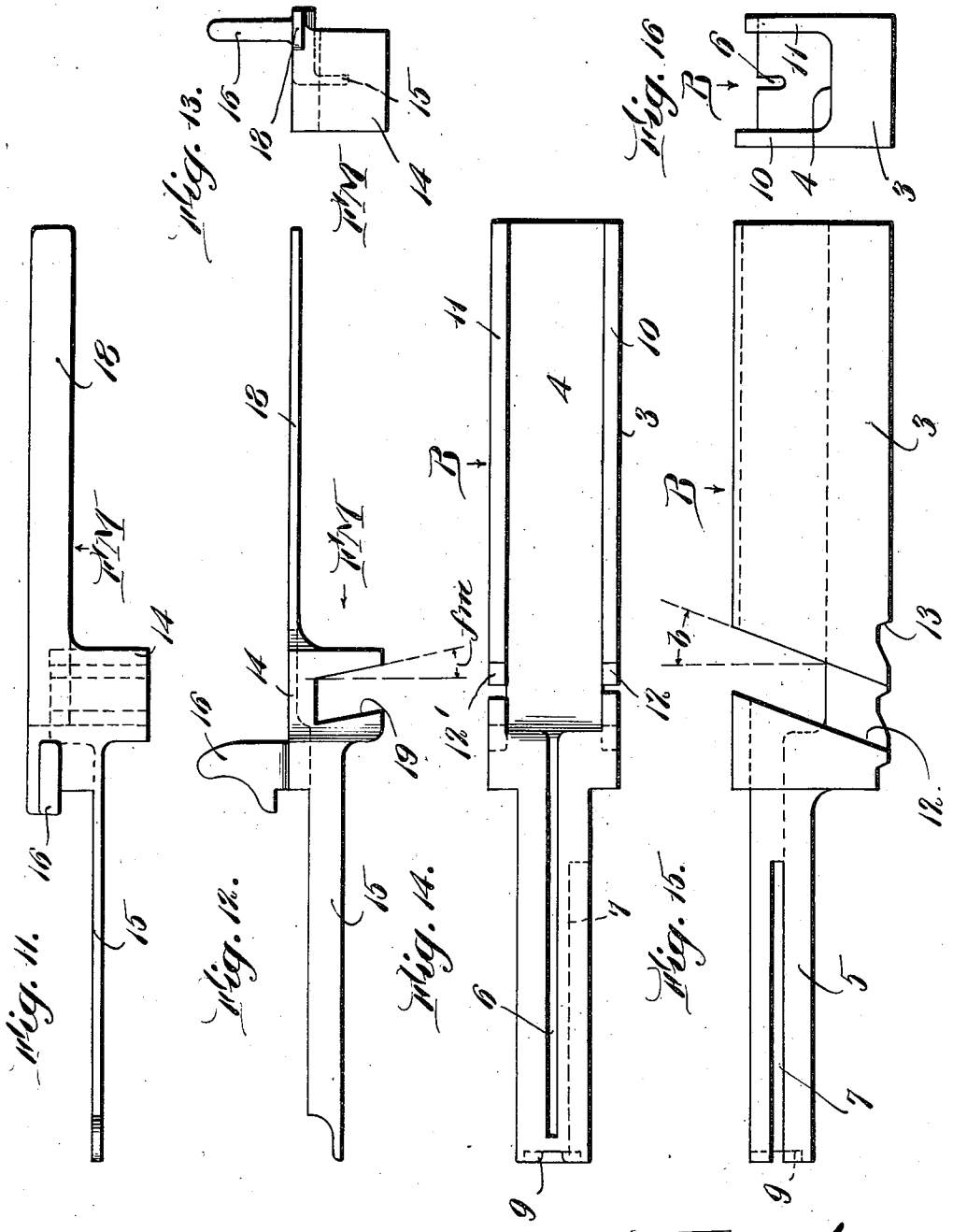

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UNITED STATES PATENT OFFICE.

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

FIREARM.

1,363,809. Specification of Letters Patent. Patented Dec. 28, 1920.

Application filed March 14, 1919. Serial No. 282,642.

To all whom it may concern:

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

This invention relates particularly to firearms such as pistols, rifles, machine guns, etc., which operate automatically according to the discovery disclosed in the patent to Blish 1,131,319, granted March 9, 1915, viz., which automatically lock the breech closed during high breech pressure and which automatically unlock the breech at diminished breech pressure. However, the invention is applicable in certain of its aspects to manual and semi-automatic firearms as will be evident to those skilled in the art.

