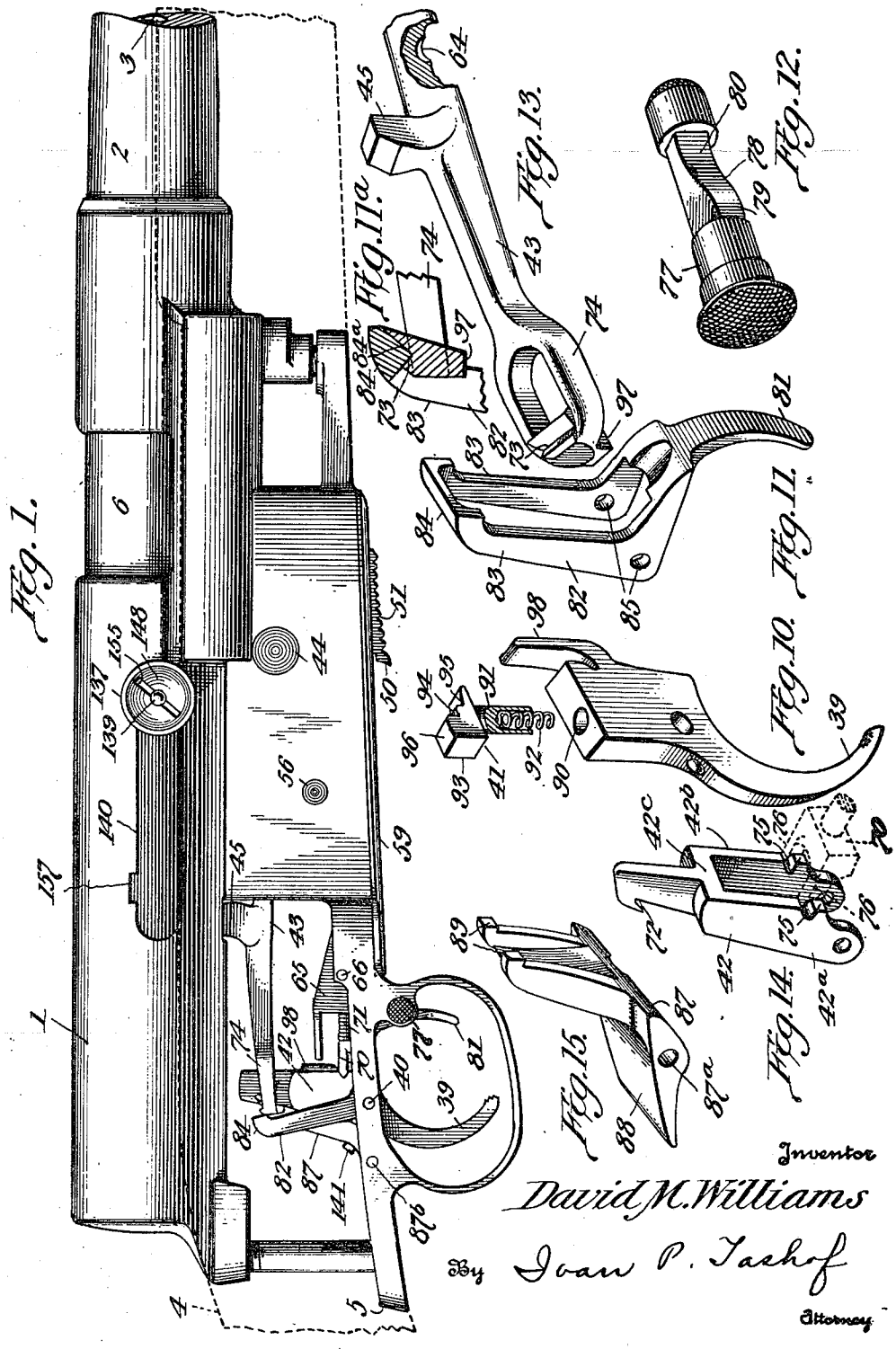
Aug. 24, 1937. D. M. WILLIAMS 2,090,656

AUTOMATIC FIREARM

Original Filed Feb. 7, 1931 7 Sheets-Sheet 1



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AUTOMATIC FIREARM

Original Filed Feb. 7, 1931 7 Sheets-Sheet 2

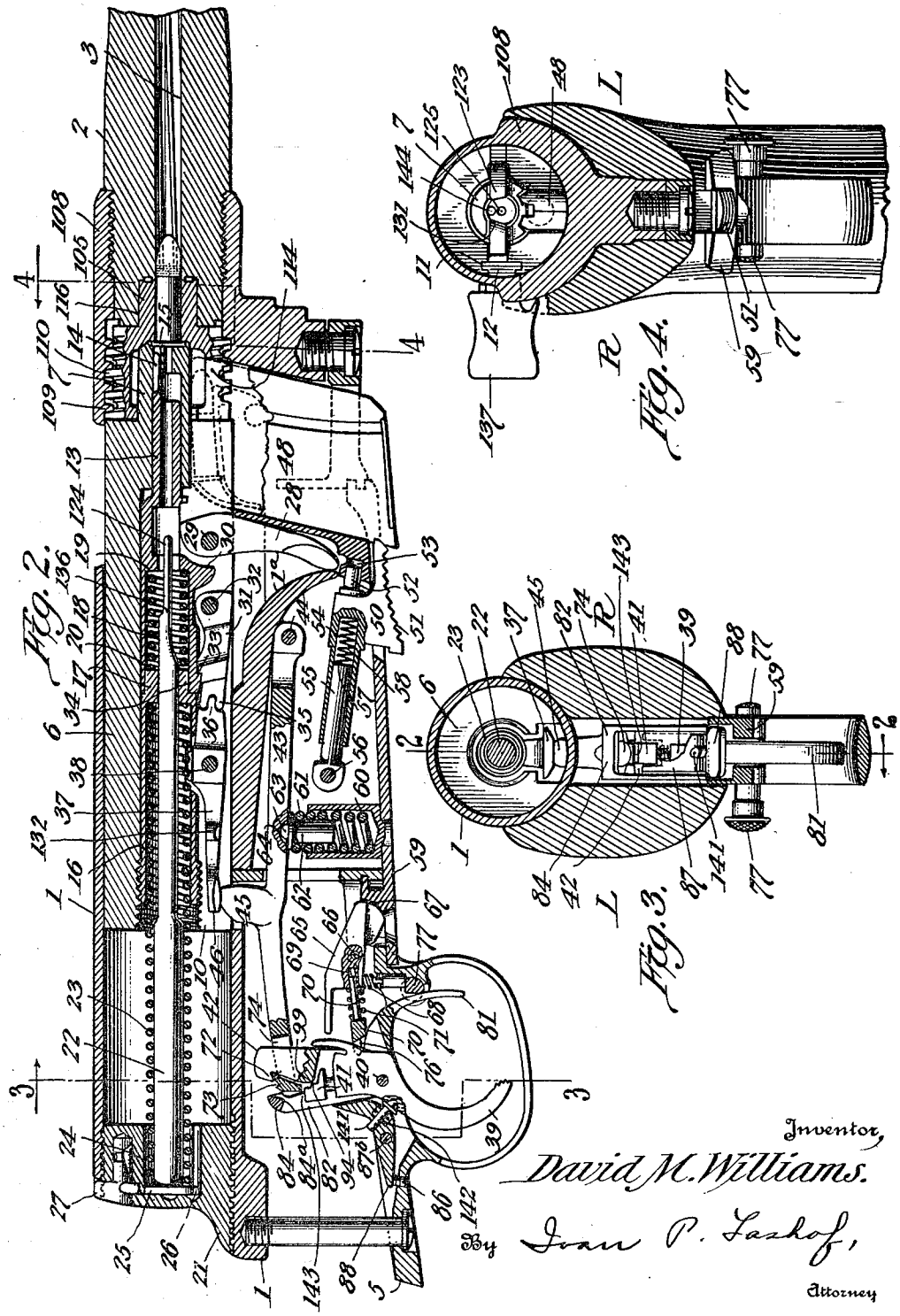

Fig. 2.

Fig. 4.

Fig. 3.

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AUTOMATIC FIREARM

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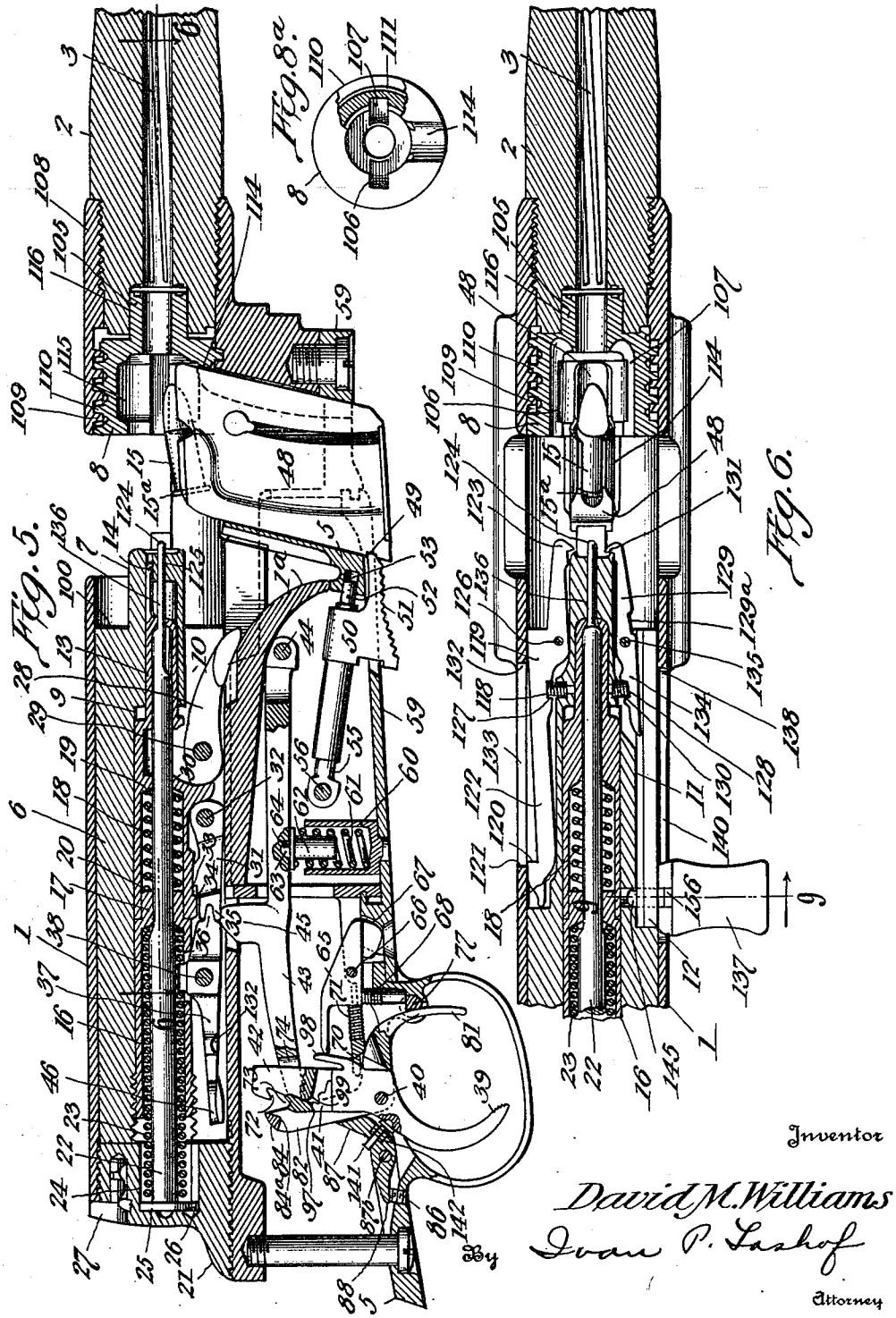

Fig. 8a.

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AUTOMATIC FIREARM

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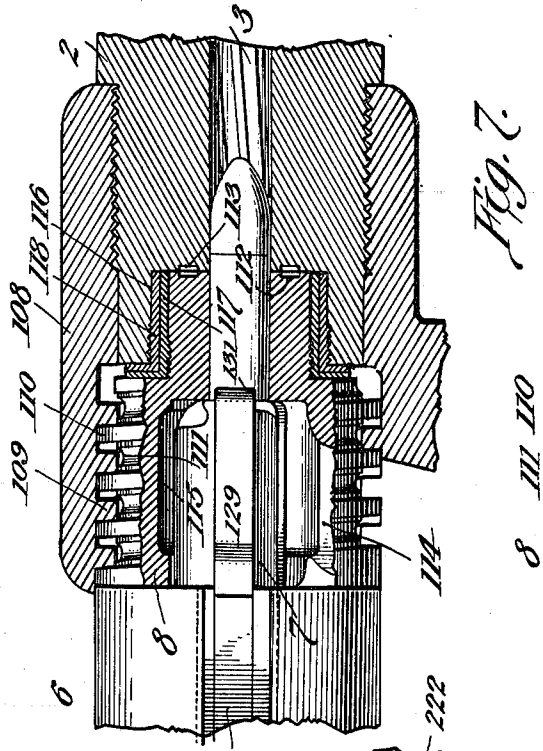

Fig. 7.

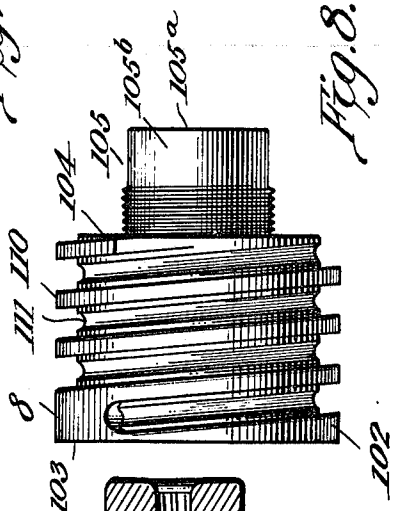

Fig. 8.

