July 4, 1944. H. SCHIROKAUER 2,353,118

GUN

Filed Sept. 24, 1941 5 Sheets-Sheet 1

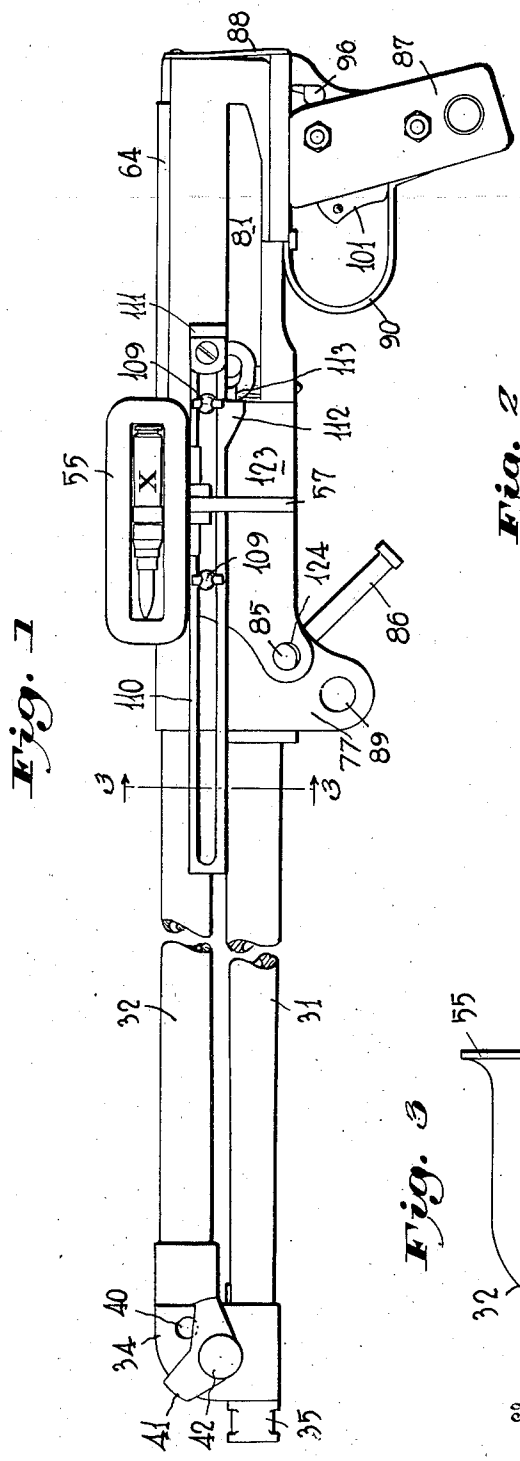


Fig. 1

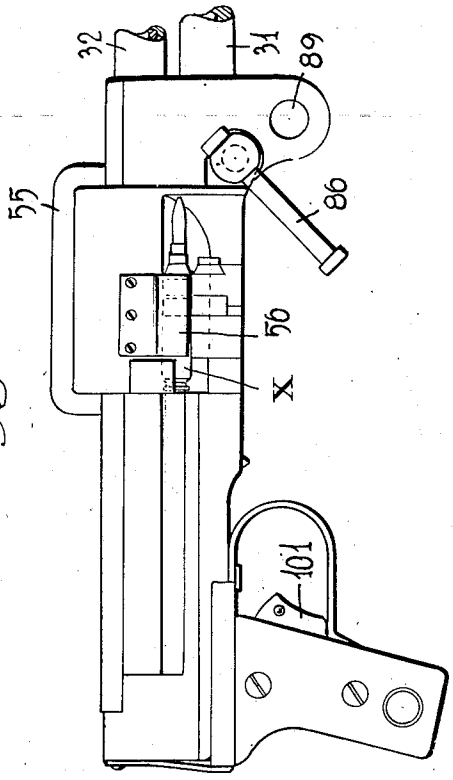


Fig. 2

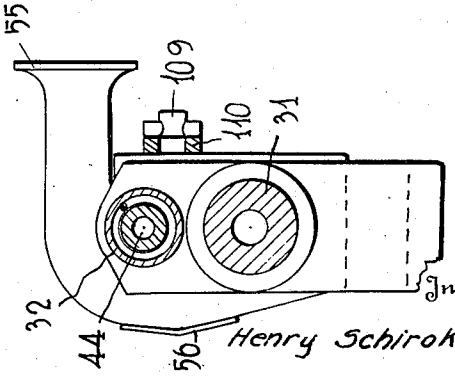


