Aug. 22, 1944. C. C. LOOMIS 2,356,491

FIREARM

Filed Oct. 31, 1940 3 Sheets-Sheet 1

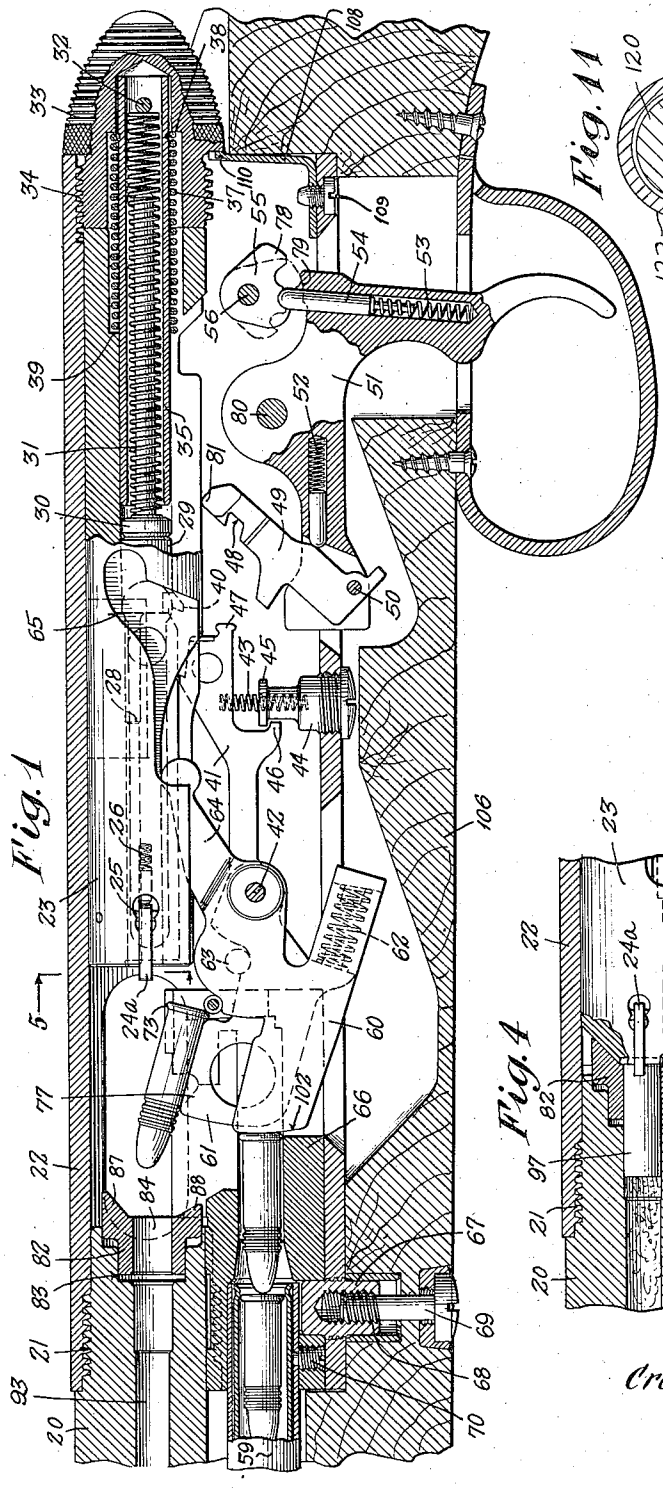


Fig. 1

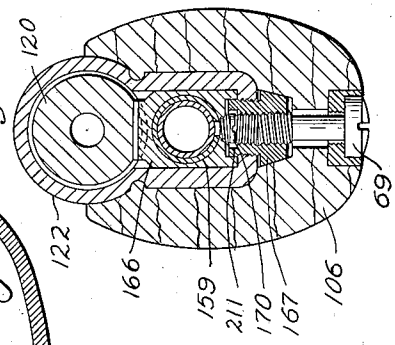


Fig. 11

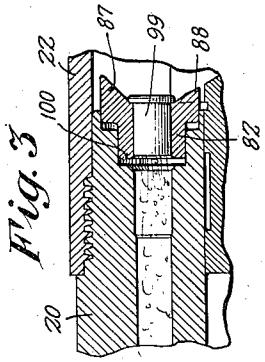


Fig. 3

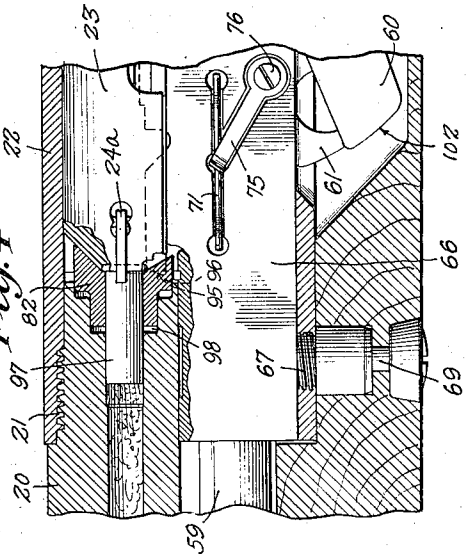


Fig. 4

INVENTOR
Crawford C. Loomis
BY
D. Vernier Smythe
ATTORNEY

Aug. 22, 1944. C. C. LOOMIS 2,356,491

FIREARM