The objects of the invention are to provide a firearm which is simple in construction, which is safe and rapid in operation, and which will operate automatically according to the discovery above referred to. More particularly the objects of the invention are to provide a lock for interlocking the breech block and firing member so that the gun cannot be fired before the breech block is locked and so that the firing member is moved into firing position simultaneously with the locking of the breech block and so that the gun is fired the instant the breech block is locked. Still further objects are to provide improved means for taking up the recoil of the breech action, to provide a more efficient breech bolt adapted to avoid the jamming of cartridges, to provide a breech action which may be assembled or disassembled quickly and without the use of tools, and to provide improved means for lubricating the breech action. While all of these objects are attainable in the preferred embodiment of my invention herein disclosed it is to be understood that by utilizing the invention only in certain of its aspects certain of the objects may be attained individually or in sub-groups without attaining all of the objects.

In one aspect the invention comprises a gun having a firing chamber, a breech block movable into and out of position to close the firing chamber, preferably though not necessarily by a purely reciprocatory movement, means for moving the breech block into said position, and means for concomitantly locking the breech block in said position and firing the gun. Thus no time elapses between the locking of the breech block and the firing of the gun, as in certain prior guns superficially resembling my improved gun, and the rate of firing is materially increased. And this increased rapidity is attained without rendering the gun unsafe; on the contrary the means for concomitantly locking the breech block and firing the gun is so arranged that the gun cannot be fired until the breech block is substantially and effectually locked. The means for concomitantly locking the breech block and firing the gun preferably comprises a lock interlocking the firing member, breech block and frame of the gun, the lock being laterally or angularly or otherwise transversely movable relatively to the part of the breech block and the line of breech pressure.

In another aspect of the invention the aforesaid lock for interlocking the various parts of the breech mechanism is arranged automatically to unlock the breech block and permit the automatic ejection of fired shells and the automatic feeding of unfired cartridges to the firing chamber when the breech pressure has diminished to a relatively low value compared with maximum breech pressure at the instant of firing. This automatic action is preferably effected by the breech pressure acting upon the lock in a manner generically similar to that disclosed in the aforesaid patent to Blish, in which case certain of the abutting surfaces of said interlocking parts are inclined to the line of breech pressure so that the breech pressure will unlock the breech block from the frame when the breech pressure has decreased to a predetermined point. While either the abutting surfaces between the lock and frame or the abutting surfaces between the block and lock may alone be inclined at the critical angle required, for purposes which will hereinafter appear I preferably incline both sets of surfaces at angles differing from each other an amount equal to the critical angle required.

When inclining the surfaces between the lock and the frame the transverse movement of the lock produces a longitudinal movement of the firing member, inasmuch as the

lock interlocks with the firing member, and this longitudinal movement alone may be utilized to move the firing member into and out of firing position. However, I preferably incline the abutting surfaces between the lock and firing member to effect or to assist in effecting this result.

Other aspects of the invention will be evident from the following description and the accompanying drawings, in which—

Figure 1 is a vertical central longitudinal section of the preferred embodiment of my improved firearm, certain parts disposed in the central plane being shown in elevation;

Fig. 2 is a vertical transverse section on line 2—2 of Fig. 1;

Fig. 3 is a vertical transverse section on line 3—3 of Fig. 1;

Fig. 4 is a side elevation of the breech lock;

Fig. 5 is an enlarged detailed section corresponding to Fig. 1, the parts being shown in firing position;

Fig. 6 is a similar view showing the parts in the position which they occupy immediately after firing and unlocking;

Fig. 7 is a vertical transverse section on line 7—7 of Fig. 5;

Fig. 8 is a vertical transverse section on line 8—8 of Fig. 5;

Fig. 9 is a vertical longitudinal section on line 9—9 of Fig. 8;

Fig. 10 is a perspective view of the lock;

Fig. 11 is a top view of the firing member;

Fig. 12 is a side view of the firing member;

Fig. 13 is a rear end elevation of the firing member;

Fig. 14 is a top view of the breech block;

Fig. 15 is a side view of the breech block;

Fig. 16 is a rear end elevation of the breech block;

Fig. 17 is a transverse section on line 17—17 of Fig. 1; and

Fig. 18 is a longitudinal section on line 18—18 of Fig. 1.