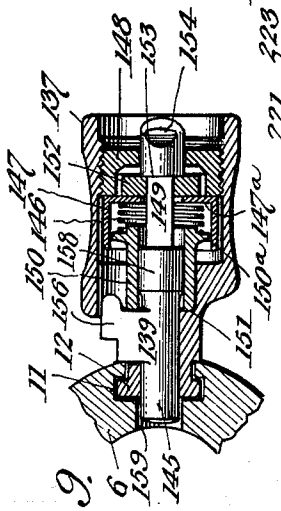

Fig. 9.

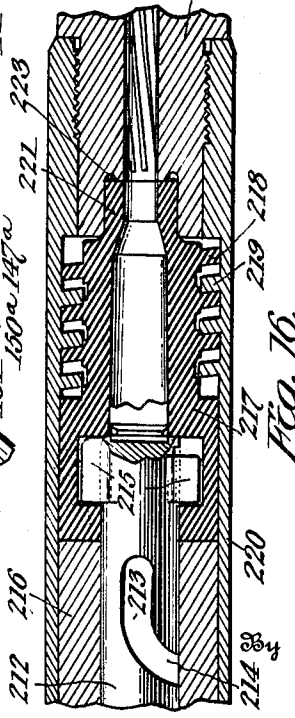

Fig. 16.

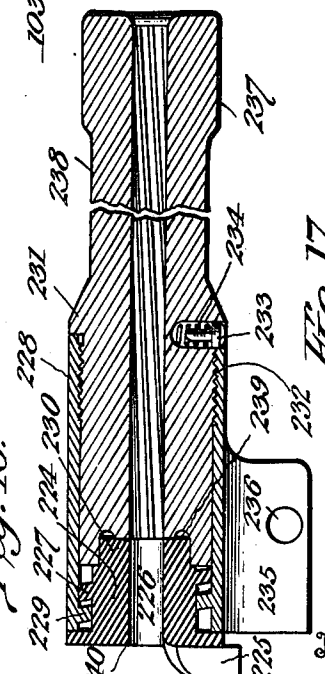

Fig. 17.

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AUTOMATIC FIREARM

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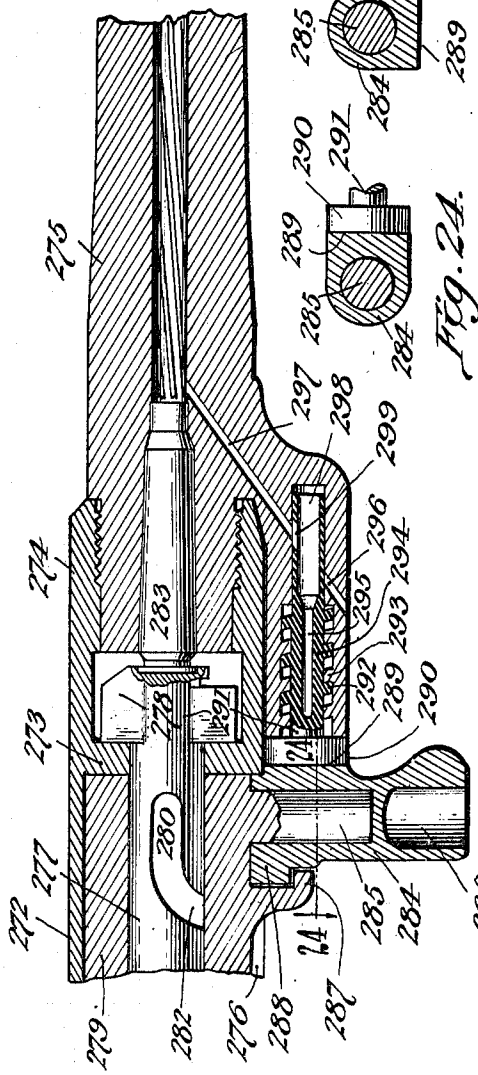

Fig. 23.

Fig. 25.

Fig. 24.

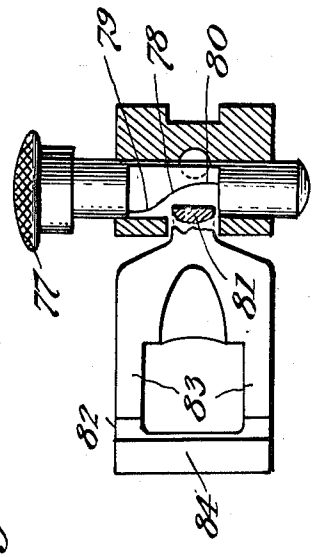

Fig. 12a.

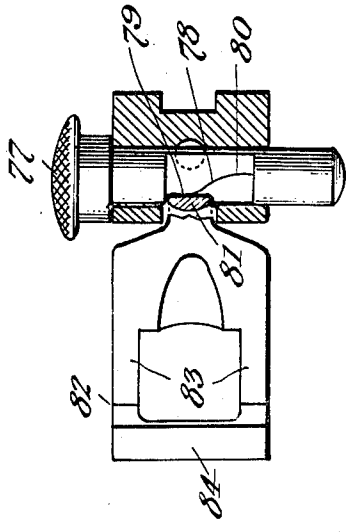

Fig. 12b.

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AUTOMATIC FIREARM

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Fig. 18.

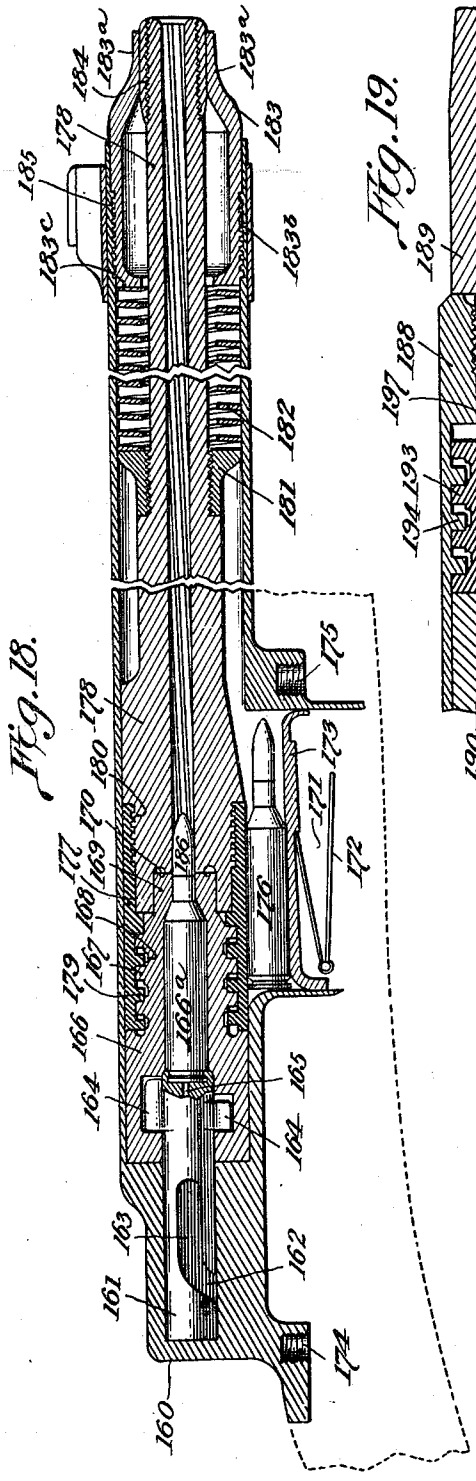


Fig. 19.

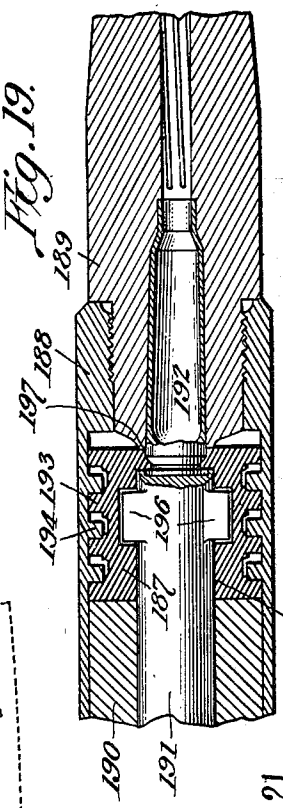


Fig. 21.

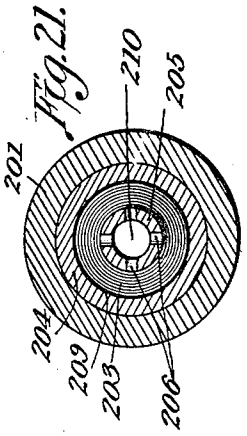
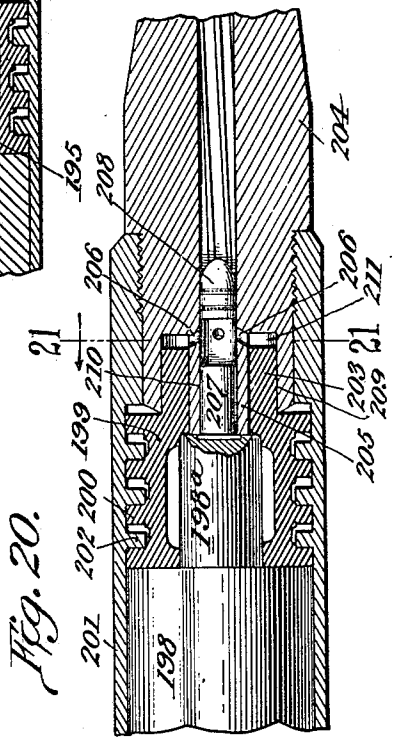


Fig. 20.



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AUTOMATIC FIREARM

Original Filed Feb. 7, 1931 7 Sheets-Sheet 7

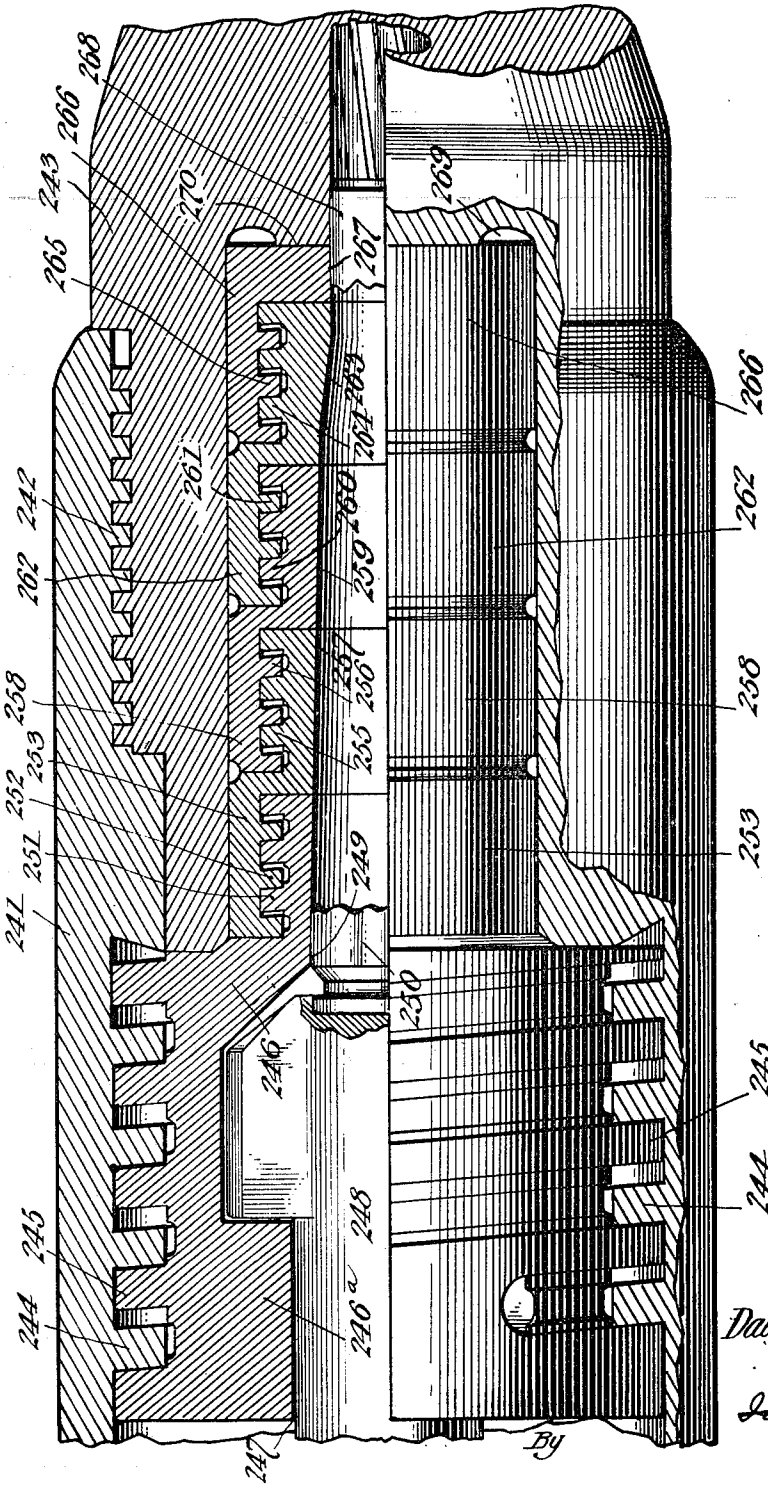

Fig. 22.

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UNITED STATES PATENT OFFICE

2,090,656

AUTOMATIC FIREARM

David M. Williams, Godwin, N. C.

Application February 7, 1931, Serial No. 514,252
Renewed August 19, 1933

61 Claims. (Cl. 42—3)

The present invention relates to new and useful improvements in automatic firearms.