Filed Oct. 31, 1940 3 Sheets-Sheet 2

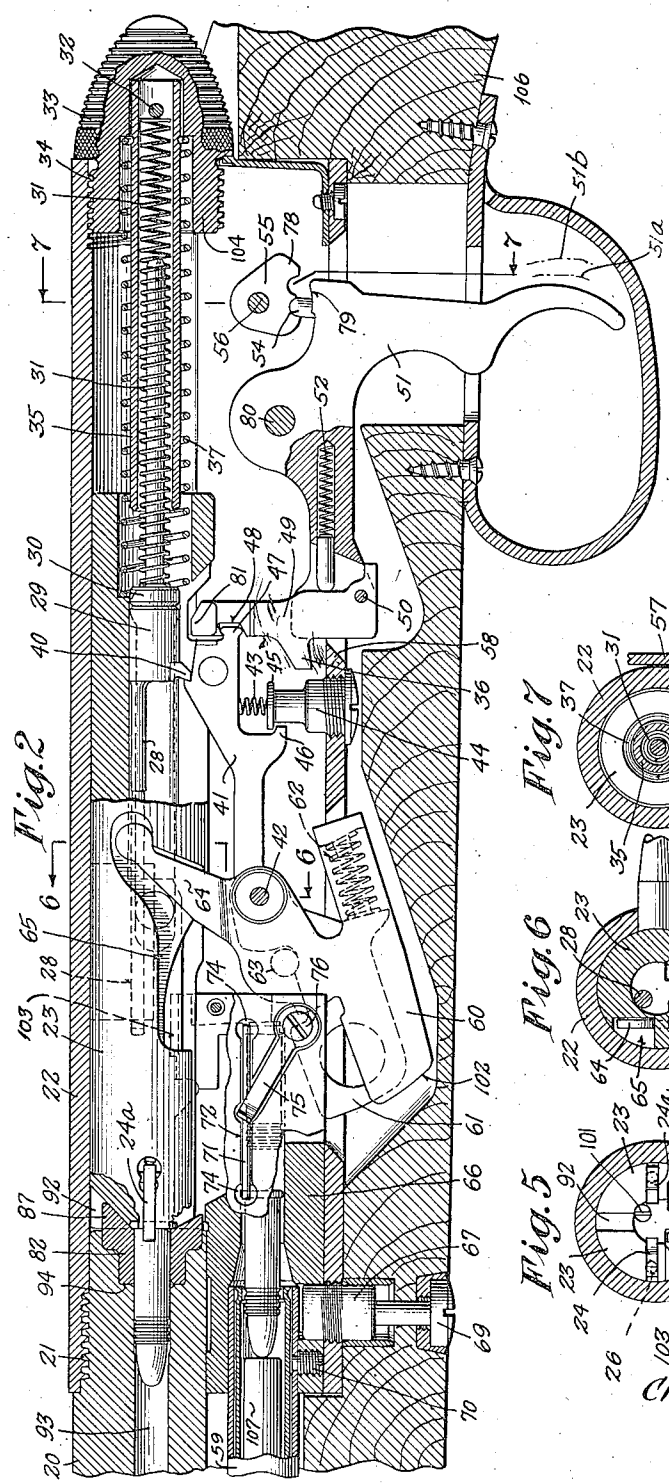


Fig. 2

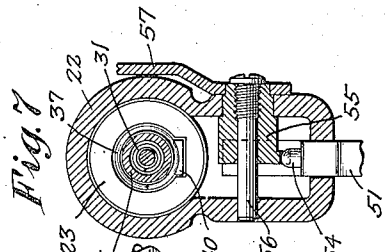


Fig. 7

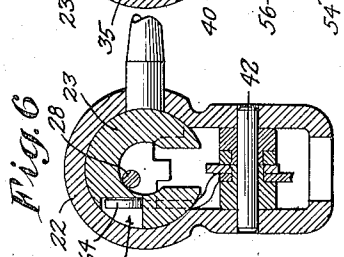


Fig. 6



Fig. 5

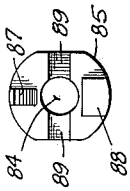


Fig. 8

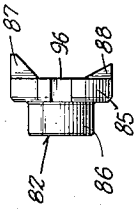


Fig. 9

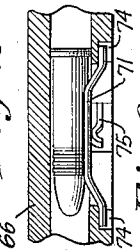


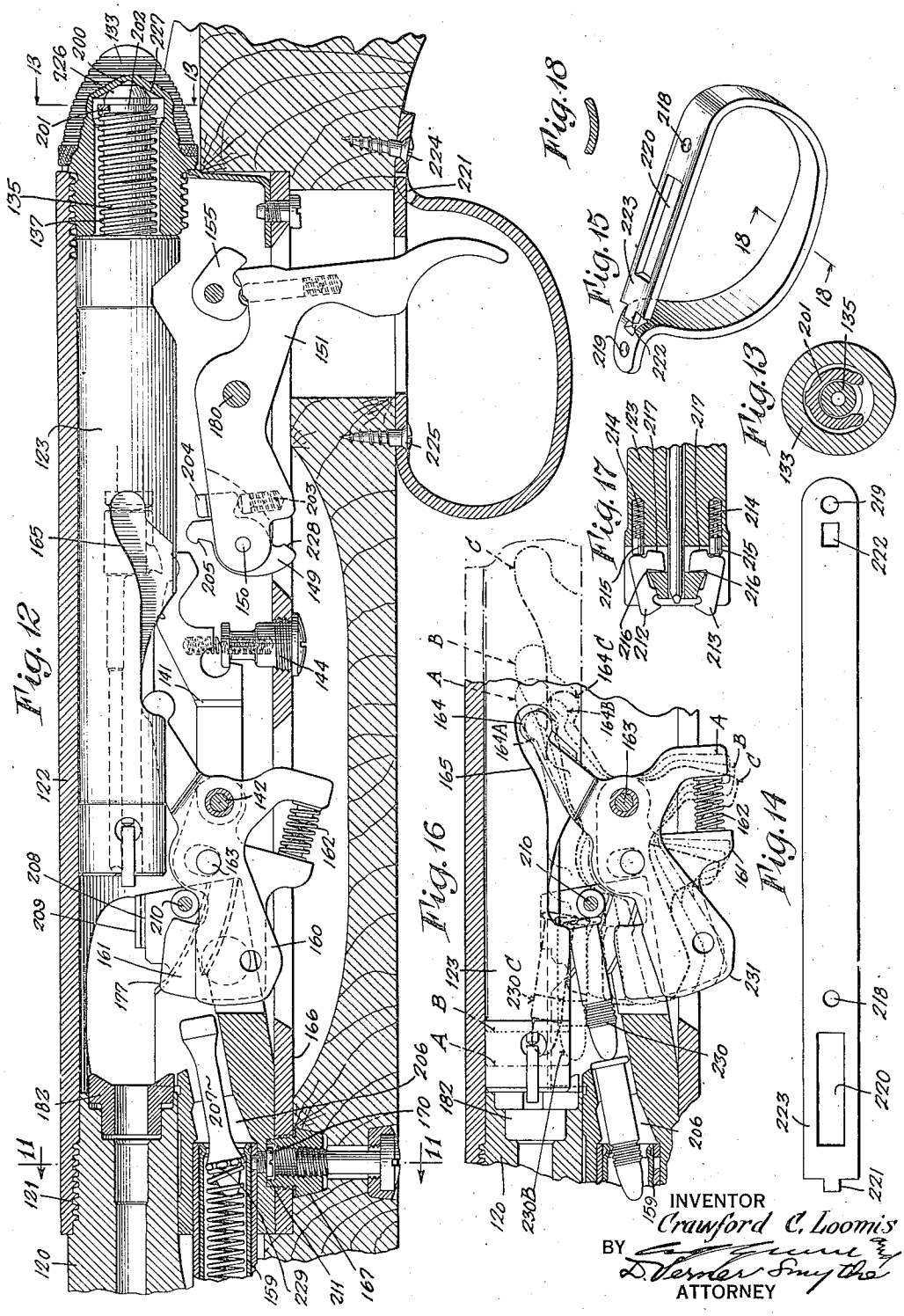
Fig. 10

INVENTOR
Crawford C. Loomis
BY Greene & D. Worker Smythe
ATTORNEY

Aug. 22, 1944. C. C. LOOMIS 2,356,491

FIREARM

Filed Oct. 31, 1940 3 Sheets-Sheet 3




INVENTOR
Crawford C. Loomis
BY
D. Vernier Smythe
ATTORNEY

Patented Aug. 22, 1944 2,356,491

# UNITED STATES PATENT OFFICE

2,356,491

## FIREARM

Crawford C. Loomis, Ilion, N. Y., assignor to Remington Arms Company, Inc., a corporation of Delaware