The particular embodiment of my invention chosen for the purpose of illustration comprises a receiver R, a barrel 1 having a firing chamber 2, a rear handle H, a forward handle H′, a magazine M, a breech block B, a lock L, a firing member FM, and a spring S for controlling the breech mechanism. As will be observed this gun is of the pistol type but it is to be understood that the invention claimed herein is applicable to rifles, machine guns, and other types of firearms.

The breech block B is arranged to reciprocate in the receiver R to and from the position shown in Fig. 1 wherein it closes the firing chamber 2, the firing chamber being fixed relatively to the frame. As shown in Figs. 14, 15 and 16 the breech block comprises a rear portion 3 which is rectangular in outline and which contains a longitudinal slot 4 adapted to receive the firing member FM and spring S. The forward portion 5 of the breech block is also rectangular in outline but is considerably smaller than the rear portion 5. The forward portion 5 contains a slot 6 on its upper side adapted to receive the forward end of the firing member, and on one side it has a slot 7 adapted to receive an ejector pin 8 mounted in the receiver R (Fig. 2), and at its forward end it has a recess 9 adapted to receive the head of a cartridge. The side walls 10 and 11 of the rear portion 3 of the breech block are provided with slots 12 and 12′ adapted to receive portions of the lock, the slots 12 and 12′ being inclined at an angle b relatively to the vertical. On its lower side the breech block is provided with a series of recesses 13 adapted to engage a sear to hold the breech block in retracted position.

The firing member FM shown in Figs. 11, 12 and 13 comprises a body portion 14 adapted to fit into the slot 4 in the breech block, a forwardly projecting firing pin 15 adapted to fit in the slot 6 of the breech block, and a finger piece 16 adapted to project upwardly through the slot 17 in the frame whereby the firing member may be manually controlled if desired. A thin projection 18 extends rearwardly from the body portion 14 of the firing member in alinement with the finger piece 16 for the purpose of closing the slot 17 in the frame. The body portion 14 is provided with a transverse slot 19 inclined at an angle fm with respect to the vertical.

The lock L, shown in perspective in Fig. 10, comprises a pair of lateral upright portions 20 and 20′, a transverse connecting piece 21, and lugs 22 and 22′ on the outer faces of the lateral portions 20 and 20′. The lateral portions 20 and 20′ of the locking member are adapted to fit into the slots 12 and 12′ in the breech block, the forward and rearward faces of the portions 20 and 20′ being inclined with respect to the vertical at the same angle b as the slots 12 and 12′ as shown in Fig. 4. The transverse portion 21 of the lock L is adapted to fit into the slot 19 in the firing member as illustrated in Figs. 5 and 6, the forward and rearward faces of portion 21 being inclined with respect to the vertical at the same angle fm as the slot 19. The lugs 22 and 22′ are adapted to fit into the slots 23 and 23′ in the receiver R, the forward and rearward faces of the lugs 22 and 22′ and the slots 23 and 23′ being inclined at an angle f with respect to the vertical.

In the particular embodiment of the present invention herein disclosed the angle f is 45°, the angle b is 22° and the angle fm is $-10°$, the firing pin angle being designated as a negative angle inasmuch as it slopes in the opposite direction from the

other angles. The angle *fm* of the firing pin may be varied considerably but should not be made too large inasmuch as it results in undue friction between the firing member and the lock and it should not be made too small inasmuch as the firing member would then not be projected forwardly relatively to the breech block with sufficient momentum to fire the cartridge.

When the breech mechanism is in firing position as shown in Figs. 5, 8 and 9 the rear portion of the breech block B is at the forward end of the chamber C in the receiver R and the forward portion 5 of the breech block is in position to close the firing chamber, the body portion 14 of the firing member is at the forward end of the slot 4 in the breech block, and the lock L is in its lowermost position with the lugs 22 and 22′ disposed in the slots 23 and 23′ of the frame and with the transverse portion 21 in the lower end of the slot 19 in the firing member. When the breech mechanism is moved out of firing position, either manually or automatically as will hereinafter be described, the lock occupies a raised position in which the lugs 22 and 22′ are above the level of the slots 23 and 23′ in the receiver and in which the transverse portion 21 of the lock is disposed in the upper end of the slot 19 in the firing member, the firing member FM is retracted somewhat relative to the breech block, and the breech block is free to move rearwardly in the receiver together with the firing member and lock, the breech block and firing member still being interlocked by the lock.