It has been proposed heretofore to provide a cartridge chamber adapted to receive a cartridge but in all cases the cartridge chambers have had a long stroke and have been so positioned with respect to the magazine which carries the cartridges that a separate device was required to return the cartridge chamber, and this also necessitates returning means such as springs, levers, plungers and pins, and as a corollary thereto, retaining means to retain the returning devices in the gun. Further, the magazine or ammunition carrier has been so closely positioned with relation to the chamber means that the ammunition cannot be fed from the ammunition carrier means into the chamber means when the chamber is in a retracted position. According to the present invention, it is not necessary to have any returning means, and consequently no retaining means. This simplifies the entire construction, cutting out unnecessary movement in the gun, reducing the cycles of operation.

The hammered blow of the bolt mechanism herein set forth serves to drive the vibrator home, provided it is not already so positioned, which is the firing position or its forward seat position.

A vibrator of the character herein set forth reduces the movements required for one complete function of the gun or, as it may be differently termed, reduces the number of cycles, as the operation of the bolt mechanism does not depend upon the return of the vibrator as if the cartridge chamber portion of the barrel made a movement of such length as to require its return by mechanical means before the gun could be reloaded, and of course, if the cartridge chamber were not moved forwardly, the ammunition would not fit into the cartridge chamber due to it having directly passed or partly passed the ammunition container and of course the cartridge.

In a vibrator constructed as set forth, the action of entire gun mechanism is absolutely free to move without any reference to the loading or unloading position of the vibrator.

The use of a vibrator constructed as herein set forth enables a floating breech mechanism to be used of the type which does not have a mechanical lock but is of the gas lock breech type having the required characteristics to furnish the necessary inertia.

The vibrator of the present invention is preferably a threaded member. Threads may be eliminated therefrom and then other means may be employed to limit the motion of the vibrator. In that case, the vibrator becomes a moveable member and cooperates with bolt means having a predetermined locking and unlocking stroke and initiates rearward movement of the bolt means on firing of the gun. Means are provided for delaying the unlocking of the bolt means from the moveable member after the latter has initiated rearward movement of the bolt means.

A gun constructed as herein set forth, when properly proportioned, gives accuracy of the highest order. The gun is not restricted to the use of light weight bolt mechanism as any convenient weights may be used which make the gun function properly. It may be pointed out that the .22 caliber self-loading guns in use today are adapted to be used with low speed ammunition. Recently there has been developed the high speed ammunition. As far as known at the present time, these guns do not function satisfactorily using the new high speed ammunition. When using the new high speed ammunition, safety is not insured and accuracy of a high order is not obtained. If guns of such a character are modified to incorporate therein the vibrator of the present invention and the weight of the bolt properly adjusted, the new high speed ammunition may be used with safety and with accuracy of a high order.

It may further be pointed out that small caliber guns or low power guns of the automatic type have been so constructed that they inherently have a weak, delicate, or unreliable action and do not function with certainty. The mechanism of the low caliber guns does not function with the same degree of certainty as do the high pressure, high velocity military rifles of the self-loading or automatic design. The kick or recoil of small cartridges of the .22 caliber class causes it to be practically impossible to design a satisfactory functioning self-loading or automatic rifle of this caliber. As a result, there has been developed by various arms organizations an especially designed .22 caliber cartridge, and a rifle especially adapted to use it. However, this new cartridge and rifle has in a great measure been a failure from the standpoint of economy, accuracy and popularity with sportsmen. By incorporating the vibrator of the present invention in small caliber guns, they can be made to function as the high pressure, high velocity military rifles function in self-loading or automatic designs, and further the small caliber guns may have incorporated therein the high tension or much desired high

speed firing mechanism which permits the operator to shoot with greater accuracy. For example, a .45 caliber Colt automatic Government model (army automatic) has strong resistance springs in its pistol mechanism, due to the fact that the .45 caliber Colt cartridge has sufficient recoil or kick upon firing to function the strong gun action. The action has a stroke that is longer than that required for a .22 caliber automatic pistol.

In accordance with the present invention, the vibrator herein disclosed may be incorporated in a .45 Colt automatic pistol and its construction slightly changed as necessity may require, and then the pistol may be operated with .22 caliber ammunition instead of with .45 caliber ammunition, and it functions just as well as it did when using the .45 caliber ammunition. Therefore, there is a great saving in the cost of ammunition and other advantages, as later will be pointed out. The vibrator also locks the breech of the pistol by employing the gas lock principle.

It may be pointed out that using a vibrator, as herein disclosed, provided with means for restricting the movement of the vibrator to a relatively short distance, upon firing the gases will operate upon the vibrator's front or gas contact end with great violence, and this functions when threads are employed on the receiver, or when equivalent means are employed to take the slack out of the threads or the like, giving the vibrator a short movement rearwardly. When stopped by the restricting means, it will rebound forwardly and this movement will be repeated again and again or until the vibrating energy ceases to such an extent that it ceases to move or vibrate the vibrator.

When a firearm having a vibrator herein disclosed is fired at the instant of firing before the bullet has emerged from its shell or mouth, gases escape. However, at the instant the bullet has cleared the mouth of the shell, the gases are free to act without any mechanical restriction and as a result thereof the forward end of the gas contact end of the vibrator receives the full force of the given pressure generated at that time. The gas end of the vibrator is of such a diameter that its total area far exceeds the total area of the head of the powder case or shell, therefore the pressure generated acts upon this greatly enlarged area of the gas end of the vibrator and the vibrator is held in close contact or in a locked position momentarily with the bolt or block mechanism.

The point is here made that the distance the vibrator travels and the position which the ammunition carrier assumes with respect to the vibrator should be such as to eliminate the necessity of any returning means. In no case shall the motion or movement of the vibrator cause the vibrator or its bore to be positioned over the magazine so as to require a returning device to return the vibrator to a position which permits it to be reloaded from a magazine or other ammunition carrier.

A vibrator is provided which does not travel a sufficient distance to require any returning means and retaining devices to retain the returning means. Ammunition may be fed from the ammunition carrier, irrespective of any position the vibrator may assume. The length of the vibrator movement in most cases does not exceed $\frac{1}{32}$ of an inch, and sometimes is even less. However, the length of travel of the vibrator can be increased to $\frac{1}{8}$ of an inch, $\frac{1}{8}$ of an inch or even more, provided the magazine or ammunition carrier is properly located with respect to the vibrator.

There is also provided a novel extractor mechanism and a compound safety which comprises one for transporting purposes and one for hunting purposes, as hereinafter more specifically set forth.

In its broadest form, applicant's invention comprises the combination in a repeating firearm of a barrel member, a sliding member, said barrel member and slide member being reciprocable one with respect to the other to move between approximal and spaced positions, a vibrator arranged to engage one of said members and initiate movement of the members to spaced position, and a magazine for cartridges positioned to allow the cartridges to be fed rearwardly of the vibrator. As pointed out, the vibrator is mounted for limited reciprocation. More specifically, there is provided a firearm having a barrel, a bolt and a vibrator interposed between the barrel and the bolt and having a loosely threaded attachment to the barrel to permit reciprocatory movement relative thereto between narrow limits, the vibrator having its rear portion bearing against the forward portion of the bolt and in free engagement therewith. In one form of the invention a sleeve is affixed to the rear end of the barrel and projects rearwardly thereof. The sleeve is provided with an internal screw thread having the spaces between the convolutions greater than the thicknesses of the thread. A vibrator is interposed between the barrel and bolt and is provided with an external screw thread having the spaces between the convolutions greater than the thickness of the thread, the threaded portions of the sleeve and the vibrator engaging for limited reciprocatory movement of the vibrator with respect to the barrel. The vibrator has a cartridge supporting chamber therein alined with the bore of the barrel and normally closed by the forward end of the bolt.

The firing mechanism includes a sear, a pivoted set lever movable into and out of sear releasing position, a pivoted safety bow movable into safety position to engage the set lever and hold it out of the sear releasing position, and movable out of position to engage the set lever to permit movement thereof to sear releasing position, and manually operable means engaging the safety bow to lock the same against accidental movement to release the set lever. The safety bow has a finger engageable arm projecting downwardly for engagement by the firing finger of the gunner and acts to move the safety bow to set lever releasing position upon forward movement of the finger.

There is also provided a bolt slidably mounted in the receiver, an ejector pin mounted in the bolt and arranged to permit sliding movement of the bolt thereon. The ejector pin has its forward end projecting forwardly of the bolt upon full retraction of the latter. A pair of extractor levers are pivoted to the bolt and have forwardly projecting cartridge hook noses and springs urging said noses towards each other. The receiver has a slot extending longitudinally of the receiver, the slot having a shoulder at its rear end. A cam lug on one of the levers sliding in the slot and engageable with the shoulder upon retraction of the bolt moves the lever to cartridge releasing position against a spring action.

The present invention also contemplates certain novel details of combination, construction

and arrangement of parts of the improved apparatus, whereby certain important advantages are obtained, as will be more fully described hereinafter and pointed out in the claims, it being understood that the invention is susceptible of various changes in construction which may be made within the scope of the claims without departing from the spirit of the invention.

The present invention will be disclosed and fully explained by reference to the accompanying drawings wherein:

Figure 1 is a side elevation of a portion of a gun showing the parts as generally assembled, the stock of the gun being omitted for the purpose of illustration;

Fig. 2 is a longitudinal section of the gun taken on the line 2—2 of Fig. 3, the gun mechanism being shown in the closed position ready to fire;

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 2;

Fig. 4 is a transverse section taken on the line 4—4 of Fig. 2;

Fig. 5 is a longitudinal section similar to Fig. 2, the parts being shown in open position assumed after firing;

Fig. 6 is a longitudinal section taken on a horizontal plane on the line 6—6 of Fig. 5, showing the cartridge extracting means in the disengaged position after the cartridge has been ejected. This figure also shows the cam operated extractor arm in its depressed position. This figure also shows the top of the magazine and the relative relation of the cartridge about to be fed into the cartridge chamber by the forward movement of the bolt;

Fig. 7 is an enlarged vertical view partly in section taken through the barrel showing the vibrator in its closed position; this view also shows the bolt in side elevation and the short right hand extractor engaging the rim of the cartridge;

Fig. 8 is an enlarged side elevation of the vibrator;

Fig. 8*a* is an end view of the vibrator;

Fig. 9 is a vertical section of the bolt handle taken on the line 9—9 of Fig. 6, showing the means for dismounting the bolt handle from the bolt. This also shows means for holding the gun mechanism in its open position.

Fig. 10 is a perspective view of the trigger member;

Fig. 11 is a perspective of the safety lever;

Fig. 11*a* is a detail showing the engagement between the set lever and the safety lever;

Fig. 12 is a perspective view of the transport safety pin;

Fig. 12*a* is a detail showing the position the safety pin takes in relation to the bow, the transport safety being shown in the off position and the safety lever in the safe position. The safety lever is in a position to be moved by the operator's finger.

Fig. 12*b* shows the transport safety in the "on" position and the safety lever cammed to its safety position.

Fig. 13 is a perspective view of the rear end of the set lever;

Fig. 14 is a perspective view of the set lever pawl;

Fig. 15 is a perspective view of the stop member adapted to engage the lever pawl for the purpose of properly adjusting the engagement of the set lever pawl with the set lever;

Fig. 16 is a modified form of the vibrator used in a mechanically locked gun, the vibrator including an extension member adapted to engage and lock the bolt member;

Fig. 17 is a detail of a unit showing a vibrator adapted to be inserted in a large caliber gun for the purpose of allowing said large caliber gun to mechanically function with small caliber ammunition as efficiently as it would if large caliber ammunition were used;

Fig. 18 is a longitudinal vertical section of a modification showing the vibrator used in a gun of the forward sliding barrel type;

Fig. 19 is a longitudinal vertical section of a modification showing the vibrator adapted to be operated by direct recoil;

Fig. 20 is a longitudinal vertical section of a vibrator used with the modified form of barrel end;

Fig. 21 is a transverse vertical section on line 21—21 of Fig. 20;

Fig. 22 is a longitudinal vertical section partly in elevation showing a modified form of vibrator;

Fig. 23 is a horizontal longitudinal section showing the vibrator positioned at a point remote from the central axis of the barrel;

Figs. 24 and 25 are vertical sections on the line 24—24 of Fig. 23, showing the bolt handle in automatic position and disengaged position with respect to the vibrator.

The gun comprises a receiver 1 carrying a barrel 2 having a rifle bore 3. The gun carries the usual stock 4 and is provided with a guard indicated as an entity by the numeral 5. Positioned within the receiver 1 is a bolt 6 having at its forward portion a projecting member 7 adapted to engage a vibrator 8.

The bolt 6 is apertured centrally at 9 to receive a portion of the bolt mechanism cooperating therewith, the lower wall of the bolt being slotted at 10 from the aperture to its periphery, this affording means for inserting the sear mechanism in said slot 10 of the bolt 6. The bolt 6 is provided in its right hand wall with a T-slot 11 adapted to receive the bolt handle mounting 12. Mounted within the forward portion of the bolt aperture 9 is a striker 13 provided with a striker point 14 adapted to engage the rim of the cartridge 15 and prime or fire the same. Mounted adjacent the rear end of the aperture 9 is a striker spring compressor element 16. The forward end 17 of the element 16 has a sliding relation with the rear portion of the striker member 13. Confined within the striker member 13 is a spring 18 bearing at its front end on the forward wall 19 of the striker and at its rear end on the front end 20 of the compressor element 16.

Mounted in the rear end of the receiver plug 21 is an ejector 22 serving to guide the bolt spring 23 encasing the ejector rod at its rear end. The plug 21 is recessed at 24 for the purpose of seating the head 25 of the ejector 22. This head 25 is provided with a key 26 to prevent rotation of the ejector 22. The spring 23 is seated at its rear end against the face of the ejector head 25 and at its front end in the forward wall of spring compressor well. 27 indicates a retaining plunger for locking the receiver plug 21 against rotation.