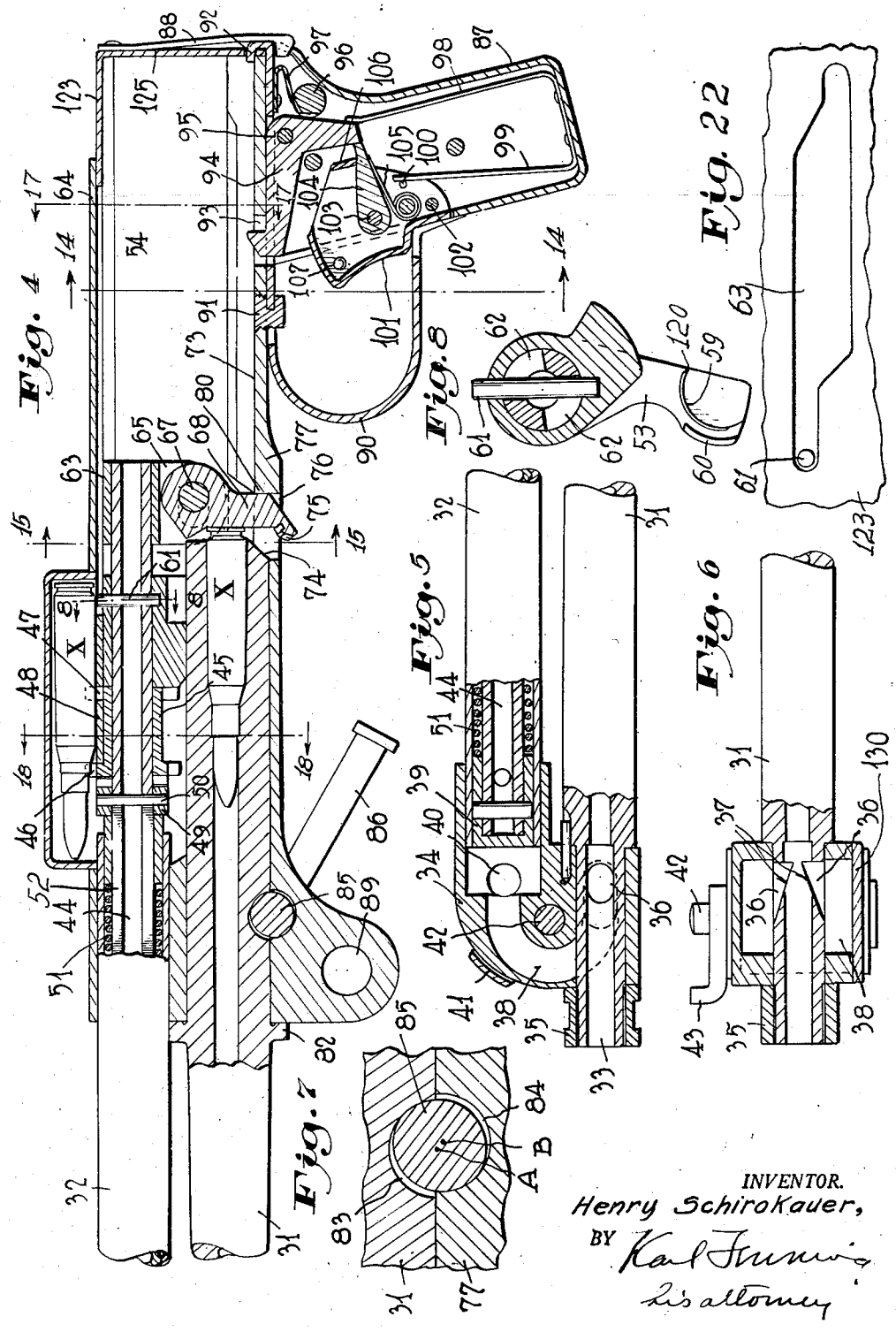
Fig. 3

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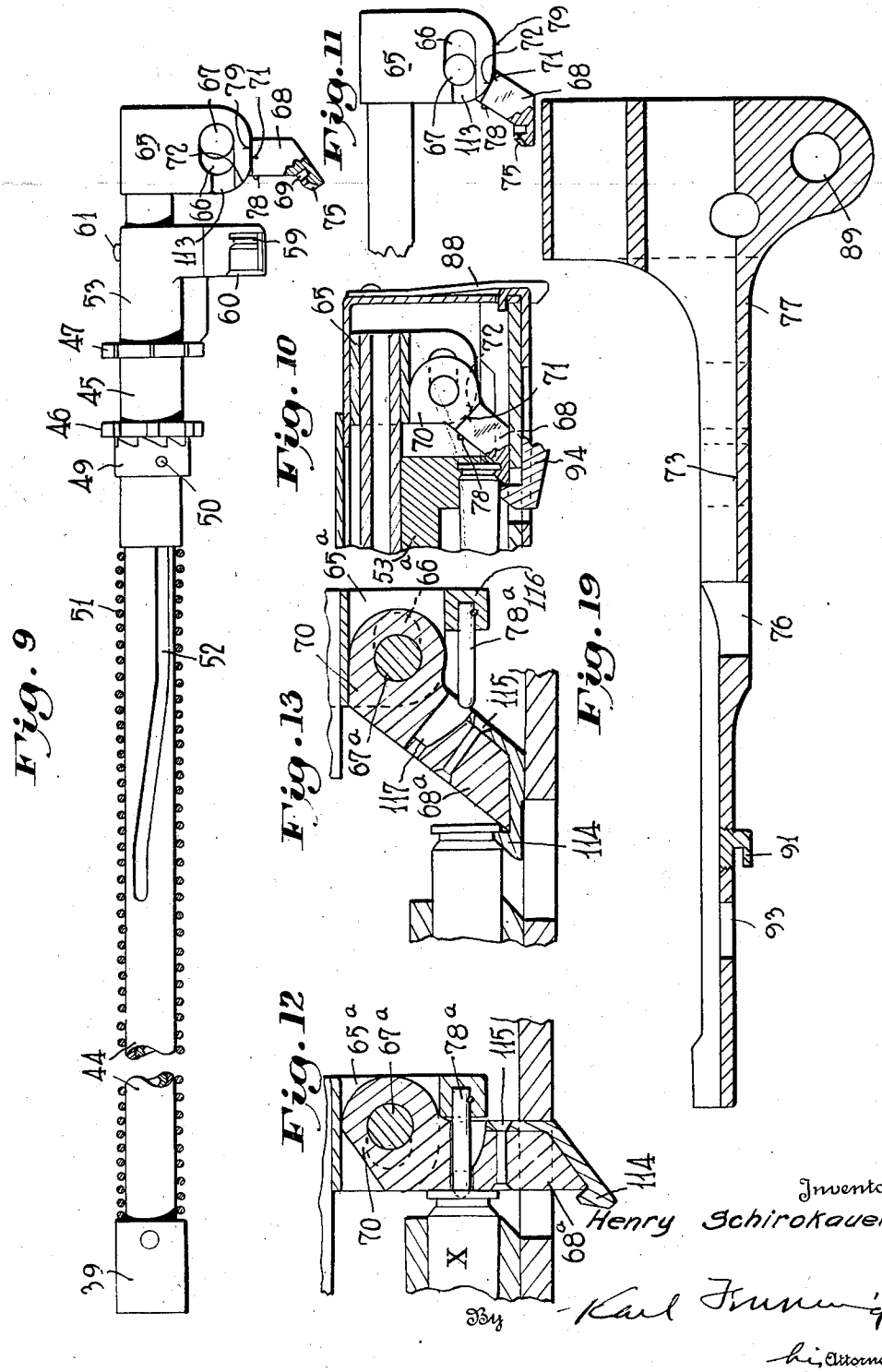
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Fig. 16