Application October 31, 1940, Serial No. 363,613

3 Claims. (Cl. 42—3)

This invention relates to firearms and particularly those of the type wherein the energy of the explosion of cartridges of varying lengths or energy and power is used to perform the operations incident to reloading the firearm in preparation for the next firing. The usual firearm employs a chamber which is fixed relative to the barrel. Patent No. 2,090,656, issued August 24, 1937, discloses a movable vibrator which is used to initiate the operations in an autoloading firearm wherein the energy of the recoiling parts, after movement by explosion of the cartridge, is imparted to springs, which serve to close the bolt at the appropriate time. The inertia of the parts and strength of the springs must be such that the explosion of the cartridge will perform the desired functions. In the application of Williams, Serial No. 308,929, filed December 13, 1939, now Patent No. 2,336,146, dated Dec. 7, 1943, there is disclosed a gun which will operate with cartridges of varying lengths or energy and power. The present invention comprises improvements that might be used on such a gun, if desired, although it is to be distinctly understood that said improvements are not necessarily limited thereto. The invention herein described may be applied to any type of firearm, including, for example, rifles, shotguns, machine guns, hand guns, etc., these merely being illustrative of the invention. These and other objects will appear in the following description and drawings, which are merely illustrative.

In the drawings:

Fig. 1 is a fragmentary sectional elevation with the action open and a cartridge ready to be carried into the chamber by the bolt on the closing motion thereof.

Fig. 2 is a fragmentary sectional elevation with the action closed, a long cartridge being shown in the chamber.

Fig. 3 is a fragmentary sectional elevation showing a short shell in the chamber immediately after it has been fired, the actuator in this instance being at the limit of its relative motion.

Fig. 4 is similar to Fig. 3 with the exception that a long shell is shown in the chamber.

Fig. 5 is a cross sectional view taken at line 5—5 of Fig. 1.

Fig. 6 is a cross sectional view taken at line 6—6 of Fig. 2.

Fig. 7 is a cross sectional view taken at line 7—7 of Fig. 2.

Fig. 8 is an end view of the actuator.

Fig. 9 is a vertical side view of the actuator.

Fig. 10 is a fragmentary sectional plan view of a cartridge engaged by the cartridge retainer shown in Figs. 1 and 2.

Fig. 11 is a cross-sectional view on the line 11—11 of Fig. 12, the magazine follower being omitted for greater clearness.

Fig. 12 is a fragmentary sectional elevation of a modification of the firearm of Fig. 1, showing the action open and the feeding means in position to hold a cartridge for feeding into the chamber.

Fig. 13 is a fragmentary sectional view taken at line 13—13 of Fig. 12.

Fig. 14 is a plan view of the strip of metal that may be used to form the trigger guard.

Fig. 15 is a perspective view of the formed trigger guard before it is placed upon the gun.

Fig. 16 is a fragmentary view showing the several relative positions of the bolt, cartridge lifter and elevator as the bolt moves rearwardly.

Fig. 17 is a fragmentary sectional plan view of the bolt showing a cartridge case engaged by extractors which are a modification of those shown in Fig. 11.

Fig. 18 is a sectional view taken at line 18—18 of Fig. 15.

The invention, in general, provides a means for using the same gun to fire either short or long shells, or shells of varying energy, the short cartridges generally being less powerful and therefore not capable of delivering sufficient energy to the bolt or other working parts of the gun when the springs and parts are designed for operation with the long or more powerful cartridges. It is to be distinctly understood that the invention is not limited to .22 caliber cartridges nor to the specific lengths indicated, although it will be described in conjunction with such caliber, but may be applied to different calibers and different lengths and types of cartridges.

An actuator is provided which may be supported in an enlarged bore or other suitable means at the breech end of the barrel. The actuator may be made of such a length that the long cartridges are longer than the chamber of the actuator plus the relative movement thereof, and the other cartridges to be used therewith are shorter than those just defined.