Mounted in the forward end of the slot 10 is a cocking lever 28 pivotally mounted on a pin 29, the cocking lever 28 being adapted to engage the striker cam 30. There is also positioned in the slot 10 a sear 31, pivotally mounted on a pin 32. The sear 31 is provided with a notch 33 adapted to engage a corresponding notch 34 in the striker 13. The rear portion of the sear 31 is provided with fingers 35 adapted to engage a

finger 36 on the sear lever 37. The latter is pivoted on a pin 38.

The guard comprises a trigger mechanism and a magazine catch. Referring to the trigger mechanism, there is provided a trigger 39 pivotally mounted on a pin 40. Mounted in the trigger 39 is a trigger plunger 41 cooperating with a pawl 42 adapted to engage the set lever 43. The set lever 43 is pivotally mounted at 44 and is provided with a lug 45 adapted to engage tail piece 46 of the sear lever 37. The gun is provided with the usual box magazine 48 and mechanism to hold the same in place. The magazine 48 is provided with a recess 49 adapted to engage a finger piece 50 serrated at 51. The finger piece 50 is provided with a projecting member 52 adapted to engage a recess 53. The finger piece 50 is apertured at 54 to receive a plunger 55 pivotally mounted at 56. The forward end 57 of the plunger bears against a spring 58. Mounted in the floor plate 59 is a set spring holder 60 carrying a set lever spring 61. Mounted in the top portion of the set lever spring is a plunger 62 having a ball point 63 adapted to engage a socket 64 in the set lever 43. The floor plate catch 65 pivotally mounted on the pin 66 engages floor plate 59 at 67, as shown in Figs. 2 and 5, to lock the floor plate. The floor plate catch 65 is held in position by means of the spring 68. The floor plate catch 65 is recessed at 69 to provide a seat for pawl plunger 70 actuated by the spring 71. The spring 71 functions to push the plunger 70 against the pawl 42. The pawl 42, as shown in Fig. 14, is provided with a hook 72 adapted to engage the notch 73 of the stirrup 74 of the set lever 43, as shown in Fig. 13. The set lever pawl 42 is provided with recesses 75 adapted to engage the prong 76 on the plunger 70 and so hold the pawl under tension and in general in its proper position relative to the other mechanism. In connection with the trigger mechanism there is provided a safety mechanism which functions to depress the set lever 43 and so prevent the latter from actuating the sear mechanism. In Figs. 2 and 5, the safety mechanism is shown in its position which allows the gun to be fired. There is provided a safety pin 77, as shown in Fig. 12, having a cam face 78 curved to provide a cam surface 79 and a substantially plain surface 80. The safety pin is adapted to cam the safety lever bow 81 of the safety lever 82 rearwardly, the construction of the safety lever being shown in detail in Fig. 11. The safety lever 82 is provided with forked arms 83 having a top cross member 84, the under surface of which is V-shaped in cross section to fit into the notch 73, as shown in Fig. 13. The relationship of the V-shaped under surface of the top member 84 to the notch 73 is shown in Fig. 11*a*. The safety lever 82 is provided with apertures 85 to receive pin 40. When the bow 81 of the safety lever 82 is cammed rearwardly, the top member 84 moves forwardly to engage and cam down the notch 73 in set lever 43 and prevents the lug 45 from rising into the slot 10 and operating the sear lever 37. This operates to prevent accidental discharge of the gun. When the bow 81 of the safety lever 82 is in engagement with the surface 79 of the safety pin 77, the bow is in its safe position and when the pin is moved so as to allow bow 81 to engage the surface 80, the safety pin 77 is in its neutral or firing position. It may be pointed out that when the V-shaped under surface 84*a* is in engagement with the V-shaped notch 73, as shown in Fig. 11*a*, the safety lever will remain in its safe position due to the seating relationship of the surfaces which affords a frictional contact sufficient to keep it in the safe position. The mechanism set forth provides the gun with two independent safeties, one for transporting purposes and one for hunting purposes. This may be termed a compound safety. When the transport safety pin 77 is pushed to the right, the right and left hand sides of the gun being indicated in Fig. 3 by the letters R and L, cam surface 79 engages bow 81, camming safety lever 82 into its transport safety position and at the same time the safety lever is in the position shown in Fig. 11*a*. This insures a positive locking for the purpose of transporting the gun.

When it is desired to use the gun in emergency and at the same time desired to have a safety device capable of being released quickly without a loss of time, the safety pin 77 is moved to the left until the surface 80 coincides or is in line with trigger bow 81. Fig. 12*a* is a detail showing the position the safety pin takes in relation to the bow 81, the transport safety being shown in the off position and the safety lever in the safe position. The safety lever is in a position to be moved by the operator's finger. When it is desired to release from the hunting safety position and throw the safety lever 82 to a firing position, this is accomplished by the back of the trigger finger moving toward the front of the gun against the bow 81, causing the V-shaped surface 84*a* to to be disengaged from the notch 73 and allowing the notch 73 to rise and be engaged by the hook 72 of the set lever pawl 42.

The trigger mechanism is provided with means for making adjustments with regard to the trigger pull or adjustments with respect to pawl hook 72 and notch 73. To effect the adjustment there is provided an adjusting screw 86 which abuts against an adjusting lever 87 which has a tail piece 88 and projecting therefrom locating fingers 89 curved at their upper portion designed to contact with the forked arms 42*a* and 42*b* of the pawl 42. The adjusting lever 87 is provided with an aperture 87*a* and is pivotally mounted on the pin 87*b*. Screwing in or out screw 86 causes adjusting lever 87 to rock on its pivot 87*b* more or less forwardly, thereby causing fingers 89 to position pawl 42 in its adjusted position. In other words the fingers 89 press against the rear of the forked arms 42*a* and 42*b* to allow the pawl 42 to move on its pivot pin 40, and so vary the relative position or adjustment of the pawl hook 72 and the set lever notch 73.

The trigger 39 is provided with an aperture 90 adapted to receive a trigger plunger member 41 having a spindle 91 recessed to receive a spring 92. Positioned at the upper end of the spindle 91 is a plunger head 93 cut away to provide a cam shoulder 94 and a locating stop 95. The upper surface 96 of the plunger head 93 provides a detent to cooperate with stirrup lug 97 carried by the stirrup 74 of the set lever 43. The trigger 39 is also provided with a finger 98 which may be adjusted to any desired position when the gun is being assembled. The finger 98 cooperates with the surface 42*c* of the pawl 42. This construction is shown in Figs. 2, 10, 13 and 14. The plunger cam shoulder 94 contacts with the pawl 42 at the point 99, as shown in Fig. 2 to provide a camming action which eliminates any back lash or looseness with respect to the trigger 39 and the pawl 42 by forcing the pawl 42 in close contact with the finger 98 of the trigger 39. This forms a rigid unit which is eminently desirable. As wear develops, the plunger adjusts itself to the

wear, assuming a higher position, and at the same time still maintains the rigidity of the unit. The trigger 39 is held under tension by means of plunger 141 and plunger spring 142 mounted in adjusting lever 87.

Referring to the vibrator 8 and its association with the bolt 6, it is to be noted that the latter is shouldered at 100 to provide a bolt stem 7 which in one position projects into the interior of the vibrator. The vibrator 8 comprises a cylindrical member 102 having a rearward bolt engaging face 103 and a forward face 104. Projecting from the latter is a vibrator piston member 105. The face 103 of the vibrator contacts with the face of the bolt at 100. The vibrator 8 is provided with extractor recesses 106 and 107, as shown in Fig. 8a for the purpose of receiving the extractors as hereinafter referred to. The receiver hood 108 is internally threaded at 109 to receive the external threads 110 of the vibrator 8. Means are provided for allowing the vibrator to vibrate upon being duly actuated. Various constructions may be employed to bring about this result. In the drawings one construction has been shown which has been found to give very satisfactory results. It is to be noted that the distance between the internal threads 109 of the receiver hood 108 is greater than the thickness of the external threads 110 of the vibrator 8. Consequently, when the external threads are in engagement, opportunity is afforded for the vibrator threads 110 to move and thereby allow the vibrator to have a vibratory motion when properly actuated. This is clearly brought out in Fig. 7 which is greatly enlarged in order to bring out the construction permitting a vibratory motion of the vibrator. In other words, the construction shown provides a thread tolerance permitting vibration of the vibrator. It is to be understood that the thread tolerance may be varied so as to permit a greater or less movement of the vibrator. Adjacent the roots of the thread 110 clearance cuts 111 are provided cut in the body of the vibrator, as shown in Figs. 7 and 8 for the purpose of providing recesses. The undercut portions 111 function to allow collection of foreign elements which ordinarily would tend to induce the sticking together of the external threads 110 and internal threads 109. The vibrator piston 105 is provided with a circular clearance cut 112 cooperating with clearance cut 113 in the barrel 2. The vibrator 8 is provided with a magazine slot 114 for the purpose of allowing the magazine to be positioned within the vibrator, as shown in Figs. 7 and 8a. The vibrator 8 is provided with a lightening cut 115 in order to make the vibrator function better.

It is to be noted that the vibrator piston 105 engages the recessed portion 116 of the barrel 2. The vibrator piston 105 and barrel 2 are subjected to corrosive action or rusting due to the action of the gases and other elements, and in order to totally eliminate or substantially reduce this action the piston 105 is provided with a non-corrosive shell 117. This may be non-corrosive steel or any material which will resist corrosive action. The barrel 2 is provided with a non-corrosive metal cylinder 118.

Referring to Fig. 6, the gun is provided with an automatic extractor 119, this being a left hand extractor. The extractor is pivotally mounted on a pin 126 and is provided with a hook member 123 for the purpose of engaging the rim 15a of the cartridge 15. The arm 122 of the extractor 119 is provided with a lug 120 which functions as a cam against a receiver shoulder 121. The extract 119 is provided with a recess 118 forming a seat for spring 127, the spring holding the extractor 119 under tension. The extractor is cut away to provide a lug 120 which travels in a slot 133 cut in the receiver 1. When the gun is in the closed position, cam lug 120 is at a position indicated at 132, the cam lug having traveled through the slot 133 in receiver 1. The cam lug 120 is pushed outwardly by the tension of the spring 127 and the extractor arm 122 assumes a position substantially parallel to the receiver 1 and bolt 6. When this occurs, the hook 123 is in position to engage the rim 15a of the cartridge 15.

The right hand extractor 129 is pivoted at 135 and is provided with a hook 131 for engaging the rim 15a of the cartridge 15. The rear portion or arm 134 of the extractor 129 is provided with a recess 128 adapted to receive the spring 130 which holds the extractor 129 under tension. The extractor 129 is provided with a dismounting notch 129a which is adapted to cooperate with a retaining plunger spindle 145, as more clearly shown in Fig. 9. The ejector member 22 is provided at its forward portion with a finger 136 having an ejector point 124 adapted to protrude from the conduit 125 when functioning to eject the shell. The location of the ejector conduit 125 is clearly shown in Fig. 4.

The receiver 1 is provided with a bolt handle slot 140 extending from the bolt handle to the point 138, the bolt handle being identified as 137 and having a bolt handle mounting 12. The bolt handle is retained in the bolt by means of the retaining plunger 139. The cartridge 15, as shown in Fig. 6, is positioned in the magazine 48 and is ready to be pushed into the vibrator 8. To fire, the striker point 14 continues its movement through the striker conduit 144 with sufficient protrusion to fire the cartridge. The position of the striker conduit 144 is clearly shown in Fig. 4.

Fig. 3, which is a cross section taken on line 3—3 of Fig. 2, showing the gun at its closed position ready to fire, indicates the position the transport safety 77 takes in the ready-to-fire position. It is to be noted that the trigger poppet 141 is slidably mounted in the adjusting lever 87. The trigger plunger proper 41 is shown in the engaged position with reference to the pawl 42. The safety lever 82 is in the ready to fire position, and the lug 45 is in contact with the sear lever 37. There is a slight gap 143 between the trigger plunger detent face 96 and the set lever lug 97, as more clearly shown in Fig. 2, when the gun is in the ready to fire position.