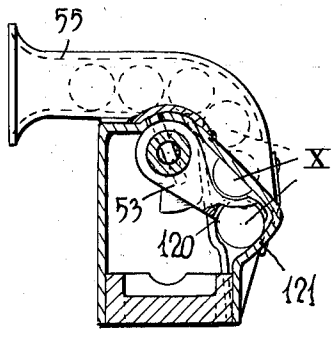
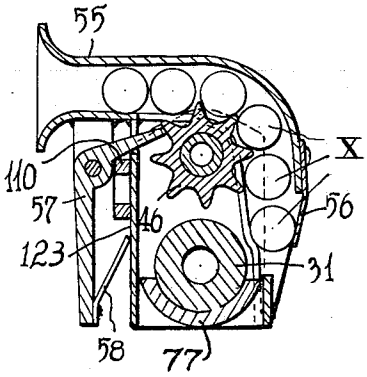


Fig. 18



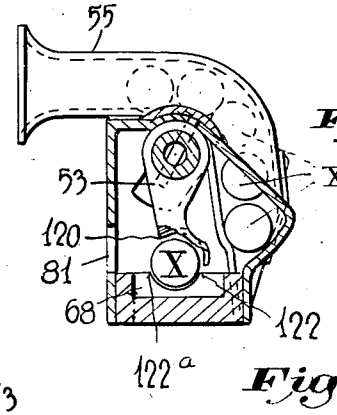


Fig. 17

Fig. 14

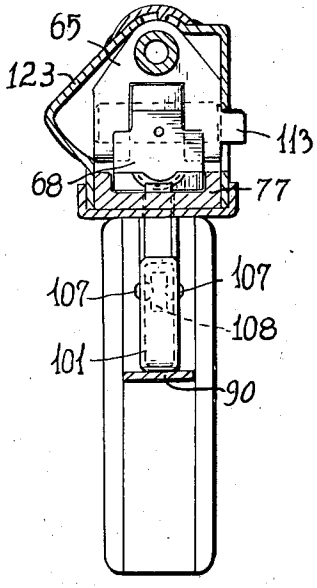
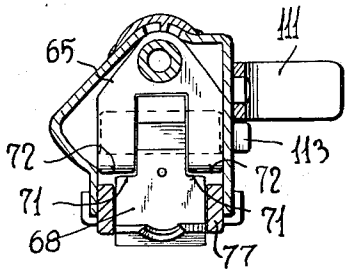


Fig. 15



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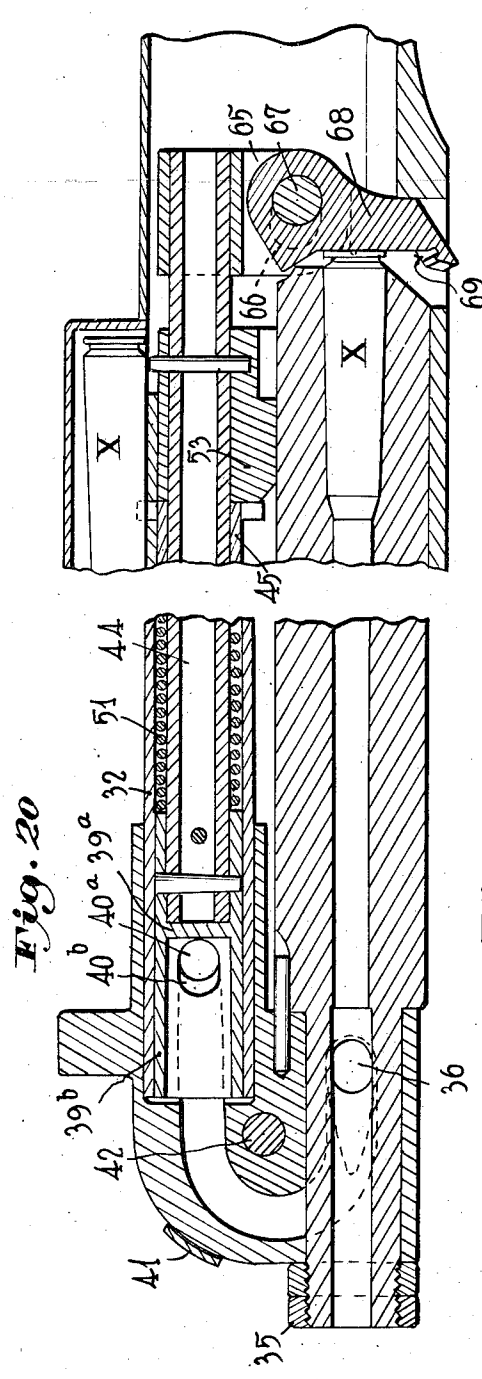


Fig. 20

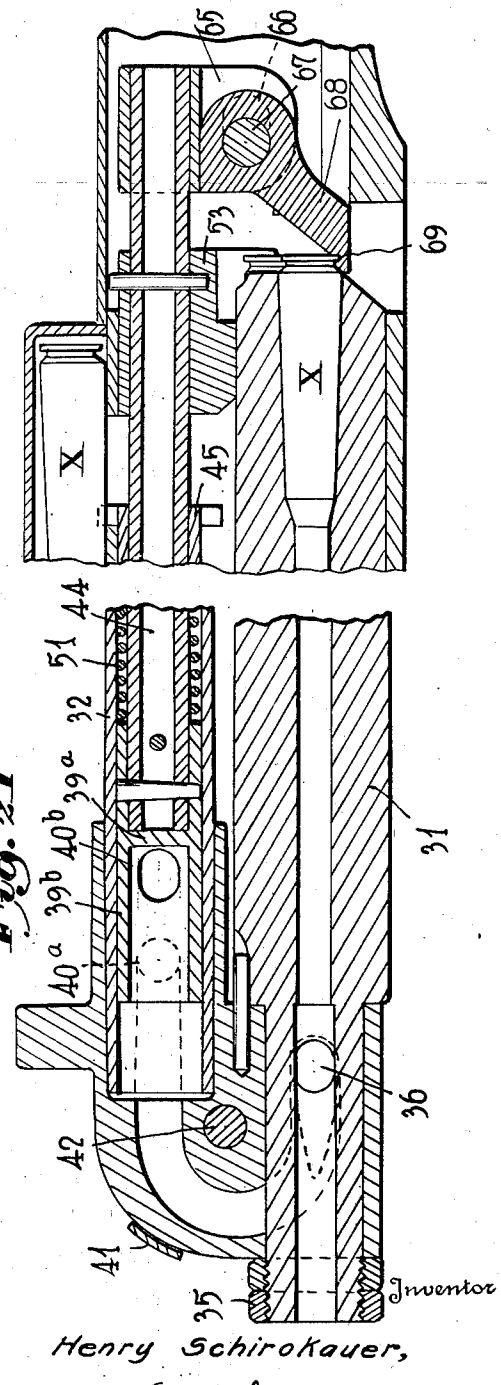


Fig. 21

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UNITED STATES PATENT OFFICE

2,353,118

GUN

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Application September 24, 1941, Serial No. 412,168