The operation of the breech mechanism is as follows: The compression spring S urges the breech block, firing member, and lock forwardly by virtue of its engagement with the rear end of the firing member. After the breech mechanism has moved from the locked position shown in Fig. 5 to the unlocked position shown in Fig. 6 the breech block, firing member, and lock move rearwardly together against the action of spring S without moving relatively to each other, the lock L maintaining the parts interlocked. In the rearward movement of the breech block the empty cartridge-shell is ejected by means of pin 8 (Fig. 2) and a new cartridge is forced up from the magazine into position in front of the breech block. In the forward movement of the breech mechanism the new cartridge is pushed into the firing chamber by the forward end of the breech block. When the lugs 22 and 22′ reach the slots 23 and 23′ the lock starts to move downwardly and continues to move downwardly during the last portion of the forward movement of the breech mechanism. During the downward movement of the lock the firing member is advanced relatively to the breech block and at the instant the breech block reaches its forward position the lock reaches its final locking position and the firing member fires the cartridge in the firing chamber. The lock L is moved into locking position not only by virtue of the slots 23 and 23′ in the frame but also by virtue of the inclination of the lateral portions 20 and 20′ riding in the slots 12 and 12′ in the breech block, as will be evident from the fact that the spring S exerts a forward pressure on the firing member which in turn exerts a forward pressure on the lock and the lock in turn exerts a forward pressure on the breech block, this forward pressure of the lock on the breech block tending to force the lock downwardly due to the inclination of the engaging surfaces between the lock and the breech block. The forward pressure of the firing member on the portion 21 of the lock has a slight tendency to force the lock downwardly, but this tendency is negligible compared with the downward components of force acting on the lock as above described.

In retracting the breech closing mechanism manually through the medium of the thumb piece 16 the firing member exerts a rearward pressure on the lock which in turn exerts a rearward pressure on the breech block. Owing to the inclination of the abutting surfaces between the firing member and portion 21 of the lock and owing to the engagement of the lugs 22 and 22′ with the rear faces of the slots 23 and 23′ and owing to the inclination of the abutting surfaces between the portions 20 and 20′ of the lock and the slots 12 and 12′ of the breech block the lock is caused to move upwardly until the lugs 22 and 22′ leave the slots 23 and 23′ after which the breech block, lock and firing member move rearwardly as a unit in the interlocked relationship shown in Fig. 6.

The breech mechanism above described is adapted to be unlocked automatically in the following manner: When the gun is fired the breech block transmits the breech pressure to the portions 20 and 20′ of the lock, and the lock transmits the pressure to the receiver through the medium of lugs 22 and 22′. By inclining the abutting surfaces between the breech block and lock or between the lock and receiver a certain critical amount, as disclosed in the aforesaid patent to Blish, the lock may be caused to unlock automatically when the breech pressure diminishes to a relatively low value. It is also possible to effect this automatic unlocking by inclining both the abutting surfaces between the breech block and lock, and the abutting surfaces between the lock and receiver, as disclosed in the application of Eickhoff and Payne Serial No. 203,887, filed November 26, 1917, in which case the difference between the inclination of these two sets of abutting surfaces should be approxi-

mately equal to said critical angle. Thus in the embodiment of my invention herein disclosed, where the abutting surfaces between the breech block and lock are inclined at an angle b to a plane perpendicular to the line of breech pressure and the abutting surfaces between the lock and receiver are inclined at an angle f to said plane, the difference between these angles, which is indicated $f—b$ in Fig. 4, should be equal to the critical angle at which the mechanism will unlock automatically at reduced breech pressure. Thus under the influence of diminished breech pressure the lock will be moved upwardly from the position shown in Fig. 5 to the position shown in Fig. 6, the firing member will be retracted relatively to the breech block to the position shown in Fig. 6 and the lock, firing member and breech block will then move rearwardly in interlocked relationship until their momentum has been absorbed by spring S, after which the spring S will return the mechanism to the locked position shown in Fig. 5 and simultaneously fire the new cartridge fed to the firing chamber during the forward movement of the mechanism. In order to assist in taking up the recoil momentum of the breech mechanism a buffer D may be inserted between the spring S and the rear end of the chamber C. The buffer D comprises a plunger 50 having a rear portion 51 of reduced diameter adapted to fit snugly into an opening in the rear end of the receiver R. Fitting over the forward end of the plunger 50 is a cylinder 52, the space between the forward ends of the plunger and cylinder being filled with leather washers 53 and the forward end of the cylinder preferably being provided with an air vent. The spring S fits around the cylinder 52 and bears against a flange on the rear end of the cylinder.