Referring to Fig. 9, the bolt handle mounting 12 is slidably fitted in the T-shaped slot 11. The retaining plunger 139 has a spindle portion 145 adapted to engage the bolt 6, thereby functioning to keep the bolt handle mounting 12 in its proper relationship with respect to the T-slot 11. The retaining plunger 139 is held in position by the action of the spring 146 and cup 147, the outer end of the cup resting against nut 148. The cup 147 is apertured centrally to admit a flattened portion 149 of the retaining plunger 139 in the bottom of the cup. The cup 147 rests against the nut 148. One end of the spring 146 is seated against bottom wall 147a of the cup 147. A sleeve 150 is mounted around the retaining plunger 139. The sleeve 150 is provided with a flange 150a and slidably mounted in the mouth of the cup 147. The spring 146 seats against the flanged end of the sleeve 150. The cylinder end of the sleeve

150 rests against a seat 151 in the bolt handle 137. 152 is a split keeper mounted on the flattened portion 149 of the retaining plunger 139. The motion of the retaining plunger 139 is limited by the abutment or shoulder 153. A dismounting notch 154 serves for retracting the retaining plunger 139. Nut 148 is provided with external threads adapted to engage the bolt handle 137. This nut is also provided with a slot 155, as shown in Fig. 1, for the purpose of unscrewing the nut from the bolt handle 137. The retaining plunger 139 is provided with a lug 156 which is adapted to engage a recess 157 in receiver 1, as shown in Fig. 1, when it is desired to hold the mechanism in the open position or retracted position. The cylindrical portion 158 of the retaining plunger 139 serves to guide the sleeve 150. When it is desired to dismount the bolt handle unit from the bolt, a dismounting medium is inserted in the notch 154 and force applied to retract the retaining plunger outwardly. On application of appropriate force, the retaining plunger 139 moves outwardly, carrying sleeve 150 and compressing spring 146 against the bottom wall of the cup 147, this cup resting against nut 148. At the same time the spindle 145 of the retaining plunger 139 withdraws from the bolt aperture 159 and permits the bolt handle mounting 12 to be moved from its T-slot 11. When it is desired to retain the gun mechanism in its open position and the bolt handle mechanism is positioned in the bolt 6, the bolt handle and the bolt mechanism is pulled to its full open position by grasping the bolt handle 137 until the lug 156 coincides with the recess 157, formed in receiver 1, as shown in Fig. 1. The finger is then pushed inwardly on the plunger at 154. This causes the split keeper 152 to move with plunger 139, carrying cup 147, and compresses spring 146 against sleeve 150, causing the lug 156 to engage with the recess 157, as shown in Fig. 1. When the retaining plunger 139 is held in the aforedescribed position and when the lug 156 contacts with the forward portion of the recess 157, as shown in Fig. 1, the bolt mechanism moves forwardly under the tension of the bolt spring 23. Sufficient friction is generated to cause the retaining plunger 139 to retain its pushed-in position and keep the gun mechanism open. In order to allow the gun mechanism to spring forwardly, it is only necessary to pull back on bolt handle 137, which breaks frictional contact between the lug 156 and the recess 157. Retaining plunger 139 then moves to its normal position under the action of spring 146. The retaining plunger 139 and its train of mechanism is shown in Fig. 9 in its normal or neutral position.

Fig. 18 shows the utilization of the vibrator herein disclosed in a forward sliding barrel type gun. The receiver which carries the stock and all other mechanism necessary to fire and properly operate the gun is indicated by the numeral 160. The receiver 160 is provided at its rear or breech end with a recess for receiving the rotary or turning bolt 161. The rotary bolt 161 is provided with a cam slot 162 and a straight or neutral slot 163. The function of these slots is to allow suitable means to be inserted therein for the rotation of the bolt 161. Any known means may be used for effecting the rotation of the bolt. However, the following sets forth one set of means which may be used. Suitable means, for example pins, may be fixed in the receiver 160 to engage slots 162 and 163. When the bolt travels forwardly, it does not rotate. The pins or any other suitable turning means are engaged with slots 163. However, the bolt 161 does rotate when the pins or other suitable turning means engage slots 162, this causing the bolt head carrying locking lugs 164 to unlock from the vibrator 166. This form of the mechanism is provided with the usual firing pin well 165. The vibrator 166 is constructed on the same principle and of the same general design as heretofore described. As shown in Fig. 18, the locking portion of the vibrator and the threaded portion of the vibrator is integral. This is merely the preferred form and obviously may be changed.

The vibrator 166, which is chambered centrally to receive the ammunition powder case 166a, is threaded externally at 167 with the usual vibrator threads having the usual clearance cuts 168. The usual piston 169 and clearance cut 170 are also provided. The magazine 171 is shown as located on the drawings, although the position thereof may be varied. The magazine may be of the usual box type of either single or double row cartridge design, although any other suitable type may be employed. The magazine is provided with a magazine spring 172 which serves to push or actuate the magazine follower 173. Threaded recesses 174 and 175 are provided for receiving the usual stock bolts. The drawings show a cartridge 176 positioned in the magazine 171. The barrel proper 178 is provided with an extension member 177 having threads 180 adapted to engage corresponding threads on the barrel 178. The barrel extension member 177 is also provided with threads 179 adapted to engage corresponding threads on the vibrator 166. Suitably mounted on the barrel 178 is a collar 181 which functions to provide a seat for the barrel spring 182 encircling the barrel. At the muzzle end of the receiver or jacket 160 is located a spring collet 183 split longitudinally to form fingers at its front end and threaded at its rear end at 183b so that it may be screwed into the receiver 160.

The spring fingers 183a embrace the muzzle piece 184 of the barrel. The rear wall 183c of the split collet 183 functions as a seat for barrel spring 182. The split collet 183 is externally threaded at 183b to engage corresponding threads in jacket 185. The muzzle piece 184 is threaded to engage corresponding threads on the barrel 178. The muzzle piece 184 is of a larger diameter than any other portion of the barrel that operates between the fingers 183a of the collet 183, thereby causing the barrel to slide freely when the muzzle piece 184 has moved from the collet fingers 183a. This construction also permits the muzzle piece 184 and the collet 183 to have a snug driving fit at the time of firing which promotes accuracy.

When the cartridge 166a is fired, the bullet 186 emerges from the mouth of the shell and the gases produced expand with full force upon the piston 169 at and adjacent the clearance cut points 170. This forces the barrel 178 forwardly with great force. The barrel 178 moves forward, carrying with it the extension member 177. The threads 179 move forward with the extension member 177, engaging the threads 167 located on the vibrator. This functions to pull the vibrator 166 and at the same time bolt 161 forwardly. During such forward motion, the bolt rotating means travels in neutral slot 163. Upon continuation of the forward movement the rotating means enters rotary slot 162. This causes

the bolt lugs 164 to rotate and unlock from the vibrator 166. The bolt remains fixed at this point and the vibrator barrel and other action continues forward to the full open position. During this motion, the spring 182 is compressed and the muzzle member 184 slips out from between collet fingers 183a. On continuation of this movement, collar 181 continues forwardly fully compressing spring 182 against collet 183. The gun is then in the open position. The spring 182 acts to return the barrel 178, the latter receiving a cartridge from the magazine 171. On continuation of the movement, the bolt mechanism is locked to the vibrator 166. The gun is then in the closed position, as shown in Fig. 18, and is ready to fire.

Fig. 19 shows a modified form of mechanism employing the vibrator principle. By comparison of this figure with other figures, it will be noted that as shown in Fig. 19 the vibrator 187 does not have an extending piston member, the powder case 192 being held or chambered by the barrel 189 positioned in receiver 188. The head of the powder case 192 is positioned or held by the forward end of the vibrator 187. The vibrator is threaded with the usual vibratory threads 193 adapted to engage corresponding receiver threads 194. The vibrator, as shown, also affords means whereby bolt 191 may be locked thereto by suitable mechanism cooperating therewith, the vibrator being recessed at 195 to receive bolt 191 and apertured at 197 to receive the head of the powder case. The bolt lugs 196 are shown locked in the vibrator. In action the vibrator 187 cooperates with bolt 191, and the powder case 192 is violently set back, imparting to the bolt carrier 190 the necessary momentum to operate the gun.

Figs. 20 and 21 show a further modified structure. The vibrator 199 has the usual vibrator threads 200 engaging corresponding internal threads 202 on the receiver 201. The bolt member 198 has a stem or spindle 198a projecting into the vibrator 199. The vibrator 199 is provided with a vibrator piston 203. The barrel 204 is provided with a chambered spindle 205. At the forward end of the chambered spindle 205 is located one or more vents 206 which communicate with gas chamber 211. The powder case 207 carrying a projectile 208 is positioned in the chamber 210 of the barrel spindle 205. The piston 203, being cylindrical in shape, has a sliding fit on spindle 205. It also has a sliding fit in barrel 204. The barrel 204 is provided with a recess 209, adapted to receive the vibrator piston 203.

Upon a cartridge being fired in a mechanism of the character set forth, the powder case 207 will recoil against bolt spindle 198a. When the bullet 208 passes ports 206, the gases will expand through ports 206 and into chamber 211 and then expand against the vibrator piston 203 of vibrator 199, causing the vibrator to impart to bolt 198 the required momentum to operate the gun. The vibrator, aside from the distinguishing features set forth, is constructed as previously described.

Fig. 16 shows a still further modified structure utilizing the vibrator principle in a mechanically locked breech type gun. The bolt 212, which is of the usual rotary type, has a straight slot 213 continuous with a camming slot 214, and is provided with the usual lugs 215. The slot 213 is designed to have a delayed action relative to the unlocking means. It may be pointed out that the cam slot 214 causes a rotary motion when it cooperates with the unlocking means. The bolt carrier 216 constitutes means for controlling the rotary motion of the bolt 212 and for the operation of the gun. The vibrator 217 is formed to receive the rotary bolt 212 and threaded with the usual vibratory threads 218 adapted to cooperate with threads 219 of the receiver 220. The vibrator has the usual piston 221 adapted to work in a corresponding recess formed in barrel 222. When a cartridge is fired, the gases expand against the face 223 of piston 221, driving the same with great violence the distance allowed by the thread relationship. The vibrator movement is predetermined by having the distance between threads 219 greater than the width of the vibrator threads 218. The bolt carrier 216 attains the speed set up by the vibrator by virtue of the fact that it rests directly against the rear face of the vibrator 217, the bolt carrier having imparted thereto momentum necessary to properly function the gun. The slots 213 provide means for delaying the unlocking of the bolt 212 for a period of time until the bullet has left the barrel and the pressure has been substantially reduced, this period of time being technically known as "barrel" time. The unlocking time may of course be varied to suit the particular circumstances. Unlocking begins when the means carried by carrier 216 engages with unlocking slot 214, which rotates and unlocks lugs 215 from the vibrator 217. Bolt carrier 216 and bolt 212 and other mechanism continue open and function the mechanism. In the structure shown, the firing means which are necessary to cause the gun to fire and operate are, of course, provided. From the above it is clear that the vibrator 217 only initiates movement of the bolt 212 and does not move for a period of time corresponding to the barrel time and unlocking or locking time. This same relationship is inherent in the structure set forth in Figures 18 and 23.

Fig. 17 shows a sub-caliber unit adapted to be assembled in a large caliber pistol to cause the large caliber mechanism to function with small caliber ammunition, as satisfactory as it would function with large caliber ammunition. The unit is shown assembled in the unit mount 228 having a barrel 231, the latter having a small 238 and a swell 237. The mount 228 is secured to the barrel 231 by means of threads 232. A retaining plunger 233 cooperating with a spring 234 is seated in barrel 231 and serves to prevent the mount 228 from unscrewing from the barrel 231. Upon plunger 233 being depressed, mount 228 may be unscrewed from the barrel 231. The mount 228 is provided with a locating lug 235 having a hole 236, the purpose of the latter being to engage retaining means not shown. The vibrator 224 is provided with the usual threads 227 which cooperate with threads 229 of the mount 228. The vibrator is provided with the usual piston member 230 adapted to engage the barrel 231. The vibrator is also provided with a ramp 225 for the purpose of guiding the noses of cartridges into vibrator chamber 226. The lug 225 also serves to prevent rotation of the vibrator when the latter is assembled within the gun.

In action, the powder case of the cartridge is located in the vibrator chamber 226, and the bullet in barrel 231. Upon firing of the gun, the bullet emerges from the powder case and the gases enter against the vibrator face at the

point 239, imparting to vibrator 224 a violent impulse rearwardly. The movement of the vibrator is restricted within the limits of the threads 227 and 229. Suitable bolt mechanism is held in contact with the face of the vibrator at the point 240. The bolt mechanism receives the impulse speed of vibrator 224 and thereby attains the momentum necessary to function and in turn operate the gun. Swell 237 when in firing position engages a bearing located in the slide, receiver, or other usual gun mechanism. As the slide moves rearwardly or opens, swell 237 projects from the gun mechanism and the mechanism slides around the small 238 of the barrel, which permits a very much freer action than would be the case if the barrel was of the same continuous diameter throughout. Swell 237 is capable of a tight fit in a gun at the time of firing which promotes accuracy. The unit shown in Fig. 17 is readily used in the army .45 caliber automatic which has the usual slide and frame. The vibrator unit functions the large caliber gun mechanism when using small caliber ammunition just as well as the large caliber ammunition heretofore usually employed operated the gun.

Fig. 22 shows a modified vibrator unit. The vibrator unit is inserted in a gun having a receiver 241 attached to a barrel 243 by means of threads 242. The receiver has threads 244 adapted to cooperate with the vibrator threads 245. The vibrator 246a is formed at 247 to receive bolt 248, and carries a locking extension member 246 apertured at 249 to receive the powder case 250. The vibrator locking extension member 246 carries threads 251 to engage threads 252 on member 253, positioned within the barrel 243. The member 253 also carries threads 255 which are adapted to engage threads 256. The member 253 is provided with a central aperture 257 to receive a portion of powder case 250. The member 258 is provided with threads 260 and has a central aperture 259 to receive a portion of the powder case 250. The member 258 is provided with threads 260 to engage threads 261. The member 262 has a central aperture 263 to receive a portion of the powder case 250 and carries threads 264 adapted to engage threads 265 of member 266. This member has a central aperture 267 to receive a portion of the powder case 250, the mouth or neck of the powder case being identified by the numeral 268. A clearance cut 269 is provided. The mouth end 268 of the powder case 250 engages the barrel 243, the bore of the barrel 243 serving in the capacity of a part chamber for the powder case 250.

In action, the recoil of powder case 250, due to the firing of the cartridge, pushes the head of the powder case 250 rearwardly. This head carries the bolt 248. When the bolt 248 moves rearwardly, it carries with it the vibrator extension member 246. This functions to take up the play or tolerance between threads 251 and 252. When this occurs, member 253 is moved rearwardly by the contact of the above mentioned threads. Member 253 continues moving rearwardly, causing the threads 255 to slide in contact with threads 256, which takes the play or tolerance out of the threads. Member 253 then pulls member 258 rearwardly, causing threads 260 to move to a new position and to engage with threads 261. When the threads 260 reach the limit of the movement prepared in thread tolerance, the member 262 is pulled rearwardly by member 258. Member 262 continues moving rearwardly, causing the threads 264 to slide and contact with or engage threads 265, the amount of slide prepared in the thread construction determining the amount of movement. Member 266 is then pulled rearwardly by member 262, causing member 266 to slightly disconnect with barrel 243 at point 270. The total amount of the sliding movement prepared in the threads of members 246, 253, 258, 262 and 266, plus a very slight distance at 270, may not exceed the distance vibrator extension member 246 may travel rearwardly as prepared in threads 244 and 245.