4 Claims. (Cl. 89—33)

The invention relates to guns, but phases of the invention are not confined to any particular type of gun. All the elements involved in the invention, however, may be combined in a machine gun of the automatic, semi-automatic or self-loading and operating types. Such a gun may comprise in general the gun barrel with which is associated the receiver or cartridge chamber and cartridge feeding and firing mechanism. The firing mechanism may be controlled by a trigger device. With the barrel may be associated a gas cylinder tube. Connecting the barrel and the gas cylinder tube may be a gas muzzle or mechanism having a channel for leading gases from the fired cartridge to the gas cylinder tube where they may operate some or all of the gun mechanism. The present invention contemplates improvements in substantially all of the gun elements.

In the gun barrel and leading to the gas transmitting mechanism may be holes formed in an improved manner as so as to receive a sufficient quantity of the gas in a way to accomplish the desired purpose. The gas muzzle which transmits the gas to the gas cylinder may be so formed as to receive the gas and consume some of its energy. This preferably is done in a manner to effect a more or less smooth operation without sudden kicks or jerks. In the gas muzzle sufficient energy of the gas may be consumed to act as a complete counter-recoil device for the gun so that there is substantially no kick or recoil at the stock or firing end of the gun. Sufficient active gas for operation is fed to the gas cylinder tube but before it arrives there means may be provided for releasing some of the gas when excess of energy might otherwise be introduced. The relieving gas outlets may be controlled by an adjacent device to vary and regulate the gas conditions.

The gas cylinder tube is provided with a reciprocating piston on the piston rod of which may be mounted a mechanism for feeding or advancing the cartridges and also a conveyor for ejecting the cartridges from the cartridge belt when used and feeding them to the cartridge chamber. The piston rod may also carry the breech block in which may be incorporated the firing pin and the extractor for the empty shell. The piston rod may be provided with a clutch mechanism for rotating the cartridge feeding device and for operating the clutch a suitable cam mechanism may be provided. Also mounted on the piston rod may be a spring which acts as the spring for holding the clutch in engagement and also acts as the spring for returning the rod against the spent gas pressure and so feeding the cartridge to the gun and firing the gun. For convenience of assembling, disassembling, handling and operation the mechanism carried by the piston rod may be assembled and fastened together as a unit.

The operation of the firing means may be controlled by a sear. A unitary casing may carry the sear and the trigger operating mechanism for controlling the firing of the gun. Preferably the trigger mechanism as a unit may be removed from the gun. The trigger casing may carry a spring controlled locking device for holding the sear in position to prevent firing the gun. In the trigger frame may be a trigger structure which preferably may move the sear to release the firing apparatus and then release the sear to return to its non-firing position. The trigger may also include means for moving and holding the sear in firing position so that the gun mechanism may be free to fire automatically repeatedly rapidly. The trigger may be provided with a stop controlling mechanism to limit the movement to a single firing operation. Preferably this stop mechanism may be arranged so that additional force placed on the trigger may release the stop and allow the trigger to proceed to the position to hold the sear for automatic rapid firing of the gun.

The breech block mechanism which preferably will be carried by the piston rod may reciprocate in the receiver. It may include a member pivoted to a support carried by the piston rod. Preferably this will be mounted by a loose motion mechanism such as a pin riding in a slot. The contact surfaces of the support and the breech block may have a cam action so that in one position of the loose motion mechanism the breech block may be free to turn on its pivot while in another position of the loose movement mechanism it may be locked against turning. The breech block may carry an extractor mechanism which in one pivoted position may be away from the cartridge and in the other pivoted position may engage the shell to extract it from the barrel. The breech block may also carry the firing pin in such a way that in one pivoted position it may be held away from the cartridge while in another pivoted position it may be forced against the cartridge cap to fire the gun. The conveyor may deliver the cartridge to such a position in the receiver that it will force the empty shell from the gun. After the incoming cartridge reaches this position

the breech block in coordination with the conveyor may feed it to the gun barrel and properly position it therein for firing. Preferably the sear when not acted on by the trigger will be in such position as to restrain and hold the breech block away from the breech end of the barrel and prevent it from advancing the cartridge into the barrel.

The conveyor mechanism may engage a cartridge which has been advanced to the proper position by the cartridge feeding mechanism. The conveyor preferably may be mounted on the piston rod so as to reciprocate therewith but be free to turn thereabout. The movement of the conveyor may be effected and controlled in any suitable manner such as by a pin thereon engaging a suitable cam or cam slot in the gun casing. The cartridge may be engaged by the conveyor and moved to a position near the rear end of the receiver and then the turning movement of the conveyor may force the cartridge into proper position to be fed into the barrel by appropriate mechanism such as the breech block in coordination with the conveyor. The conveyor may be so formed as to engage the groove at the base of the cartridge which may be so proportioned and so arranged with respect to the other parts of the gun that the cartridge cannot be displaced from the conveyor until it is finally released in its final feeding position. This may be accomplished by causing the space between the conveyor and the adjacent portions of the frame to be less than the diameter of the cartridge so that it may not slip through. The cartridge seat in the conveyor may be somewhat elevated so that when the conveyor reaches its final position the cartridge will drop away and allow clearance for the return movement of the conveyor.

The gun may be provided with bearing means for the trunnions of a stand or the like. Apertures opposing each other in the barrel and frame may be so formed that they may receive a rotatable pin which may bind the barrel against the frame and hold the parts rigidly together.

In order to initiate operation of the gun, to feed in an initial cartridge or to take care of emergencies caused by failure to fire, misfiring, etc., hand operating means may be provided on the outside of the gun for operating the movable parts. Likewise the mechanism for feeding in the cartridges even when in a cartridge belt may be manipulated by mechanism accessible to hand operation from the outside of the gun.