It will be observed that the firing member and breech block are interlocked by the lock L at all times, being interlocked in the position shown in Fig. 5 at the time of firing and being interlocked in the position shown in Fig. 6 during the recoil and advance of the breech block. Moreover, when interlocked in the position shown in Fig. 6 the firing member is wholly retracted within the breech block so that it is impossible for the firing member to strike the cartridge compartment, and the firing member is locked in this position until lock L has moved downwardly to lock the breech block to the frame, whereby the firing member cannot possibly fire a cartridge before the breech block is locked. It will also be observed that the firing member is advanced relatively to the breech block into firing position concomitantly with the movement of the lock into the locking position and that the cartridge is fired at the instant the lock reaches final locking position. This is a decided advantage over certain prior mechanisms wherein it is necessary for the firing member to travel forwardly a considerable distance after the breech block is locked inasmuch as no time is lost between locking and firing by my improved mechanism.

While the magnitude of the aforesaid critical angle depends largely on the magnitude of the breech pressure, and to a small extent on certain other factors such as the weight of the breech block, the weight of the firing member, the weight of the lock, the spring pressure, etc., it should be approximately 25° for pistols and approximately 5° for ordinary army rifles. The rapidity of action of the breech mechanism may be varied by varying various factors involved. For example, the action may be made more lively by slightly increasing the value of said critical angle, by decreasing the angle between the lock and firing member (the theoretical limit of this angle being an angle equal to the angle between the lock and breech block) by decreasing the mass of either the bolt, firing member or lock, or by reducing the spring pressure.

While any suitable trigger mechanism may be employed with the invention herein claimed I prefer to employ the trigger mechanism illustrated in Fig. 1, which comprises a sear 30 pivoted on the frame F and urged in a counter clockwise direction by a spring 32, a trigger 33 pivoted on the frame F by a shaft 34 and urged in a clockwise direction by spring 35, a disconnector 36 pivoted on the trigger at 37 and urged in a clockwise direction by spring 38 and a trip 39 pivoted on the shaft 34. The trip 39 has a portion 40 projecting into the magazine M and a portion 41 engaging the disconnector 36. In the normal operation of the trigger mechanism the disconnector 36 engages the sear 30 so that when the trigger is rotated in a counter clockwise direction the sear is rotated in a clockwise direction to release the breech block, the shoulder 42 of the sear being adapted to coöperate with one of the recesses 13 on the bottom of the breech block. When the magazine M becomes empty and the plate 42′ is pressed upwardly against the end 40 of the trip 39 by means of the spring 43 in the magazine, the trip 39 is rotated in a clockwise direction, thereby rotating disconnector 36 in a counter clockwise direction about the pivot 37 out of engagement with the sear 30, so that the breech block is permanently held in retracted position by the sear 30 after the last cartridge has been fired.

The frame F is provided with flanges 55 (Fig. 3) fitting into grooves in the opposite sides of the receiver R and is positioned on the receiver by sliding on the receiver from the rear. A plunger catch 56 is provided in a recess at the rear of the receiver to hold

the frame in position after it has been slipped on the receiver. A spring is provided in the recess behind the plunger catch to urge the catch into holding position. The spring is arranged to prevent the catch from falling out of the recess by having its last upper turn expanded to press tightly against the periphery of the recess and having its last lower turn contracted to grip the rearward end of the plunger.

Another important feature of the present invention comprises means in the receiver for automatically lubricating the breech action. As shown in Figs. 1, 17 and 18, this means comprises elongate lubricating pads 60 and 60′ formed of felt or the like, which are disposed longitudinally of the receiver on opposite sides of buffer D in the rear of the receiver. The pads are respectively mounted on the two arms 61 and 61′ of a U-shaped spring holder 62, the upper and lower edges of the arms 61 and 61′ being bent outwardly over the edges of the pads and the base of the U holder having an opening to receive plunger 50. The forward ends of the pads project slightly beyond the forward ends of the arms 61 and 61′. When the breech block recoils the rear portion of the block passes between the arms 61 and 61′ and the buffer D and in the extreme rearward position of the block the lugs 22 and 22′ of the lock engage said forward ends of the pads but do not engage the forward ends of the arms 61 and 61′. The pads are saturated with a suitable lubricant and this lubricant is gradually fed to the sliding parts of the breech block, lock, firing member, etc., during the operation of the firearm. Owing to the unique location and arrangement of the lubricating means it does not add to the size of the gun, it may be readily removed for cleaning or repairing, and it holds ample lubricating for many thousand rounds of firing.