In Fig. 1, a barrel 20 is threadedly engaged at 21 with a receiver 22. The bolt 23 is reciprocable or slidingly mounted within the receiver. A striker 28 is carried in a suitable aperture in the bolt 23. Said striker has a head 29 (Fig. 2) that is engaged by the striker spring guide means 30. The striker spring 31 acts upon the enlargement of the guide means 30, which in turn contacts head 29, thereby urging the striker to firing position. The opposite end of the spring 31 abuts the pin 32 located within the receiver plug 33. The receiver plug 33 may be removably connected by means of screw thread 34 to the receiver 22. A spring arm 108 may be fastened to receiver 22 by means of screw 109. A projection 110 on the end of said spring arm cooperates with depressions on the face of plug 33 to hold the plug

from unscrewing accidentally from the receiver. Tubular guide means **35** may be mounted in the plug **33**. A recoil spring **37** is located on the outside of the guide means **35** and one end abuts the shoulder **38** of the plug **33**. The other end of the recoil spring **37** abuts the shoulder **39** of the bolt **23**.

*Trigger and sear*

The striker **28** has a sear notch **40** which may be engaged by the pivoted sear **41**. The sear **41** is pivoted on pin **42** and has a spring **43** serving to rotate the sear to effective position. The spring **43** is carried in a hollow bushing **44**, which is threadedly engaged with the receiver **22**. A lip **45** on the bushing serves to engage the projection **46** on the pivoted sear **41** and limit the upward movement of the sear. The projection **47** of sear **41** may be engaged by the notch **48** of the pivoted arm or connector **49**, this arm being pivoted as at **50** on the trigger **51**, which is pivoted at **80** to the receiver. A spring **52** serves to rotate the arm **49** in a counter-clockwise direction (Figs. 1 and 2). In Fig. 1, the connector **49** is shown as it has been rotated in a clockwise direction by retraction of the bolt **23**.

In Fig. 2, the projection **47** is shown engaged in the notch **48** of the arm **49** and the sear notch **40** engaged by the sear **41** in cocked position. If the trigger be pulled, the pivoted connector **49** will move downwardly, thereby rotating the sear **41** so as to disengage it from the notch **40** of the striker **28**. This will allow the cocked striker spring to move the striker to fired position. A trigger spring **53** (Fig. 1) and plunger **54** may be employed in the customary fashion to return the trigger to normal position. Backward or forward movement of the bolt **23** away from the barrel will cause engagement of the tip **81** of the lever **49** and rotate **49** in a clockwise direction (Figs. 1 and 2) and disengage the projection **47** of sear **41** from the notch **48** of lever **49**. This will allow the sear spring **43** to rotate the sear **41** in a counter-clockwise direction or toward the effective position so that, as the bolt moves forward to its closed position, the sear notch **40** will engage the sear **41**. The projection **47**, however, will not engage with notch **48** until they are aligned, which does not occur until the pull upon the trigger has been released. In this manner, the gun will not fire a second time until the trigger is released and pulled again. In order to replace the bolt in the gun after it has been removed, it is desirable to provide means to remove the lever **49** from the path of the bolt. For this purpose, a projection **36** (Fig. 2) is provided which will engage portion **58** of the receiver when the trigger is pulled beyond the normal sear releasing position. The normal sear releasing position is approximately as shown in the dotted lines at **51***a* of Fig. 2. When the trigger is pulled beyond this, say, for example, to **51***b*, the projection **36** will engage **58** and rotate the arm **49** about its pivot **50**, thereby removing it from the path of the bolt.

*Trigger safety*

The trigger safety arm **55** is carried on shaft **86**, which may be turned by safety operating arm **57** (Fig. 7). The plunger **54** engages one of the two notches of the safety **55**. When in the position shown in Fig. 2, the safety is released and the trigger may be pulled. When the safety is turned to the position shown by the dotted lines (Fig. 1), the heel **78** of the safety arm **55** will engage the surface **79** of the trigger **51** and prevent operation thereof.

*Actuator*

2,090,656, a vibrator is employed to provide the initial movement of the recoil parts as the cartridge is fired. In accordance with the present invention, a chambered actuator **82** is employed which may be located within the enlarged bore **83** (Fig. 1) of the barrel. The actuator **82** has an internal bore **84**, which serves as a chamber or a portion of the chamber into which the cartridge is inserted. Figs. 8 and 9 show an enlarged detailed view of the actuator. The actuator has an enlarged diameter **85** and a smaller portion **86**. Portion **86** fits the enlarged bore **83** of the barrel. Ears **87** and **88** are provided to guide and limit the rotation of the actuator and to hold the same in position, suitable slots or clearance being provided in the bolt **23** to receive the ears **87** and **88**. The ear **88** may also be held between the upstanding portions of the cartridge feed box. The bore into which portion **85** of the actuator fits may have a similar shape so as to assist in positioning the actuator. The means for limiting the rearward motion of the actuator will be described presently. The forward movement of the actuator **82** is limited by the length of the enlarged bore **83** of the barrel **20**. It is evident that the pressure of the bolt need not be exerted directly against the actuator when in the closed position, as it may be transmitted thereto through the cartridge itself.