The various parts of the gun may be held together by means which may be manipulated by hand and without the use of complicated tools. This may be especially important in connection with mounting and dismounting the trigger mechanism, the frame and the piston rod carrying the conveyor, the breech block, etc.

The entire mechanism has been so designed, constructed and associated as to provide a gun of relative simplicity, of light weight and of small size especially with respect to over-all length of the gun. The parts may be conveniently and accurately made in quantity so that they are interchangeable and replaceable and may be conveniently, economically and rapidly assembled into the various sections and the completed gun.

The invention may be incorporated in various specific structures and is not confined to specific details. Without limiting the invention specific apparatus embodying the invention is disclosed in the accompanying drawings and will be specifically described so as to further and fully explain the invention.

In the accompanying drawings Figure 1 is a side elevation of a gun taken from the left. Fig. 2 is a fragmentary side elevation of the gun taken from the right. Fig. 3 is a transverse vertical section on the line 3—3 of Fig. 1. Fig. 4 is a longitudinal vertical section of a portion of the gun showing the trigger and other operating parts. Fig. 5 is a longitudinal vertical section of the muzzle end of the gun. Fig. 6 is a horizontal section through the muzzle end of the gun upwardly showing associated parts. Fig. 7 is a fragmentary section on a larger scale showing the mechanism for locking the barrel to the frame. Fig. 8 is a fragmentary vertical section on the line 8—8 of Fig. 4. Fig. 9 is a side elevation of the piston rod and parts carried thereby. Fig. 10 is a fragmentary longitudinal vertical section showing the breech lever and associated parts in retracted position. Fig. 11 is a side elevation of the breech lever in retracted position. Fig. 12 is a fragmentary longitudinal vertical section showing in firing position an optional form of firing pin and associated parts. Fig. 13 is a similar view of the parts of Fig. 12 in partially retracted position. Fig. 14 is a transverse vertical section on the line 14—14 of Fig. 4 but with the piston in retracted position. Fig. 15 is a fragmentary transverse vertical section on the line 15—15 of Fig. 4 looking to the right. Fig. 16 is a fragmentary transverse vertical section on line 15—15 of Fig. 4 looking to the left showing the conveyor in position when it first engages a cartridge. Fig. 17 is a view similar to Fig. 16 on line 17—17 of Fig. 4 showing the conveyor in its final position delivering the cartridge to the receiver. Fig. 18 is a transverse vertical section on the line 18—18 of Fig. 4. Fig. 19 is a longitudinal vertical sectional view through the frame member. Fig. 20 is a fragmentary vertical longitudinal section through a gun with another form of reciprocating piston. Fig. 21 is a section similar to Fig. 20 showing the parts in another position. Fig. 22 is a fragmentary top plan view of the casing with the cover removed showing the slot controlling the conveyor.

The gun is provided with a barrel 31 and a gas tube 32 substantially parallel thereto. At its muzzle end the barrel bore may be slightly enlarged at 33. Fitting on the muzzle end of the barrel and the adjacent end of the gas tube 32 is a gas muzzle device 34 held in place by a nut 35 on the muzzle end of the barrel. In the wall of the enlarged portion 33 of the muzzle of the gun are holes 36. These holes are preferably somewhat oval and have their outer walls 37 at an angle of less than 23° to the walls of the gun barrel. The openings 36 communicate with a channel 38 in the gas muzzle 34. The channel 38 is arch shaped or semi-circular, having a curved outer wall. The channel 38 leads to the interior of the gas tube 32 and impinges on a piston 39 movable therein. Near the entrance to the gas tube 32 are holes 40 open to atmosphere. A shutter member 41 pivoted at 42 to the gas muzzle 34 may be moved or adjusted by a handle 43 to regulate and control the amount of the holes 40 left open.

The gas muzzle device may be made of a casting 34 provided with a cover plate 130 at one side which may be fastened in place in any suitable manner. By this construction it is possible to manufacture the gas muzzle device by simple machine operations. Thus the openings for the

gas tube 32 and the end of the barrel 31 may be bored from the end of the casting 34. The casting may then be turned on its side and from the side which is to receive the cover 130 the remaining operations may be performed. The hole 36 may be drilled as deeply as may be needed, and may be properly formed. The hole 40 may be drilled entirely through the casting 34. With an end mill machine the channel 38 may be formed. The hole to receive the pivot bolt 42 may be drilled entirely through the casting 34. The cover 130 may then be prepared by drilling through it the continuation of the hole 40 and a hole through may then be fastened rigidly in place and the valves 41 mounted by means of the pivot pin 42.

As the gun is fired and the bullet passes through the gun barrel the propelling gases under pressure follow the bullet. As the bullet approaches the muzzle of the gun it passes the holes 36 and a portion of the following gases become free to pass through the holes 36. Because of the small 23° angle made by the wall 37 there is not an abrupt change in the direction of the gases and a kick or shock may thus be avoided. The gases continue through the curved channel 38 and tend to press upon the forward curved wall thereof in such a way as to counteract the irregular or kicking action of the gun. The effect of this may be to keep the gun more or less steadily in one position and make it easy to handle and manipulate and at the same time not materially interfere with the aim or direction of shooting. As the gases pass through the channel 38 which directs them backwards 180° they enter the gas tube 32 and impinge upon and move the piston 39 for a purpose to be explained. The amount of energy remaining in the gases may be very large and may be more than is necessary to operate the piston 39. The pressure may be relieved by allowing a suitable portion of the gas to exit through the openings 40. The valves 41 may be adjusted and set at a proper position to give the desired relief and procure whatever pressure is desired on the piston 39.

The piston 39 carries a piston rod 44 which is shown as a hollow tube.