Another important feature of the present invention resides in the arrangement of the parts of the breech action so that the parts may be assembled or disassembled quickly and without the use of tools. To disassemble the breech action the breech closure B is placed in forward position and the safety 70 placed in firing position, all as illustrated in Fig. 1. The catch 56 is then pressed inwardly and the frame F is slipped to the rear off of the receiver. The plunger 50 is then pressed forwardly until the projection 51 clears the rear wall of the receiver and the spring holder 62 and the plunger, cylinder and spring S are then lifted out through the open bottom of the receiver. The breech block B together with the lock and firing member, is then moved into retracted position and is lifted out. The firing member and lock are then moved into forward position and the lock is removed, the lugs 22 and 22′ of the lock sliding through the inclined slots 12 and 12′ in the receiver. The firing member is then moved into retracted position and lifted out. To assemble the parts the above order is reversed.

Still another feature worthy of particular notice is the general shape of the breech block, involving a small forward portion and a large rearward portion. The forward portion 5 (Fig. 15) is only slightly larger in cross-section than the cartridges and consequently the space in the receiver through which the forward end of the block moves may be made almost as small as the cartridges. This has the decided advantage of avoiding jamming of the cartridges in this space, a fault common to most guns of this general type. If the space were large in cross-section, as is customary, the cartridges could turn more or less transversely of the space and the cartridges would at times wedge or jam. However, by making the space only a small degree greater in diameter than the cartridge it is impossible for the cartridges to turn in this space any appreciable amount and consequently the danger of jamming is substantially eliminated. By making the rear portion of the breech block relatively large adequate bearing surfaces are provided, not only for the breech block but also for the lock and firing member, whereby great strength and rigidity is obtained along with the elimination of jamming.

I claim:

1. A firearm comprising a receiver, a breech-block, means interposed between the receiver and breech-block, with oblique surfaces arranged on a plurality of sides of the line of breech pressure for preventing movement of the breech-block relatively to the receiver at high breech pressure but permitting such movement at low pressures, and a firing member interconnected with said means to be actuated thereby.

2. Breech closure mechanism comprising a breech-block, a stop, a lock normally interposed between the breech-block and stop with surfaces abutting the block and stop respectively, certain of said surfaces being inclined to the direction of breech pressure so that the lock is held in locking position during high breech pressure but is forced from between the block and stop by the breech pressure when the pressure diminishes to a relatively low value, and a firing member interconnected with said lock to be moved into and out of firing position as the lock moves into and out of locking position respectively.

3. A gun of the character described comprising a frame, a firing chamber, a breech block movable into and out of position to close the firing chamber, means for moving the breech block closure into said position,

a lock movably mounted on said breech block to lock the breech block to said frame when the block reaches said position, said lock having oblique surfaces arranged to unlock the breech block in response to reduced breech pressure, a firing member interlocking with said lock, and yielding means for moving said parts into operative position.

4. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock interlocking with said frame and breech block and firing member, certain of the abutting surfaces of said interlocking parts being inclined to the line of breech pressure so that the breech pressure will unlock the breech block from the frame when the breech pressure has decreased to a predetermined value.

5. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, the abutting surfaces between said receiver and lock being inclined to the line of breech pressure so that the transverse movement of the lock is oblique to the path of the breech block.

6. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, certain of said surfaces being inclined to the line of breech pressure so that the breech pressure will unlock the breech block from the receiver when the breech pressure decreases to a relatively low value.

7. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, certain of said surfaces including the abutting surfaces between said receiver and lock being inclined to the line of breech pressure so that the breech pressure will unlock the breech block from the receiver when the breech pressure decreases to a relatively low value.

8. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, certain of said surfaces including the abutting surfaces between said lock and breech block being inclined to the line of breech pressure so that the breech pressure will unlock the breech block from the receiver when the breech pressure decreases to a relatively low value.

9. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, certain of said surfaces being inclined to the path of the firing member so that the firing member is moved into and out of firing position during the transverse movement of the lock.

10. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, certain of said surfaces including the abutting surfaces between said lock and firing member being inclined to the path of the firing member so that the firing member is moved into and out of firing position during the transverse movements of the lock.

11. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, certain of said surfaces including the abutting surfaces between said lock and firing member being inclined to

the path of the firing member so that the firing member is moved into and out of firing position during the transverse movements of the lock, and so that the transverse movement of said lock permits the firing member to move into firing position.

12. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, certain parts of said coöperating surfaces being so inclined to the line of breech pressure at different degrees respectively that the breech pressure will automatically unlock the breech block from the receiver when the breech pressure decreases to a relatively low value.

13. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, the coöperating surfaces between said receiver and lock and the coöperating surfaces between said lock and block being so inclined to the line of breech pressure at different degrees respectively that the breech pressure will automatically unlock the breech block from the receiver when the breech pressure decreases to a relatively low value.

14. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, and said coöperating surfaces of the various interlocking parts respectively being inclined to each other so that the firing member moves relatively to the breech block when the lock moves transversely of the breech block and so that the breech pressure will automatically unlock the breech block from the receiver when the breech pressure diminishes.

15. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, and said coöperating surfaces of the various interlocking parts respectively being inclined to each other so that the firing member moves relatively to the breech block when the lock moves transversely of the breech block and so that the breech pressure will automatically unlock the breech block from the receiver when the breech pressure diminishes, the coöperating surfaces between the lock and firing member being inclined in one direction relatively to the line of breech pressure and the coöperating surfaces between the lock and breech block being inclined in the opposite direction relatively to said line.

16. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, and said coöperating surfaces of the various interlocking parts respectively being inclined to each other so that the firing member moves relatively to the breech block when the lock moves transversely of the breech block and so that the breech pressure will automatically unlock the breech block from the receiver when the breech pressure diminishes, the coöperating surfaces between the lock and firing member being inclined to one side of a plane normal to the line of breech pressure and the coöperating surfaces between the lock and receiver being inclined to the other side of said plane.

17. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, and said coöperating surfaces of the various interlocking parts respectively being inclined to each other so that the firing member moves relatively to the breech block when the lock moves transversely of the breech block and so that the breech pressure will automatically unlock the breech block from the receiver when the breech pressure diminishes, the coöperating surfaces between the lock and firing member

being inclined in one direction relatively to the line of breech pressure and the coöperating surfaces between the lock and breech block and lock and receiver being inclined different degrees in the opposite direction relatively to said line.

18. A gun comprising a receiver, a firing chamber, a breech block movable in said receiver into and out of position to close the firing chamber, a firing member movably mounted on the breech block to fire the gun, and a lock movable transversely of the line of breech pressure, said lock having transverse surfaces coöperating with transverse surfaces on said receiver and breech block and firing member for interlocking said parts, the coöperating surfaces between the lock and firing member being inclined to the path of the firing member so that the firing member moves relatively to the breech block when the lock moves transversely of the breech block, and the coöperating surfaces between the lock and breech block and receiver being inclined to the line of breech pressure so that the breech pressure will automatically unlock the breech block from the receiver when the breech pressure diminishes.

19. A gun comprising a receiver, a breech block movable in said receiver, a firing member movable on said breech block, and a lock movable transversely of said breech block for interlocking said parts, the lock having lateral portions and a central portion connecting said lateral portions together, the lateral portions engaging said receiver and breech block and the central portion engaging said firing member.

20. A gun comprising a receiver, a breech block movable in said receiver, a firing member movable on said breech block, and a lock movable transversely of said breech block for interlocking said parts, the lock having lateral portions and a central portion connecting said lateral portions together, the lateral portions having transverse surfaces engaging the receiver and breech block respectively and the central portion having a transverse surface engaging the firing member, certain of said surfaces being oblique to the breech block.

21. A gun comprising a receiver, a breech block movable in said receiver, a firing member movable on said breech block, and a lock movable transversely of said breech block for interlocking said parts, the lock having lateral portions and a central portion connecting said lateral portions together, the lateral portions engaging said breech block and the central portion engaging said firing member, and the lateral portions having lugs engaging said receiver.

22. A gun comprising a receiver, a breech block movable in said receiver, a firing member movable on the breech block, and an H-shaped member movable transversely of said breech block for interlocking said parts.

23. A gun comprising a receiver, a breech block movable in said receiver, a firing member movable on the breech block, and an H-shaped member movable transversely of said breech block for interlocking said parts, the H-shaped member having lateral lugs engaging said receiver.