The motion of vibrating extension member 246 can be used to actuate any suitable gun mechanism. This unit serves in one instance to compensate for excessive head space and to cause the powder case to have a series of stretches instead of one single stretch that will ordinarily separate shell or powder case.

Fig. 23 shows a vibrator unit positioned eccentrically of the bore of the barrel of the gun. The gun is provided with the usual receiver 272, adapted to receive at its rear end a gun mechanism. The receiver is provided with lugs 273 for the purpose of carrying means whereby the bolt mechanism may be securely locked thereto. The receiver 272 is provided with a hood 274 threaded to engage gun barrel 275. Receiver 272 carries a slot 276, this slot allowing a portion of the bolt mechanism to ride therein. The bolt body 277 is provided with lugs 278 which function as means for causing the bolt to be locked against lugs 273 carried by the receiver 272. The bolt carrier 279 carries any suitable means for causing the bolt 277 to unlock from the receiver 272. The bolt 277 is provided with a straight or neutral slot 280 and continuous therewith a spiral or sloping cam formation 282 for the purpose of imparting an unlocking motion to bolt 277 with respect to receiver 272. A powder case 283 is seated in the barrel 275. The revolving bolt handle 284 has positioned therein a bolt carrier spindle 285 about which the bolt handle 284 is adapted to operate. The bolt handle has a lightening cut 286. The bolt carrier 279 has formed thereon a hook member 287 for the purpose of retaining handle 284. The bolt handle 284 is provided with a lug 288 adapted to engage hook 287 of bolt carrier 279. The bolt handle 284 is provided with a contact face 289 serving as a seat for vibrator head 290 of the vibrator 294. Projecting from the head 290 of the vibrator is a vibrator stem 291 carrying vibrator threads 292 which are adapted to engage threads 293 carried by the barrel 275 or the like. The cooperating threads have the usual vibratory fit or tolerance. As indicated on the drawings, the distance between the threads 293 is greater than the width of threads 292. The vibrator 294 is provided with a lightening cut 295. A vent 297 is provided, the outer end of the vent being indicated at 296. The vibrator 294 is provided with a hollow extension member 298 having a gas intake port 299, the latter being in alinement and in operative communication with the vent 297. The member 298 is made hollow so as to be capable of expanding under the high gas pressure developed therein. This high gas pressure also functions to push this member rearwardly and cause the vibrator to operate against bolt handle which in turn causes the gun mechanism to open. Suitable means are provided to close the gun. The purpose of revolving bolt handle 284 is to cause the gun to be inoperative automatically when face 289 is revolved from contact position with respect to vibrator head 290. The gun can

then be operated manually by manipulating the bolt handle 284.

Fig. 2 shows the gun in its closed position. In order to fire the gun, the trigger 39 is pulled, retracting poppet 141 which in turn compresses spring 142. Trigger plunger 41 then moves forwardly, carrying pawl 42 forwardly against the resistance of pawl plunger 70 and pawl spring 71. Pawl hook 72 then moves forwardly, disengaging itself from set lever notch 73. When this happens, set lever spring 61 expands upwardly carrying plunger 62 upwardly, thereby forcing set lever 43 and set lever lug 45 upwardly. The lug 45 functions to force set lever tail 46 of set lever 37 upwardly, causing sear lever finger 36 to move downwardly, thereby carrying sear fingers 35 downwardly. This carries the free end of the sear 31 downwardly, causing the sear notch 33 to disengage from contact with striker notch 34. Then striker spring 18 drives striker 13 forwardly, causing the striker pin 14 to prime or fire cartridge 15.

When the cartridge 15 is fired, the recoil generated by the cartridge begins to function and the head of the cartridge begins to push against the bolt 6. When the bullet emerges from the mouth of the shell, the gases impinge against the forward face of the vibrator piston member 105 of the vibrator 8. The gas pressure generated causes the vibrator piston member 105 and the vibrator 8 to move rearwardly to the extent permitted by the engagement of the external vibrator threads 110 and the internal threads 109 of the receiver hood 108. This movement is one of great violence sufficient to cause the vibrator 8 to be securely locked against bolt 6 during the travel of the vibrator, and the bolt 6 having received the necessary momentum to open the gun mechanism effects the necessary movements. Vibrator 8 moves rearwardly, its threads 110 contacting with the threads 109. After it is moved the distance permitted by the thread contact, the vibrator 8 rebounds forwardly, continuing its vibrating movement until its vibrating energy has exhausted itself. Bolt 6 continues moving rearwardly, revolving cocking lever 28 on its pin 29. The top portion of the lever 28 contacts with the striker cam lug 30, camming the striker 13 rearwardly and compressing striker spring 18. Bolt 6 continues moving rearwardly and the cocking lever 28 continues to revolve because of its free end sliding on receiver cam 1a. Sear lever 37 continues moving rearwardly with the bolt 6, and due to its inclined or sloping position causes set lever lug 45 to fall or be depressed, depressing with it set lever 43. On bolt 6 continuing its movement rearwardly, striker 13 is caused to be cammed rearwardly by cocking lever 28 to the extent that the striker notch 34 meshes with the sear notch 33. The free end of the sear 31 rises to its cocked position, causing sear lever 37 to assume a position shown in Fig. 5. During the movement of the bolt 6 rearwardly, the bolt spring 23 is continually being compressed in proportion to the amount the bolt travels.

The continued rearward movement of bolt 6 causes sear lever 37 and sear 31 to depress lug 45 to its lowest position, thus causing set lever 43 to assume a corresponding depressed position. During this stage of depression, set lever spring 61 and plunger 62 are also depressed. During this stage of depression, the set lever stirrup 74 of set lever 43 moves downwardly, encircling the pawl 42. The set lever 43 is shown in Figs. 1, 2 and 5 in assembled relationship with its other cooperating elements and in Fig. 13 in detail.

Fig. 14 shows a detail of the pawl 42. The lug 97 of the stirrup 74, as shown in Fig. 13, contacts with the upper surface 96 of the plunger head 93, which forms a portion of the trigger plunger member 41, as shown in Fig. 10. This causes the plunger 41 to be depressed, as shown in Fig. 5. When this occurs, cam surface 94 of trigger plunger 41 disengages with its corresponding cam 99 formed on pawl 42, and causes trigger 39 to get out of mesh or gear with pawl 42. When the trigger 39 is out of mesh with the pawl 42, the plunger 70 and spring 71 move the pawl 42 rearwardly, causing it to position itself so as to permit the engagement of its hook 72 with the set lever notch 73 when the gun is closed. This out of gear or mesh position with respect to pawl 42 and trigger 39 is shown in Fig. 5.

The bolt 6 continues to move rearwardly, causing automatic extractor 119, as shown in Fig. 6, to release the head 15a of the fired cartridge 15. Extractor cam lug 120 contacts with the receiver 1 at the shoulder 121, causing the lug 120 to be cammed inwardly, thus forcing extractor hook 123 to move away from the rim 15a of the shell of the cartridge 15, allowing the empty cartridge shell to be free to leave the gun. Since the ejector 22 remains stationary with respect to its seating plug 21, the ejector point 124 is projected through and out of ejector conduit 125, shown in Fig. 4. When the automatic extractor 119 is cammed inwardly, it revolves on its pin 126 and compresses extractor spring 127. At this stage the ejector point 124 projects through ejector conduit 125 and strikes the shell centrally. The right hand extractor 129 retains its position shown in Fig. 6 under the action of extractor spring 130. The hook 131 is then in engagement with the rim 15a of the empty shell of the original cartridge 15. The continued protrusion of the ejector finger 136 functions to allow the ejector point 124 to eject the shell. The bolt 6 abuts or comes to a stop at about this time by contacting with the receiver plug 121.

The sear lever 37 is held under tension at all times by any suitable means that may function in cooperation with the lug 132, shown in Fig. 5. One form of suitable means not shown in the drawings is a plunger and spring arrangement.

When the cycle of operations above set forth is completed, the gun is in the full open position as shown in Figs. 5 and 6, the latter also showing the position of the extractors in the full open position of the gun. At this time the gun is in position to close and reload.

The vibrator principle and construction herein set forth may be used in an automatic pistol including small caliber, high caliber, small caliber rifle, a high power rifle, an automatic shot gun, a machine rifle, a machine gun, a machine gun of sub-caliber, light machine guns, heavy machine guns, and in anti-aircraft guns. The advantages obtained from the use of the vibrator in firearms of the type set forth will now be discussed;

Use of the vibrator in an automatic pistol of small caliber

1. It is a well known fact that an automatic pistol that functions by the recoil of small caliber ammunition is very unreliable as compared with large caliber pistols. The vibrator overcomes this difficulty completely by receiving from

the gases generated the equivalent of several times the recoil generated by the explosion of the cartridge, this magnification of force plus the recoil of the cartridge operating the pistol.

2. When it is desired to design a pistol capable of operating with both small caliber and large caliber ammunition, it is desirable that the large caliber mechanism remain unchanged with reference to the strong bolt spring, the heavy firing mechanism and the heavy bolt mechanism. The vibrator herein shown functions perfectly to accomplish this purpose. The only change necessary to be made is to replace the large caliber barrel unit with a sub-caliber vibrator unit, one form of which is shown in Fig. 17. It is of course obvious that this structure shown may be greatly changed and still come within the spirit of the present invention.

3. When it is desired to design a stationary barreled locked breech pistol, it is admirably accomplished by using the vibrator in a design as herein previously set forth to effect what is herein termed a gas locked breech.

4. When it is desired to have a small caliber pistol with a mechanical lock breech, it is easily designed by utilizing the principle herein set forth.

5. A pistol with accuracy of the very highest order may be constructed by using a gas lock or mechanical lock substantially as herein described.

6. Another advantage when using a vibrator as herein described is that when the vibrator is in the preferred form, it holds or positions the powder case only. The bullet extending into the barrel is seated in the rifling at the time of firing. A slight protrusion of the powder case at the piston end of the vibrator is ideal for some small caliber firearms.

7. The vibrator, in view of its construction, is of such compactness that it readily adapts itself to substantially any pistol construction.

8. The extremely short vibratory movement of the vibrator eliminates the necessity of returning or repositioning devices to cause the vibrator to be in a reloading or ejecting position.

9. A large caliber pistol may readily be constructed with the desired stationary barrel, the latter having as a breech locking mechanism the mechanical type of lock or the gas lock.

10. The vibrator in certain combinations may reduce the recoil in large pistols.

Advantages of use of vibrator in small caliber rifles

1. When the vibrator is used in small caliber rifles of the automatic form, the combination of high power rifle mechanisms of the automatic type may be easily constructed to cooperate with small caliber ammunition, thereby producing a high power, high tension automatic action in a small caliber rifle, the small caliber ammunition operating the high power action with perfection.

2. The vibrator enables the gun mechanism to have the much desired high-speed firing mechanism; also an automatic set trigger mechanism. An automatic extractor or any other mechanism that requires force for its operation may be used.

3. In the rifle the gas lock is easily effected, due to the inertia of the bolt mechanism and other members.

4. The mechanical locked breech may be used, the vibrator serving as an actuator for the lock mechanism and bolt mechanism.

5. Accuracy of the highest order may be obtained.

6. The vibrator does not require any relocating or repositioning means to be returned to the reloading position, its vibratory movement being of such a small order that the feeding of ammunition is not affected by any position the vibrator may take.

7. In small caliber rifles, in the preferred construction, the vibrator positions the powder case only, or a portion of the powder case as may be desired. The bullet is seated in the barrel at the time of firing.

Advantages of using the vibrator in a high power rifle

1. When the vibrator is used in a high power automatic rifle, the rifle may have a locked breech and a stationary barrel, and the locked breech may be of the mechanical type.

2. With certain combinations herein previously described, the gas locked breech may be used.

3. The threaded vibrator will not assemble in the gun mechanism in an incorrect or unsafe manner.

4. The vibrator principle reduces the number of parts required for a locked breech gun. It also reduces the number of cycles required for its opening and closing movements.

5. The barrel may be of a heavy or stationary type without adding any extra weight to the rifle due to the elimination of barrel jacks and barrel jack mechanisms.

6. The great energy the vibrator receives from the high breech pressure insures the proper functioning of the rifle.

7. The proper utilization of the vibratior principle reduces the recoil or at least apparently reduces its effect on the gun operator.

Advantages inherent in the use of the vibrator in an automatic shot gun

1. There is a reduction in the number of the recoiling parts and in the weight thereof.

2. A stationary barrel may be embodied in the automatic shot gun.

3. There is a reduction in the number of cycles required for the functioning of the gun and a consequent reduction in the number of gun parts.

4. The fore-end of the gun may be of a better shape and size.

5. The balance of the gun is considerably improved.

Advantages of using the vibrator in a machine rifle

1. There is an elimination of the usual gas tubes, gas regulators, and the gas operated system in general.

2. There is a better balance and therefore a corresponding reduction in weight and size.

3. The mechanism functions with great reliability due to the vibrator's violent movement.

Advantages of using the vibrator in a machine gun of sub-caliber type

1. The vibrator may be used in a machine gun of sub-caliber type to advantage, due to the fact that the sub-caliber ammunition has a comparatively low recoiling energy.

2. The vibrator causes the sub-caliber ammunition to operate with greater reliability and therefore operates the gun mechanism more reliably.

3. The operation of the gun mechanism does

not require any oil or other lubricating elements for the successful operation of the gun.

4. The gas lock principle adapts itself readily to the sub-caliber machine gun. This may eliminate the mechanical lock. However, the mechanical lock may be used to advantage.