In Fig. 4, a long cartridge **97** has just been fired and the projectile is someplace within the bore or has just left the muzzle of the gun. The actuator **82** has moved to the rearward limit of its motion due to recoil energy when the cartridge is fired, and the bolt **23** has had its recoiling action initiated, starting to compress the recoil spring **37**. The cartridge case when fired expands and tightly grips the walls of the chambered actuator so that force is exerted rearwardly thereon, thereby moving the actuator to the rear under the force of the gases in the barrel. The portion of the case within the barrel slides therein. It is to be noted that the cartridge powder case **97** still bridges the joint **98** between the barrel **20** and actuator **83**, so that the powder gases are sealed from said joint and do not affect the gas contact area of the actuator.

In Fig. 3 is shown a powder case **99** of a cartridge that is shorter than the chamber or internal bore **84** depicted just after having been fired, the actuator **82** having moved to the rearward limit of its movement. It is to be noted that, as the cartridge case **99** is shorter than the chamber or internal bore **84** of the actuator, that the joint **100** between the barrel **20** and the actuator **82** will be subjected to the force of powder gases moving the projectile through the barrel. For this reason, therefore, the gas contact area of the actuator is affected by the pressure of the powder gases which, in conjunction with the recoil energy, moves the actuator backwardly, thereby initiating the movement of the recoiling parts. Rearward movement of the actuator is limited by engagement of a portion of surface **96** of the actuator with the upstanding portion **95** of the cartridge feed box, which is integral with the receiver closing filler block **66**. In this way, a simple means is provided to position the actuator and, at the same time, to allow easy access and removal thereof.

*Cartridge feeding means*

A tubular magazine 59 is carried in the receiver closing filler block 66. The tubular magazine 59 is of the conventional type having a spring (not shown) and follower 107 to push the column of cartridges rearwardly therein. A cartridge elevator 60 is pivoted on pin 42 and has an upstanding arm 64 which cooperates with the continuous cam surface 65 located on the side of the reciprocable bolt 23. A cartridge lifter 61 is also pivoted on 42 and is connected to the elevator 60 by means of the spring 62. The stop 63 serves to limit the movement of the lifter 61 under the urgence of spring 62. As shown in Fig. 2, when the bolt is forward, the elevator and lifter are in their downward position so that a cartridge may be delivered rearwardly over the lifter 61 and held from upward movement by the retainer spring 71 located in slot 72 within the cartridge feed box. The cartridge feed box is an integral part of the receiver closing filler block. There is also a cartridge retainer at the top of the feed box defined by the inturned lips 90 and 91 (Fig. 5). As the bolt moves rearwardly, as shown in Fig. 1, the continuous cam 65 will start to oscillate the elevator 60 in a clockwise direction. This will start the movement of lifter 61 through the spring 62. As soon as sufficient force is exerted on spring 62 by the elevator 60 to force the cartridge past the auxiliary retainer spring 71, the cartridge will start to move upwardly until the rim thereof engages the inturned lips 90 and 91 of the cartridge retainer of the cartridge feed box. Further rearward movement of the bolt will compress the spring 62, because further movement upward of lifter 61 will be prevented. As the bolt moves forward, it will engage the rim 73 or base of the cartridge, as shown in Fig. 1, and slide the cartridge forwardly until the rim thereof is opposite the openings 77 of the inturned lips, at which time the compressed spring 62 will move the lifter 61 and the cartridge upwardly so that the cartridge may be readily moved into the chamber 84. As shown clearly in Fig. 10, the spring or retainer 71 may be held in position by the spring 75, which in turn is held in place on the cartridge feed box by the screw 76, the ends of the retainer spring 71 being held in the apertures 74 of the cartridge feed box. The receiver closing filler block 66 is held in position by the bushing 67, which is threadedly engaged in the receiver 22. The upward pressure of this bushing serves to hold the filler block 66 firmly in position and to exert pressure upwardly upon the barrel 20, thereby firmly holding the barrel 20 within the threads 21 of the receiver 22. A suitable screw 69 may be engaged in the thread 68 of the bushing 67 to hold the gun in position upon a suitable stock 106. The feed box is assembled from the rear of the receiver before the other parts are in place.

*Extractor and ejector*

The ejector 103 is made as an integral part of the cartridge feed box, which is a distinct advantage because the ejector may be made sufficiently strong, will not be subject to damage, and may be easily and more cheaply assembled and manufactured. The extractors may take the form shown in Fig. 11 wherein the extractors 24 and 24A are pivoted on pivots 25 and are urged into rim engaging position by the springs 26 carried in the apertures 27 of the bolt 23.