24. A gun comprising a receiver, a breech block movable in said receiver, a firing member movable on the breech block and an H-shaped member movable transversely of said breech block for interlocking said parts, the transverse portion of said H-shaped member engaging the firing member and the lateral portions of said H-shaped member engaging the breech block.

25. A gun comprising a receiver, a breech block movable in said receiver, a firing member movable on the breech block, and an H-shaped member movable transversely of said breech block for interlocking said parts, the transverse portion of said H-shaped member engaging the firing member and the lateral portions of said H-shaped member engaging the breech block, and the lateral portions of the H-shaped member having lugs on their outside faces engaging said receiver.

26. A gun comprising a receiver, a breech block movable in said receiver, a firing member movable on the breech block, and an H-shaped member movable transversely of said breech block for interlocking said parts, said firing member having a transverse slot fitting over the transverse portion of said H-shaped member, said breech block having transverse slots fitting over said lateral portions of the H-shaped member, and said lateral portions of the H-shaped member having lugs fitting into transverse slots in said receiver.

27. A gun comprising a firing chamber, a receiver, a breech closure movable in the receiver to and from the firing chamber, a plunger disposed in the receiver in the rear of the breech closure, a cylinder fitting over the forward end of the plunger, and a recoil spring interposed between the cylinder and breech closure said spring extending around said cylinder and abutting the cylinder in the rear of the forward end of the plunger.

28. A gun comprising a firing chamber, a receiver, a breech closure movable in the receiver to and from the firing chamber, a plunger mounted in the rear end of the receiver, a cylinder fitting over the forward end of the plunger, the cylinder having a flange on its rearward end, and a compression spring surrounding the cylinder and bearing against said flange at one end and against the breech closure at the other end.

29. A gun comprising a receiver, breech closing means movably mounted in the receiver, lubricant pads disposed on opposite

sides of the receiver, a U-shaped member extending around the rearward end of the receiver chamber for holding said pads in position, and a buffer disposed between said pads and extending through said U-shaped member so as to interlock with said member.

30. A gun comprising a receiver, a breech-block, a breech-lock interposed between the receiver and breech-block the breech-lock having a locking abutment inclined relatively to the line of breech thrust automatically to permit the breech-block to open after the breech pressure has decreased to a safe value, and means having a cam engagement with the breech-lock for manually unlocking and opening the breech-block in response to a straight pull.

31. A gun comprising a receiver, a breech closure having a locking lug movable transversely of the line of breech thrust for holding the breech closed, said receiver and lug having abutting faces inclined to said line at such angle that the breech is maintained closed during high breech pressure but is automatically opened directly in response to the breech pressure acting on the lug through the closure, and manual means including a cam arranged to move said lock out of holding position and including a member movable only in a straight line for unlocking and opening the closure.

32. A gun comprising a receiver, a breech-block, a breech-lock interposed between the receiver and breech-block, and an actuator, the receiver and breech-block and breech-lock and actuator having engaging surfaces, certain of said surfaces being inclined to the path of the block automatically to unlock and open the breech in response to the breech pressure acting upon the breech, and certain of said surfaces being inclined to the path of the block manually to unlock and open the breech in response to a straight rearward movement of the actuator.

33. A gun comprising a breech-block and a breech lock, a firing member interengaging through surfaces disposed at such angles to the path of the bolt that a straight rearward pull on the firing member unlocks and retracts the block, and a handle on the firing member by which the member may be manually retracted.

34. Breech closure mechanism for firearms comprising a receiver, a breech-block movable relatively to the firing chamber for closing the breech, a breech-lock movable relatively to said breech-block for locking the breech-block in closed position, a firing member movable relatively to the breech-block and a recoil spring, said receiver and block and lock and member interengaging through surfaces certain of which are inclined relatively to the line of breech pressure so that the firing member is retracted and the lock unlocked, and the block opened directly in response to the breech pressure and so that the block is closed and the lock locked and the firing member advanced by the recoil spring.

35. A gun comprising a receiver, a breech closure having a locking lug movable transversely of the line of breech pressure, and an actuator movable longitudinally of said line, said receiver and lug having a set of inclined engaging faces and said lug and actuator having a set of inclined engaging faces, said two sets of engaging faces being inclined in opposite directions relatively to said line.

Signed by me at Cleveland, Ohio this twenty-fourth day of February 1919.

OSCAR V. PAYNE.