Advantages of using the vibrator in a machine gun

1. It eliminates the regular gas operating mechanism if the gun is of the gas operated type.

2. It eliminates the heavy recoiling barrel, its mounts or slide ways and the accompanying mechanism.

3. The mechanism operates with greater speed due to the vibrator's violent movement and the great reduction of the weight of the recoiling parts.

4. There is less strain, wear and tear or pounding of the mechanism at corresponding firing speeds.

5. A machine gun embodying the vibrator is capable of a tremendous firing speed when used for aircraft purposes. This is due to the fact that the weight of the recoiling parts is cut to a substantial minimum and further to the unlimited power of the vibrator.

6. The vibrator enables a heavy barrel to be used on a machine gun which adapts itself more readily to be air cooled, the heavy barrel dissipating heat as fast as generated. This will totally eliminate the use of artificial cooling means.

7. The heavy stationary barrel will give better accuracy than the light floating barrel; also the chance of the hot barrel sticking in the barrel casing is absolutely eliminated.

8. Aluminum or other heat radiating material may be used on the barrel for cooling purposes.

Advantages of use of vibrator in a heavy machine gun

The advantages of using the vibrator in the heavy type machine gun are similar to the advantages herein set forth in connection with the use of the vibrator on light machine guns. However, the advantages are more pronounced. The heavy machine guns requiring heavy barrels are at a great disadvantage if the barrel recoils with the mechanism. The vibrator eliminates the heavy recoiling barrel completely and so eliminates its attending disastrous pounding action.

Advantages of using the vibrator in artillery

1. The vibrator may be used in artillery to cause the gun to eject the empty powder case more quickly.

2. In the case of self-loading or automatic loading artillery, the vibrator may serve as a mechanism actuator or mover.

Construction of gas pressure end of vibrator and vibrator piston

The gas pressure end of the vibrator, and more specifically of the vibrator piston **105** may be convex, concave, of disk contour, or of a countersunk shape. It may have a pointed shape, a round nose shape, it may have varying diameters, it may have a single or multiple number of recesses drilled longitudinally of the piston member, functioning as pockets or clearance spaces so that elements of combustion, powder grains, lead or other foreign elements may fall into the recesses. This will insure that the vibrator piston or nose seats close to the bore of the barrel. An expansible ring may be fitted around the piston member **105** for the purpose of sealing the piston against the escape of the gases. This ring may be capable of expanding by slots cut thereon, or be completely cut in half or separated in one side or by other separations. It may be thin enough to expand. Instead of using a single expansible ring, several such rings may be used or multi rings may be used. The face **105***a* may be countersunk or shaped so as to have a scraping action to loosen directly or indirectly elements of combustion, and in this manner insure their non-interference with the operation of the gun. The cylindrical surface **105***b* of the piston member **105** may have a radial cut thereon adapted to receive a split skirt or otherwise expansible sleeve fitted therein. The sleeve will then be in contact with the piston and the barrel thereby removing the danger of the piston expanding out of the desired proportions due to the continual pounding of the gases.

The face **105***a* of the piston member **105** may have a radial cut therein, this cut being located in the gas pressure area. The radial cut may have a shell type plunger located therein upon which the gases may act, expanding and sealing the piston against the escape of gas. The piston member **105** may be split one or several ways to provide for expansion. The face **105***b* of the piston **105** may be drilled with a series of holes in its side. The gas pressure end **105***a* of the piston member **105** may have a valve face formation to fit in a corresponding face in the barrel **2**. Several such valve face formations may be provided and there will be a series of corresponding faces in the barrel to receive them.

Contour, form, or appearance of piston member of vibrator

The piston member **105** may be entirely omitted, and in that case the vibrator may be increased in length and threaded over its entire cylindrical surface. In that case, the front end of the vibrator will contact with the barrel. The vibrator member may have the thread eliminated therefrom and then be in the shape of a true cylinder. When this is done, other means may be located elsewhere to limit the motion of the vibrator. The outer surface of the vibrator piston may be in a step shape. A single step cut may be provided or a series of step cuts used in circular or radial order. The vibrator piston may not be of the usual piston shape but be of a tapered formation similar to the taper employed in the use and manufacture of tapers or machine arbors, lathe centers and the like. The taper may be constant or otherwise. The outer surface of the vibrator piston may be of the varying tapered shape or may have an ever changing degree of diameter.

Shape of means holding and positioning vibrator, including threads, lugs, or other equivalents

The threads **110** of the vibrator may have the usual square thread shapes. The threads may be cut at such an angle so as not to lock as in an ordinary nut and bolt, but as a special worm which will unscrew under pressure. In this case, it may be provided with locking means to prevent unscrewing. The threads may be of the usual continuous circle type thread, or may have in addition a set of interrupted type threads, this combination of threads being located on one vibrator. The threads may be of the interrupted type exclusively, that is not combined with the

continuous type of thread. The threads may be of the multi-thread type. The threads may be of such a type that two complete sets are employed on one surface, one set of threads starting at the forward end and one set of threads starting at the rear end and checking and crossing each other. The vibrator may have threads of the type and shape set forth above, and any type of threads now in use on bolts, screws, worm drives, and all screw drive members. The threads may be cut so as to hang over each other or interlock with each other with respect to the receiving threads of the male or female type, as the case may be. The threads may be substituted by convenient lugs, projections, ears, flanges and the like which will function to operate in a manner similar to the threads.

The vibrator may be slotted or slitted to receive pins or other locating members. When these elements are used, companionate recesses are cut in convenient locations in the receiver or elsewhere. These locating means may be formed directly upon the vibrator or indirectly. The vibrator may be held in place by the use of the regular complete turn type threads, and in addition to such a set of threads a set of interrupted threads may be employed. This combination may be combined to give any desired effect. One effect, for example, is that the continuous threads serve to force the vibrator from its seat, the interrupted threads disengaging at the first opportunity. This permits quick dismounting and mounting. The vibrator may be of any usual shape but may be provided with an ejector means to mechanically eject the same from the gun. The ejector means may comprise levers, handles, sleeves, springs, slide means, or any convenient locating and expelling or ejecting means. The vibrator may also be provided with means whereby the vibrator will eject or expel itself when the gun is fired, the ejection being performed automatically. The vibrator may have a locating means functioning as a toggle hinge joint such as, for example, a knee joint, the expansible link or flexible movement thereof limiting the travel of the vibrator. The dead center of this hinge joint mechanism may be used as a limit of travel, if desired, or the reversal of the process, if desired, or a part thereof.

Advantages of devising a vibrator with vibratory threads

The vibrator threads insure strength of construction causing the gun to stand up under the pounding or shock of the vibrator, vibrating at high speed without special heat treatment. When using high pressure ammunition, the vibrator having threads set forth has the required strength to withstand any pressure that the barrel is subject to, thereby eliminating weak parts in the firearm. The use of the threads makes it impossible to assemble and fire the gun when the vibrator is not fully closed and therefore locked, making it impossible to fire the gun in a dangerous position which may destroy or otherwise wreck the gun and be fatal to the operator. This may happen to a great extent if the threads are not used.

The threads act also in a measure as a gas check, aiding considerably in the check of the escape of the gases. The use of a threaded vibrator lends itself to easy and accurate manufacture. The threads may be accurately made, so they bear or contact their entire length or limit with ease and accuracy. The strength of the vibrator may be controlled by the number of turns thereon, and this without enlarging the gun proportions necessary to produce the required strength in the gun. The threads, being capable of being formed on round members, as is well understood, have a round contour similar to the barrel which is highly desirable, giving the firearm grace and balance, which is of great importance. The threads give a high degree of strength, considering the amount of metal used in the construction of the threads, thereby eliminating certain dead weight. The threads have a large contact area which is desirable, considering the problem of deformation of the vibrator due to shock and pressure; the large area of contact is gained symmetrically. A vibrator provided with threads permits easy forced removal of the vibrator by simply unscrewing the same from its holding mechanism, thereby preventing damage to the vibrator due to misdirected efforts to remove the same when the vibrator is stuck or otherwise bound in the gun. Further, the breaking, bending, shearing, and deforming by swelling or battering of lugs or contact members other than threads are eliminated. All tension and pressure is absorbed radially and evenly distributed so that the vibrator piston member has no side slap or pounding action during the violent vibration set up on firing.

Another advantage is that when just one complete thread turn is used in the construction of the vibrator, in some cases it gives an ample margin of strength. For example, this is true when a .45 Colt government automatic is modified to turn it into a sub-caliber unit. As shown, in Fig. 17, here only one thread turn is used. As shown in Fig. 17, the usual barrel mechanism is removed and the units assembled therein in the place formerly occupied by the regular .45 caliber barrel and its attendant parts. The chief advantage of the single thread used in the unit set forth in Fig. 17 is in part only one thread on the vibrator is necessary, causing the same to be short and compact. Further, it gives great symmetry and small size necessary in a modification of this type.

How the length of the vibrator chamber or bore may vary

(1) The vibrator bore may be long enough to hold the entire powder case.

(2) The vibrator bore may be $\frac{1}{32}$ of an inch less than the length of the powder case, this leaving a small portion of the powder case protruding from the vibrator bore. Under these circumstances, the front end of the shell never deforms.

(3) The vibrator bore may be longer than the shell, for example, it may be $\frac{1}{32}$ of an inch longer.

(4) The vibrator bore may be as long as the entire cartridge chamber which, in some cases, is as long as the powder case plus a part of the length of the bullet.

(5) The vibrator bore may comprise a length of usual shaped bore which may be smooth or rifled to correspond to the bore of the barrel, this giving the vibrator a chamber part and a rifled part.

(6) The length of the bore of the piston member of the vibrator may be such that a portion of the powder case may be positioned or stationed or rest in the barrel bore with the shell or powder case bridging or covering the slight gap between the front end of the piston and the rear end of the barrel.

(7) The vibrator bore may be, for example, so short as to only hold that portion of the shell or powder case that constitutes the head measurements such as the rim or the cut recessed for the extractor or the formation for the extractor or shell remover, or the portion which locates the priming means.

Further advantages of threads

It may be pointed out that the employment of a multi-sectioned vibrator serves to automatically provide for head space developments, such as result from wear and tear of mechanism. The multi-sectioned vibrator provides this adjustment automatically as head space develops.

A single piece vibrator may be employed to provide for head space development. The bolt lock holding the vibrator in its forward position secures powder case. The power for causing the vibrator to function as a head space adjuster is attained through the aid of the gases acting on the forward end of the vibrator and forcing the shell and vibrator against the gun mechanism in unison, and as a unit and in proper relationship. The advantage resulting from employing the vibrator having vibrator threads is self-evident and in that type of gun that is operated by the movement of the primer, the latter moving rearwardly and operating the gun. Fine adjustments are desirable for the member that contacts with the primer, and the threads admirably perform this function, inasmuch as they permit the desired movement and maintain indefinitely a positive adjustment. This arrangement may be termed a vibrating tappet. The threads withstand the severe pounding set up at firing admirably without special heat treatment.

Such threads also make it impossible to assemble the tappet member in an unsafe position which would allow the gun to be destroyed at the time of firing. The threads on the tappet arrangement set forth withstand the tremendous strain caused in the vibrator mechanism when the primer is pierced or otherwise permits gases to enter the mechanism under a tremendously high breech pressure.

Fit relationship between the forward end of the vibrator or vibrator piston member

The piston member does not of absolute necessity fit as hereinbefore described and shown in the drawings, but may be so fitted that the piston effect is omitted. In such a case, the forward end of the vibrator and the rear end of the barrel and its bore come in contact in a manner similar to that in which a revolver cylinder contacts with the barrel of a revolver, the gases generated upon explosion of the cartridge having free access to escape at right angles or other angles as the case may be. A clearance or other cut is provided in the receiver for such gas escapage. The receiver may be provided with screw or other locating means, as has been hereinbefore described, and may also be formed so as to locate and position the vibrator with respect to the barrel so as to aline the vibrator bore with the barrel bore, provision also being made at the forward end of the receiver for securing the barrel to the same, whether permanently or otherwise.

The front end of the vibrator piston of the vibrator may be counter-sunk or funnel-shape and when of this shape can cooperate with a cone-shaped barrel portion. The aforesaid vibrator means may have a chambered portion as usual, and communicating with the chamber and concentric therewith a funnel-shaped portion. A cylindrical portion communicates with the funnel and is adapted to cooperate with a cone formed on the barrel member and the cylindrical portion is adapted to cooperate with a cylindrical portion formed on the barrel. The funnel, cylinder and cones may be formed radially and concentrically with the barrel bore and vibrator chamber and have a seating engagement with respect to each other. This functions to cause the elements of combustion to exhaust from the gun as desired. Further, if it is desired that the explosion gases escape in a reverse direction, the cones, cylinders and funnels may be located either on the vibrator or the barrel in a reverse order or other order. The front end of the vibrator piston may have the several shapes herein described and engage corresponding faces in the barrel member, substantially as hereinbefore described.

Advantages of a trigger mechanism constructed as herein set forth

The trigger mechanism herein described has the advantage of a set trigger, inasmuch as the setting operation is effected automatically when the other mechanism operates. The usual automatic guns having trigger mechanisms are so constructed as to have a considerable take-up, play or lost motion in the trigger mechanism when the trigger is pulled. The present mechanism employs cams at all points that go into and out of gear with their respective members. The cams cause the trigger mechanism to have the one-piece trigger pull effect, such as would be the case in hand operated guns where the trigger and hammer have direct connection.

The trigger mechanism described is capable of a pull known as the "crisp" or "icicle" release, the operator not being able to detect the movement that is required to pull the trigger the distance required to fire the gun. Adjustments are made for trigger pull by means of an adjusting screw.

By "proximal position" as used in the appended claims is meant the position of the parts when the gun is loaded and ready to fire and by "spaced position" as used therein is meant the position of the parts when the parts are in their extreme open or loading position.