In Fig. 12 is shown a modification of the firearm of Figs. 1 and 2. In the following description, many of the parts are similar to Figs. 1 and 2 and will not be described in detail, except generally for the differences from the construction of Figs. 1 and 2.

120 is the barrel which is threadedly engaged at 121 with the receiver 122. A bolt 123 slides in the receiver 122 and has a recoil spring 137 surrounding a tubular guide means 135. The plug 133 serves as the abutment for the guide 135, said guide having the angle of its surface 226 which abuts surface 227 so made that the engagement with the cone-shaped aperture 200 in plug 133 will be only over a small area and allow comparatively free movement of the guide 135 within said plug so as to assure proper alignment of the parts. The recoil spring 137 abuts a split U-shaped washer 201, shown more clearly in Fig. 13. Said split washer is carried in a groove 202 near the end of the guide 135. A trigger 151 is pivoted at 180 and has a trigger safety arm 155 cooperating therewith. The pivoted connector or arm 149 performs the same function as 49 of Figs. 1 and 2. The motion of 149 under the urgence of spring 203 is limited by extension 228. Arm 149, which is preferably a stamping, comprises a laterally turned portion 204 for engagement by the bolt moves rearwardly. The sear notch is shown at 205. 161 is the sear which is pivoted at 142 and has a bushing 144 limiting the upward movement of the sear. In Fig. 12, the connector 149 is shown rotated about its pivot 150, which is beyond that normally resulting from the movement of the bolt. The receiver closing filler block 166 in this modification is made slightly different than in Figs. 1 and 2 in that the cartridge passage 206 is inclined upwardly and the follower 207 is so made that it will properly function therein. The follower 207 may have suitable rounded flutes 229 to allow movement within the passage 206. The cartridge elevator 160 is operated by the continuous cam surface 165 of the bolt 123, which causes oscillation of the lifter 161 through the spring 162, both the lifter and elevator being pivoted at 142. The cartridge feed box has inturned lips at 208, similar to that of Figs. 1 and 2, with an integral ejector 209 and a passageway 177 through the lips. It is to be noted that because it is not necessary to lift the cartridge as far in Fig. 12 as in Figs. 1 and 2, the continuous cam surface 165 is designed accordingly. At 163 is located a stop, limiting the relative movement of 160 and 161. A suitable spacer and cartridge abutment is located at 210, which serves to limit the rearward movement of the cartridges and also to space the walls of the feed box. The operation of this cartridge feed box is generally similar to that of Figs. 1 and 2, with the exception that the auxiliary cartridge retainer has been eliminated.

Referring particularly to Fig. 16, the detailed movements of the cartridge lifter and cartridge elevator will be described. It is to be understood that the description of Fig. 16 also applies generally to the form shown in Figs. 1 and 2, with the exception of the different retainer and means for feeding the cartridge to the lifter. The full lines, showing the position of cartridge elevator 160 and cartridge lifter 161 together with the continuous cam surface 165, indicate the position of these parts when the bolt 123 is closed. When in this position, a cartridge 230 has been moved backwardly through the passageway 206 under the influence of the spring and follower of the tubu-

lar magazine until the rim of cartridge **230** contacts the stop **210**. As the bolt **123** is moved rearwardly and into position A, the parts will assume the position shown by the light dash-dot lines, which also serve to indicate the position of the cam **165**. The cartridge **230** at this point is just contacted by the top of the lifter **161**, and the spring **162** has no tension exerted thereon. Further movement of the bolt to position B will cause the parts to assume the positions indicated by the dotted lines. At this point, the cartridge **230** is lifted to the position **230**—B by the cartridge lifter **161** through spring **162** and cartridge elevator **160**. No compression of the spring has taken place at this point, because the rim of the cartridge **230** has not contacted the inturned lips of the cartridge retainer. The next cartridge in the tubular magazine is moved rearwardly by the magazine spring until the rim thereof contacts the front arcuate face **231** (similar to **102** of Figs. 1 and 2) of cartridge elevator **160**. As the bolt moves to its rearward position, as indicated by the heavier dash-dot lines, wherein the arm **164** is at C, the cartridge will be now in the position shown at **230**—C. In this position, the rim thereof is held from upward movement by the inturned lips of the cartridge feed box. The cartridge lifter **161** is therefore arrested in its upward movement so that the cartridge elevator **160**, which has been moved further, has compressed the spring **162**. The arm **164** of the cartridge elevator **160** has taken the positions **164**—A, **164**—B and **164**—C respectively during this movement. Then, as the bolt moves forward, as has been previously explained, it will contact the cartridge **230**—C and move it forward until the rim thereof is opposite the openings **177** of the cartridge retainer, whereupon the spring **162** will move the cartridge lifter **161** upwardly and properly align the cartridge so that it may be moved into the chamber. It may be seen that the continuous cam surface **165** causes a continuous and smooth movement of the cartridge elevator **160** as the bolt moves to the rear and that the cartridge lifter **161** has an upward movement that results in compression of the spring **162**.