Mounted to rotate freely on the piston rod 44 is a feeding spool 45. The spool 45 has two toothed wheels on it, 46 and 47, which are adapted to engage cartridges fed to the gun. The rod 44 when pressure is brought on the piston 39 may move longitudinally through the spool 45 which is held from longitudinal movement by a portion 48 of the housing for the gun passing between the wheels 46 and 47. A clutch member 49 held on the shaft 44 by a transverse pin 50 is held in engagement with the spool 45 by a spring 51 carried by the rod 44 and bearing on the collar of the clutch member 49. The pin 50 rides in a cam slot 52 in the rod 44 so that on each reciprocation of the rod 44 the clutch 49 rotates the spool 45 one step so as to advance a cartridge to be fed to the gun. Behind the spool 45 there is mounted on the rod 44 a conveyor 53 which as the rod 44 moves longitudinally removes a cartridge from the chamber associated with the feeding mechanism and delivers it to the receiver 54 of the gun. As illustrated especially in Figs. 16, 17 and 18 the cartridges are fed into a transverse chute 55 by hand or by a belt or by suitable means not illustrated. Rotation of the feed spool 45 advances the cartridges one at a time until the lowermost cartridge reaches the position indicated at the right in the bottom of Fig. 18 where it is resiliently held by a spring 56. The feed spool 45 is normally held against reverse movement by a lever 57 controlled by a spring 58. The holding lever 57 may be released by hand pressure from the outside of the gun so as to remove or feed or manipulate cartridges if the need arises. The spring 51 extends between the clutch member 49 and the piston 39 and normally holds the piston 39 in the muzzle end of the gas cylinder tube 32. In this position the conveyor 53 is in the position indicated in Fig. 16. As is shown in Fig. 9 the arm of the conveyor 53 is provided at its end with a cavity provided with a rib 59 adapted to engage the groove in the base of a cartridge. The front edge of the cavity is bevelled at 60 so that it may slide between the lower two cartridges as illustrated in Fig. 16. In this position it will grasp a cartridge, sufficient movement for its entrance being provided by the resiliency of the spring 56. The conveyor 53 is mounted on the rod 44 by means of a pin 61 which rides in slots 62 in the rod 44 so that the conveyor cannot move longitudinally on the rod 44 but is free for a partial rotary movement thereon. The protruding end of the pin 61 rides in a slot 63 in the casing of the gun. The form of the slot 63 is illustrated in Fig. 22. A cover 64 for the slot 63 is shown. The slot 63 controls the rotary movement of the conveyor 53 and is so formed that as the piston 39 moves in the gas tube 32 the conveyor 53 moves the cartridge which it has grasped backward into line with the receiver 54 and then inward toward the center of the barrel into the position shown in Fig. 17.

It will be noted that the inner point 120 of the rib 59 in the conveyor 53 as shown in Fig. 16 is positioned less than the diameter of a cartridge X from the adjacent portion 121 of the gun housing. It is therefore impossible for the cartridge to fall down. As the conveyor 53 moves from the position illustrated in Fig. 16 to a position illustrated in Fig. 17 the point 120 always keeps nearer to adjacent parts of the structure than the diameter of the cartridge. Thus the corner 122, as the cartridge sweeps over it, keeps the cartridge in its seat in the conveyor but as the conveyor reaches the final position indicated in Fig. 17 the cartridge drops downward vertically into a position which is below the corner 120 of the conveyor 53 and with the cartridge in this position the conveyor 53 may turn counter-clockwise from the position indicated in Fig. 17 without engaging or disturbing the cartridge X and so return to its normal position to grasp and convey another cartridge. By this arrangement the cartridge as it approaches the position indicated in Fig. 17 strikes and forces out of the gun at 81 the empty shell which has been brought back by the extractor but the new shell itself is prevented from going out of the gun by the restricted distance between the corner 120 and the corner 122*a*.

Behind the conveyor 53 there is rigidly mounted on the rod 44 an inverted U-shaped supporting block 65, the depending arms of which are provided with bearing slots 66 in which is mounted a pin 67 carrying a lever 68 which acts as a breech block for the gun. The pivoted breech lever 68 travels forward and backward in the receiver 54. In its backward position the breech lever 68 as illustrated in Fig. 10, is in position to receive the cartridge from the conveyor 53. The lower end 69 of the breech lever is shaped to receive the groove at the base of a cartridge X. The breech lever 68 is free to turn on the pin 67 as a pivot. The breech lever at its upper end is provided with a cam extension 70 so formed that it engages the

under part of the supporting block 65 and forms a limiting stop for the rotary movement of the breech lever 68. The breech lever 68 is somewhat the shape of an inverted T and its extending arms are provided with flat surfaces 71 which as indicated in Figs. 10, 11 and 15 are in contact with the curved edge 72 of the lower ends of the supporting block 65. In this position forward movement of the piston 39 under the influence of the spring 51 causes the curved surface 72 to bear against the surface 71 and force the breech lever to advance and take its position behind the barrel of the gun as indicated in Fig. 4. It will be observed that during this movement the pin 67 of the breech lever is in the front end of the slots 66. As the breech lever moves it rides on the surface 73 of the gun frame 77. As the breech lever approaches the position indicated in Fig. 4 its forward end may fall down through the hole 76 in the gun frame 77 and come to final position to close the breech of the gun. To aid this action the lower edge of the breech end of the gun barrel may be bevelled as at 74 and the front end of the breech lever 68 may be correspondingly bevelled at 75 so that as the breech lever 68 approaches the position indicated in Fig. 4 the engagement between the surfaces 74 and 75 causes the breech lever to turn downward on its pivot 67 and drop into a hole 76 in the gun frame 77. Carried by the breech lever 68 is a firing pin 78 which remains out of contact with the cartridge until the breech lever turns on its pivot 67. As the breech lever support approaches its final position, indicated in Fig. 4, the breech lever 68 turns and further movement of the support 65 causes the pin 67 to ride in the slot 66 so that as indicated in Figs. 4 and 9 the pin reaches the rear end of the slots 66. This tends to cause a hammer blow of the firing pin 78 against the cartridge primer to fire the gun. The actual firing preferably takes place shortly before the device takes its final position. As the breech lever 68 turns on the pin 67 the surface 71 slides along the curved surface 72 of the breech lever support 65 and comes into contact with the flattened lower surface 79 of the support 65. (See Figs. 4, 9 and 11.) As the slots 66 progress along the pin 67 the flat surfaces 71 and 79 come into close contact and thus lock the breech lever against turning until the pin 67 again reaches the front end of the slot 66. Thus the breech lever is locked against turning in firing position. The backward movement of the support 65 pulls the slots 66 along the pin 67 until it reaches the front end of the slots when it is free to turn and this turning is caused by contact of the corner 80 of the hole 76 in the frame 77 with the back surface of the breech lever 68. This turning causes the shaped surface 69 at the end of the breech lever 68 as it rises to engage the rim at the base of the fired shell and further movement of the supporting block 65 extracts the shell from the barrel and brings it back so that as the new cartridge is brought into position indicated in Fig. 17 it forces the spent shell sidewise and outward through the opening 81 in the gun casing.