The receiver closing filler block and integral cartridge feed box are held in position in a manner similar to that of Fig. 1, with the exception that an aperture **211** is provided at the end of the bushing **167** so that the magazine tube retaining screw **170** may be reached through the opening in the bushing **167**. A modified type of extractor is shown in Fig. 17, wherein the extractors **212** and **213** are located in suitable slots within the bolt **123**. The springs **214** and plungers **215** rotate the extractors **212** and **213** about their point of engagement **216** with the bolt. The plungers **215** also, by their engagement with notch **217**, serve to retain the extractors in position in the bolt. The trigger guard may be made from a stamping of sheet metal. As shown in Fig. 14, a continuous strip of sheet metal may be cut to proper lengths, and then the screw holes **218** and **219**, passage **220** and projection **221** formed therein. The passage **220** serves as an aperture through which the trigger may pass. An aperture **222** is also cut in the trigger guard strip for a purpose that will appear presently. As shown in Fig. 15, the trigger guard is formed to its desired shape which may include suitable cross-sectional shaping, such as shown in Fig. 18, which is a section taken at the line **18**—**18** of Fig. 15. As may be seen, when the trigger guard is so bent, the projection **221** will cooperate with aperture **222** to rigidly hold the portion **223** from side movement. When the trigger guard is placed in position on the gun by means of screws **224** and **225**, the projection **221** will be forced into aperture **222** and rigidly position the portions of the trigger guard.

It is apparent that the invention is not limited to use in a shoulder rifle as shown or with the particular type of cartridge illustrated, but may be used in any type of firearm and with cartridges of varying lengths, powers and energies. The improvements herein are also not limited to use on the particular gun shown, but may be used on other than autoloading weapons. A gun which is easy to manufacture and assemble has been provided. The embodiments of the invention as herein described are to be understood as illustrative only, said invention being susceptible to embodiments in many forms, all falling within the scope of the appended claims.

What is claimed is:

1. In an autoloading firearm: a barrel; a tubular cartridge magazine located adjacent said barrel; a receiver; a breech block therefor; a chambered actuator interposed between the barrel and the breech block, said breech block operatively engaging said actuator when in closed position; a cartridge feed box removably mounted in said receiver and having an upstanding portion located within the receiver and adjacent the rear end of the barrel, said upstanding portion serving as a rearward stop for said chambered actuator, said cartridge feed box having a passage therethrough for the reception of cartridges from said tubular magazine; and means to hold said cartridge feed box in assembled position in said receiver.

2. In an autoloading firearm: a barrel; a tubular cartridge magazine located adjacent said barrel; a receiver; a breech block therefor; a chambered actuator interposed between the barrel and the breech block, said breech block operatively engaging said actuator when in closed position; a receiver closing filler block in the receiver below the barrel, and serving as a support for said tubular magazine, said receiver closing block having a cartridge feed box integral therewith, said feed box having an upstanding portion located within the receiver and adjacent the rear end of the barrel, said upstanding portion serving as a rearward stop for said chambered actuator, said cartridge feed box having a passage therethrough for the reception and delivery of cartridges from said tubular magazine.

3. In an autoloading firearm; a receiver; a barrel carried by said receiver; a breech block therefor; a chambered actuator interposed between the barrel and the breech block, said breech block operatively engaging said actuator when in closed position; a cartridge feed box removably mounted in said receiver, said feed box having an upstanding portion located within the receiver and adjacent the rear end of the barrel, said upstanding portion serving as a rearward stop for said chambered actuator, said feed box contacting the barrel; and means to hold said feed box in assembled position in said receiver and to lock the barrel in place.

CRAWFORD C. LOOMIS.

CERTIFICATE OF CORRECTION.

Patent No. 2,356,491. August 22, 1944.

CRAWFORD C. LOOMIS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 6, before "2,090,656" insert --In a gun of the type disclosed in Patent No.--; page 3, first column, line 44, after "shown" insert --more--; and second column, line 28, after "bolt" insert --as the bolt--; 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 19th day of December, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.

CERTIFICATE OF CORRECTION.

Patent No. 2,356,491. August 22, 1944.

CRAWFORD C. LOOMIS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 6, before "2,090,656" insert --In a gun of the type disclosed in Patent No.--; page 3, first column, line 44, after "shown" insert --more--; and second column, line 28, after "bolt" insert --as the bolt--; 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 19th day of December, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.