The gun frame member 77 at its forward end abuts against a projecting ring or lug 82 on the barrel 31. The barrel 31 is provided with a substantially semicircular opening 83. A similar substantially semicircular opening 84 is provided in the facing surface of the frame 77. The radii of these two openings are the same but their centers are slightly removed from each other. Thus the center B of the opening 84 may be slightly to the right and downward at an angle of about 45° from the center A of the opening 83 (see Fig. 7). A pin 85 provided with a turning handle 86 may be inserted through the openings 83 and 84. The pin 85 is somewhat elliptical in cross-section, having its upper forward portion formed on the radius B and its lower rear portion formed on the radius A; so that as the handle 86 is turned downwardly there is a tendency for the pin 85 to engage 83 with its upper right hand side and to engage 84 with its lower left hand side so as to wedge itself between the barrel 31 and the frame 77 and jam the frame 77 against the ring 82. The other end of the frame 77 lies above the trigger frame 87 which is held in place by the spring 88. In a depending portion of the frame 77 is provided an opening 89 for trunnions for the usual gun support.

The sear and the trigger mechanism is enclosed as a unit in the trigger frame 87. To the trigger frame 87 may be fastened as by welding a trigger guard 90 extending upwardly and rearwardly over the trigger frame. Depending from the frame 77 is a notched lug 91 into the notch of which enters a portion of the upper plate of the trigger guard 90. At its rear end there is a hook 92 on the trigger guard which engages the gun casing where it and the trigger frame 87, of which it is a part, is held in position by the spring 88 mounted on the gun casing. The frame 77 is provided with an aperture 93 through which extends a sear 94 in position to engage and restrain from forward movement the breech lever 68 which carries the firing pin and may be said to act as a hammer for firing the gun. The sear 94 is pivoted on a pin 95 carried in the trigger frame 87. A rotating pin 96, mounted to rotate in the trigger frame 87, has two flat surfaces against either of which may rest a spring 97, mounted in the trigger frame 87, to hold it in either of two positions. As illustrated in Fig. 4 one of the flat surfaces of the pin 96 makes room for movement of the sear 94 about its pivot 95. When the pin 96 is turned in clockwise direction the unflattened portion of the pin rests against the lower part of the sear 94 and locks it against movement. This locks the gun against operation.

A spring 98 in the trigger frame bears on the lower arm of the sear 94 and holds its upper end projected. A spring 99 in the trigger frame rests against a pin 100 on a trigger member 101 which is pivoted at 102 in the trigger frame. Pivoted at 103 in the pivoted trigger member 101 is a trigger pawl 104 which is normally held in engagement with the lower arm of the sear 94 by a spring 105. Upward movement of the trigger pawl 104 is limited by means of a cross bar 106 carried by the trigger member 101. Pressure of the operator's finger on the trigger member 101 causes the trigger pawl 104 to turn the sear 94 on its pivot 95 against the spring 98 and withdraw it from the path of the breech lever 68. As this movement takes place the pawl 104 slides down and away from the depending arm of the sear 94 and releases it and it may be returned by the spring 98. Carried by the trigger member 101 are balls 107 (see Fig. 14) which project from the sides of the trigger member 101 and engage the adjacent edges of the trigger frame 87 and form a stop or impediment for the movement of the trigger member 101. The balls 107 are held projected by an intervening cushion 108 which may be of some such material as rubber or the like so that increased pressure on the trigger member 101 may cause the balls to recede and allow

the trigger member 101 to move further. This further movement of the trigger 101 on its pivot 102 will cause the cross bar 106 to engage the lower arm of the sear 94 and hold the nose of the sear depressed or retracted for as long as the trigger is held. Thus a movement of the trigger 101 limited by the balls 107 will cause the gun to fire a single cartridge while full movement of the trigger member 101 beyond the stops 107 will place the gun in position for automatic repeated firing.

The gun housing 123 carries projecting pins 109 (see Figs. 1 and 3) which are curved to form a guideway for a sliding frame 110 which is provided with a projecting handle 111 and a depending lug 112. The depending lug 112 engages an outwardly projecting lug 113 on the breech lever support 65. By means of the handle 111 the cam 112 may be slid backward on its bearing pins 109 and it may thus force the supporting member 65 and the piston rod 44 to which it is attached in the same direction as the gases of explosion forces it. Thus the operation of the gun may be initiated by hand since the mechanism described forms a recocking mechanism for the gun. By this means the gun may be manipulated when empty, it may be initially charged, and it may be examined, etc., in case of misfire or other mishaps. Suitable releasable means may be used to releasably lock the handle 111 or the slide 110 in normal position when not in use.

The gun housing 123 is held in position by forwardly projecting ears provided with holes 124 through which passes the pin or rod 85 which holds the frame 77 to the barrel 31. A portion 48 of the housing passes over the spool 45 carrying the wheels 46 and 47. At its rear end the housing 123 is closed by a downwardly extending wall 125 in which is the opening to receive the hook 92 of the trigger frame 87. The hook 92 thus holds together the housing 123 and the frame member 77.

It will be noted that the breech lever 68 is a single piece which acts not merely as means for closing the breech but also carries a firing pin and a unitary extractor for the shell of the fired cartridge. This is an advantageous arrangement and may be highly desirable. Another arrangement, however, may be used, in which the firing pin may be a separate member and in which the extractor may be a separate member. As illustrated in Figs. 12 and 13 the breech lever support 65*a* may carry a breech lever 68*a* which may be provided with a pin 67*a* riding in slots 66*a* in the support 65*a*. The breech lever 68*a* is provided with an extractor tip 114 which may be a separate piece held in place in any suitable way such as by means of a rivet 115, so that in case of wear it may be replaced. A depending lug 116 carried by the supporting member 65*a* may be provided with a firing pin 78*a* adapted to pass through an aperture 117 in the breech lever 68*a*. In this construction the firing pin is separated from the breech lever and the firing is effected only when the supporting block 65*a* is advanced so that the pin 68*a* is in the extreme rear portions of the slots 66*a* illustrated in Fig. 12.

It will be observed that substantially all of the work of the gun is accomplished during the power stroke. Thus the movement which accomplishes the unlocking and retraction of the breech lever and feeding of the cartridge and its conveying to the cartridge chamber is effected by gas pressure during the recoil stroke. The relatively easy procedure of inserting the cartridge into the barrel and firing the cartridge is all that need be accomplished by the expansion of the spring which has been compressed by the effect of the gas on the piston head in the gas cylinder.

The various parts of the gun are connected together in units in a simple way. The gun may be readily taken apart or separated into its units by a simple procedure and mainly without the use of tools. The shaft 85 may be turned so as to loosen it in its bearings and it may then be removed laterally. In this condition the barrel of the gun may be removed for inspection, cleaning or replacement if necessary. The gas muzzle 34 may be removed with the barrel, being merely slipped off the end of the gas tube 32. The nut 35, however, may be removed and the gas muzzle as a unit freed from both the barrel and the gas tube. If it is desired to further dismantle the gun the trigger frame 87 may be moved rearwardly against the spring 88. This will allow the trigger guard frame to be withdrawn from the slot in the block 91 and the trigger frame may then be turned downward and finally released from the spring 88. The housing 123 is thus freed by the removal of the pin 85 from its forward end and by the removal of the hook 92 from its rear end. The housing 123 may now be removed. This exposes the rear end of the gun and makes it possible to withdraw from the gas cylinder the entire unit illustrated in Fig. 9 consisting of the piston and its rod carrying the spool for advancing the cartridges and also the cartridge conveyor and the breech lever with its support.

In Figs. 20 and 21 is shown another form of gas muzzle and a piston especially adapted to cooperate therewith.

With the piston in the most forward position the breech block lever 68 is in the position shown in Fig. 4 and in Fig. 20. The initial backward movement of the piston does not require a very great amount of energy since the beginning of the movement in addition to moving the conveyor 53 merely pushes the supporting block backwards so that the slots 66 ride on and finally engage the pin 67. At the same time the forward or gripping shaped surface 69 of the pivoted breech lever 68 is lifted into contact with the rim at the base of the fired shell. Up to this point in its movement no considerable energy is needed. Further movement causes the pivoted breech block to act as an extractor to pull the shell from the barrel of the gun. Sometimes the shell will stick and it may be that considerable energy is needed for its loosening. After it has once been loosened its further movement may be easier and may not require so much energy. In order to take care of this particular requirement and in order to control more regularly the movement of the piston and other parts of the gun a special form of piston illustrated in Figs. 20 and 21 may be employed. Thus the vent hole in the muzzle attachment may be placed slightly further backward as indicated at 40*a*. The piston 39*a* may be provided with a tube-like forwardly extending member 39*b*. In the side of the extension 39*b* may be provided a hole 40*b* which, if desired, may be made somewhat elliptical. The hole 40*b* is so placed that when the piston is in its normal full forward position as indicated in Fig. 20 it is in register with the hole 40*a* so that when gas from the fired cartridge first enters the gas cylinder 32 it will impinge on the piston 39*a* but the pressure may be relieved somewhat by free pas-

sage of the gas through the holes **40***a* and **40***b*. The piston thus is caused to move rearwardly and as it moves it brings the openings **40***a* and **40***b* out of register. As indicated in Fig. 21, this prevents the exit of gas. Closure of the outlet port preferably will come just before the pivoted breech block **68** reaches the position indicated in Fig. 21 so that as the extractor moves the fired shell from the barrel of the gun the full pressure of the gas is exerted on the piston head, thus giving the increased power which may be desirable at this time. In order to relieve the pressure in the latter part of the stroke, however, the extension **39***b* of the piston head **39***a* as it proceeds is withdrawn from the hole **40***a* and thus the gas pressure is again relieved.

If the full pressure of the gas were employed in the first part of the movement of the piston it might be that the impact or hammer blow of the extractor against the end of the fired shell as the extractor reaches the position in Fig. 21 would be such as to injure or deform the rim of the cartridge. For this reason there may be an advantage in relieving the pressure in the first part of the movement and in increasing the pressure during the actual extracting movement. This and other phases of the present invention may be especially important in guns of larger caliber where the gas pressure is large and the impact or effect on the parts may be strenuous.

I claim as my invention:

1. In a gun, a gun casing, a feeding mechanism for cartridges mounted in the gun casing comprising means for advancing the cartridges, a clutch constructed and arranged to actuate the advancing means, a reciprocable shaft on which the clutch is mounted, a cam surface in the shaft engaging the clutch to operate it, a compressible spring surrounding the shaft and holding the clutch in operative position and tending to move the shaft to its normal position, and a stop for the advancing means mounted on the gun casing which may be manually operated through the gun casing, the cam surface being constructed and arranged to actuate the clutch as the shaft moves from its normal position and to release the clutch as the shaft returns to its normal position.

2. In a gun, a feeding mechanism for cartridges comprising means for advancing the cartridges, a clutch constructed and arranged to actuate the advancing means, a reciprocable shaft on which the clutch is mounted, a cam surface in the shaft engaging the clutch to operate it, and a compressible spring surrounding the shaft and holding the clutch in operative position and tending to move the shaft to its normal position.

3. In a gun, a gun casing, a feeding mechanism for cartridges mounted in the gun casing comprising means for advancing the cartridges, a clutch constructed and arranged to actuate the advancing means, a reciprocable shaft on which the clutch is mounted, a cam surface in the shaft engaging the clutch to operate it, a compressible spring surrounding the shaft and holding the clutch in operative position and tending to move the shaft to its normal position, and a stop for the advancing means mounted on the gun casing which may be manually operated through the gun casing.

4. In a gun, a feeding mechanism for cartridges comprising means for advancing the cartridges, a clutch constructed and arranged to actuate the advancing means, a reciprocable shaft on which the clutch is mounted, a compressible spring surrounding the shaft and holding the clutch in operative position and tending to move the shaft to its normal position, and a cam surface in the shaft being constructed and arranged to actuate the clutch as the shaft moves from its normal position and to release the clutch as the shaft returns to its normal position.

HENRY SCHIROKAUER.

CERTIFICATE OF CORRECTION.

Patent No. 2,353,118. July 4, 1944.

HENRY SCHIROKAUER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 13, after the word "through" insert --which the pin 42 may pass. The cover plate 130--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of August, A. D. 1944.

(Seal)

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