The term "bolt means", as used in some of the appended claims, includes the usual gun bolt and, further, is intended to cover the latter together with such associated members as may be directly or indirectly acted upon by the movable member to indirectly cause the bolt to operate, it being pointed out that the bolt, in accordance with the structure disclosed in Fig. 23 of the drawings, is indirectly functioned by operation of the movable member, and the term "bolt means" is intended to cover such an arrangement of the bolt and its associated cooperating elements.

The term "barrel time" is used in the claims in its well known general significance to mean the time required for the projectile after the firing of the ammunition to pass through the bore of the gun barrel.

The term "unlocking time" as used in the claims is the time required for the bolt means to become unlocked from the ammunition chamber of the gun.

Certain modifications herein disclosed are claimed in applicant's copending application, Serial No. 686,932.

What I claim is:

1. In a gun of the class described, barrel means, bolt means, a chambered threaded vibrator pro-

vided with a gas contact area and means on said barrel means interengagingly mounted with the threads of the vibrator to provide for limited reciprocatory movement of the vibrator with respect to the barrel means, said vibrator normally resting against a portion of the bolt means in position to initiate rearward movement of the bolt means upon firing of the firearm.

2. In a gun of the class described, barrel means, bolt means, a chambered threaded vibrator provided with a gas contact area, means on said barrel means interengagingly mounted with the threads of the vibrator to provide for limited reciprocatory movement of the vibrator with respect to the barrel means, said vibrator normally resting against a portion of the bolt means in position to initiate rearward movement of the bolt means upon firing of the firearm, and spring means normally urging said bolt means and vibrator to the forward limits of their movement.

3. In a gun of the class described, a barrel, bolt means, and a chambered vibrator provided with an area exposed to the explosion gases interposed between the barrel and the bolt means and engaged with said barrel, said vibrator having its rear portion bearing against the forward portion of the bolt means in free engagement therewith, but not mechanically locked thereto, and means to limit rearward movement of the vibrator substantially immediately upon initiation of the rearward movement of the bolt means, the duration of the movement of the movable member being less than the barrel time.

4. In a gun of the class described, a barrel, bolt means, a chambered vibrator having a gas contact area interposed between the barrel and the bolt means and exposed to the explosion gases, said vibrator having its rear portion bearing against the forward portion of the bolt means and in free engagement therewith but not mechanically locked thereto to initiate rearward movement of the bolt means upon firing of the gun, said vibrator having a cartridge supporting chamber therein alined with the bore of the barrel and normally closed by the forward portion of the bolt means, and means to limit rearward movement of the vibrator substantially immediately upon initiation of the rearward movement of the bolt means, the duration of the movement of the movable member being less than the barrel time.

5. In a gun of the class described, a barrel, bolt means, a chambered vibrator having a gas contact area interposed between the barrel and the bolt and engaged with said barrel, the vibrator moving between relatively narrow limits, said vibrator having its rear portion bearing against the forward portion of the bolt means in engagement therewith, but not mechanically locked thereto, said vibrator having a cartridge supporting chamber therein aligned with the bore of the barrel and normally closed by the forward portion of the bolt means, spring means urging said bolt means forwardly to bear against the vibrator and force the same into its forward position, and means to limit rearward movement of the vibrator immediately upon initiation of the rearward movement of the bolt.

6. In a gun of the class described, a barrel, a bolt alined rearwardly of the barrel, a sleeve fixed to the rear end of the barrel and projecting rearwardly thereof, said sleeve having its projecting position provided with an internal screw thread having the spaces between the convolutions greater than the thickness of the thread, and a chambered vibrator having a gas contact area interposed between the barrel and bolt and provided with an external screw thread having the spaces between convolutions greater than the thickness of the thread, the threaded portions of the sleeve and vibrator interengaging for limited reciprocatory movement of the vibrator with respect to the barrel.

7. In a gun of the class described, a barrel, a bolt alined rearwardly of the barrel, a sleeve fixed to the rear end of the barrel and projecting rearwardly thereof, said sleeve having its projecting portion provided with an internal screw thread having the spaces between the convolutions greater than the thickness of the thread, a chambered vibrator having a gas contact area interposed between the barrel and bolt and provided with an external screw thread having the spaces between convolutions greater than the thickness of the thread, the threaded portions of the sleeve and vibrator interengaging for limited reciprocatory movement of the vibrator with respect to the barrel, said vibrator having a cartridge supporting chamber therein alined with the bore of the barrel and normally closed by the forward end of the bolt.

8. In a gun of the class described, a barrel, a bolt alined rearwardly of the barrel, a sleeve fixed to the rear end of the barrel and projecting rearwardly thereof, said sleeve having its projecting portion provided with an internal screw thread having the spaces between the convolutions greater than the thickness of the thread, a chambered vibrator having a gas contact area interposed between the barrel and bolt and provided with an external screw thread having the spaces between convolutions greater than the thickness of the thread, the threaded portions of the sleeve and vibrator interengaging for limited reciprocatory movement of the vibrator with respect to the barrel, and spring means urging said bolt forwardly to bear against the vibrator and force the same into its forward position.

9. A gun of the class described including breech mechanism, a barrel, a sleeve secured on the rear end of the barrel and having an internal screw thread at its rear end, said rear end projecting rearwardly of said barrel, a vibrator forming a cartridge chamber, said vibrator having an external screw thread loosely engaging the internal screw thread of the sleeve to permit vibration of the vibrator, a receiver having the sleeve secured to its forward end, a bolt reciprocably mounted in said receiver, spring means urging said bolt forwardly to bear against the rear end of the vibrator, and a firing mechanism and breech mechanism locking means.

10. A gun of the class described including breech mechanism, a barrel, a sleeve screwed on the rear end of the barrel and having an internal screw thread at its rear end, said rear end projecting rearwardly of said barrel, a vibrator forming a cartridge chamber, said vibrator having an external screw thread loosely engaging the internal screw thread of the sleeve to permit vibration of the vibrator, a receiver having the sleeve secured to its forward end, a bolt reciprocably mounted in said receiver, spring means urging said bolt forwardly to bear against the rear end of the vibrator, a nose on the forward end of said bolt, said vibrator having a chamber in the rear behind the cartridge chamber and receiving said nose, said nose bearing against a cartridge upon the latter being positioned in the cartridge chamber, and a firing

mechanism and breech mechanism locking means.

11. A gun of the class described including breech mechanism, a barrel, a sleeve screwed on the rear end of the barrel and having an internal screw thread at its rear end, said rear end projecting rearwardly of said barrel, a vibrator forming a cartridge chamber, said vibrator having an external screw thread loosely engaging the internal thread of the sleeve to permit vibration of the vibrator, a receiver having the sleeve secured to its forward end, a bolt reciprocably mounted in said receiver, said bolt having a bore extending therethrough, a sleeve screwed into the rear end of said bore and provided with a tubular forward end, an ejector pin having a head at its rear end bearing against the rear end of the receiver, a compression spring coiled around said pin and bearing at one end against the head and at its other end against said forward end, a firing mechanism, and a breech mechanism locking means.

12. A gun of the class described including a barrel, a sleeve screwed on the rear end of the barrel and having an internal screw thread at its rear end, said rear end projecting rearwardly of said barrel, a vibrator forming a cartridge chamber, said vibrator having an external screw thread loosely engaging the internal screw thread of the sleeve to permit vibration of the vibrator, a receiver having the sleeve secured to its forward end, a bolt reciprocably mounted in said receiver, said bolt having a bore extending therethrough, a sleeve screwed into the rear end of said bore and provided with a tubular forward end, an ejector pin having a head at its rear end bearing against the rear end of the receiver, a compression spring coiled around said pin and bearing at one end against the head and at its other end against said forward end, a firing pin having a tubular body mounted in the forward part of the bore of said bolt and surrounding said ejector pin, a firing spring surrounding the ejector pin and urging the firing pin forwardly, and a lock mechanism for releasably holding the firing pin in a retracted position.

13. In a gun of the kind described, a barrel having a bore and a chamber at the rear end of the bore, a sleeve carried by the rear end of the barrel and projecting rearwardly thereof, and a chambered vibrator having a gas contact area mounted in said sleeve for limited reciprocation therein and provided with a nose extending into said chamber and normally bearing against the forward end of the chamber, said vibrator and sleeve having loose screw thread connection.

14. In a gun of the kind described, a barrel having a bore and a chamber at the rear end of the bore, a sleeve carried by the rear end of the barrel and projecting rearwardly thereof, a chambered vibrator having a gas contact area mounted in said sleeve for limited reciprocation therein and provided with a nose extending into said chamber and normally bearing against the forward end of the chamber, a bushing screwed into said chamber, and a second bushing screwed onto said nose and fitting closely in the first bushing for sliding movement relative thereto.

15. In a gun of the kind described, a barrel having a bore, a sleeve fixed on the rear end of the barrel, a vibrator mounted in said sleeve by a loosely screw threaded connection for limited reciprocatory movement, said barrel, sleeve and vibrator being arranged to provide a pressure chamber at the forward end of the vibrator.

16. In a gun of the kind described, a barrel having a bore, a sleeve fixed on the rear end of the barrel, a vibrator mounted in said sleeve by a loosely screw threaded connection for limited reciprocatory movement, said barrel, sleeve and vibrator being arranged to provide a pressure chamber at the forward end of the vibrator, the bore of the barrel being in port communication with said pressure chamber.

17. In a gun of the kind described, a barrel having a chamber at its rear end and provided with a channel forming a gas chamber concentric to said chamber, and a vibrator provided on its forward end with an annular vibrator piston extending into the gas chamber, said barrel having vents extending between said chambers.

18. In a gun of the kind described, a barrel having a chamber at its rear end and provided with a channel forming a gas chamber concentric to said chamber, a movable member provided on its forward end with an annular piston extending into the gas chamber, said barrel having vents extending between said chambers, and means connecting the barrel and movable member for reciprocatory movement of the latter.

19. In a gun of the kind described, a barrel having a chamber at its rear end and provided with a channel forming a gas chamber concentric to said chamber, a vibrator provided on its forward end with an annular vibrator piston extending into the gas chamber, said barrel having vents extending between said chambers, and a sleeve connecting the barrel and vibrator for limited reciprocatory movement of the latter, the vibrator being loosely screw threaded in said sleeve.

20. In a gun of the forwardly sliding barrel type, a receiver, a barrel having its rear end slidably fitted in said receiver, said receiver being closed at its rear end, a gas operated movable chambered member having an area exposed to the explosion gases and loosely connected to the barrel for limited reciprocatory movement relative to the barrel, said movable member bearing at its rear end against the rear end of the receiver, the action of expanding gases moving the barrel forwardly, and means to limit the action of the movable member upon the forward movement of the barrel, the duration of the movement of the movable member being less than the barrel time.

21. In a gun of the forwardly sliding barrel type, a receiver, a barrel having its rear end slidably fitted in said receiver, said receiver being closed at its rear end, a gas operated movable chambered member having an area exposed to the explosion gases and loosely connected to the barrel for limited reciprocatory movement relative to the barrel, said movable member bearing at its rear end against the rear end of the receiver, the action of expanding gases moving the barrel forwardly, means to limit the action of the movable member upon the forward movement of the barrel, the duration of the movement of the movable member being less than the barrel time, and spring means urging said barrel to closed position.

22. In a gun of the forwardly sliding barrel type, a receiver, a barrel having its rear end slidably fitted in said receiver, said receiver being closed at its rear end, and a chambered vibrator loosely connected to the barrel for limited reciprocatory movement relative to the barrel and

bearing at its rear end against the rear end of the receiver, said loose connection comprising a sleeve fitted in said receiver and having its forward end fixed to the barrel and its rear end surrounding the forward portion of the receiver and loosely threaded thereon.

23. A gun of the class described including breech mechanism, a barrel, a sleeve screwed on the rear end of the barrel and having an internal screw thread at its rear end, said rear end projecting rearwardly of said barrel, a vibrator forming a cartridge chamber and having an external screw thread and screwed into the sleeve, the screw threaded engagement between the vibrator and sleeve being loosely fitted to permit vibration of the vibrator, a receiver having the sleeve secured to its forward end, a bolt reciprocably mounted in said receiver, spring means urging said bolt forwardly to bear against the rear end of the vibrator, a nose on the forward end of said bolt, said vibrator having a chamber in the rear behind the cartridge chamber and receiving said nose, said nose bearing against a cartridge upon the latter being positioned in the cartridge chamber, and a firing mechanism and breech mechanism locking means, said vibrator consisting of a plurality of sections each loosely connected to an adjacent section for limited reciprocatory movement relative thereto.

24. In a gun having a number of gun members and operating gun mechanism, the combination of a bolt, bolt operating mechanism, bolt handle means including a spring member and bolt handle retaining means, said bolt handle means being capable of positioning the gun members and holding the latter and the cooperating gun mechanism in an open position by its retaining means, and thereby maintaining its proper position in the gun mechanism relative to the bolt mechanism, the retaining means being adapted to assume a neutral position whereby the gun mechanism may operate independently of the bolt handle means, and be retracted for dismounting purposes, the bolt handle mechanism including operating means whereby the several positions of the bolt handle mechanism may be directly or indirectly influenced by said spring member.

25. In an automatic gun, a barrel member, bolt means, a magazine for cartridges, said barrel member and bolt means being reciprocal one with respect to the other to move upon firing of the gun between closed and opened positions, a chambered moveable member having a gas contact area adapted to actuate under the force generated by firing a cartridge and mounted relative to the barrel member for reciprocating motion between opened and closed positions, said moveable member bearing against the bolt means in its closed position to initiate movement of the bolt means to opening position upon firing of the gun, means for narrowly limiting the movement of the moveable member so that it can position itself against the bolt means to initiate movement of the bolt means to opening position upon firing of the gun, and thereafter allow the bolt means as it approaches its closed position to return the moveable member to its closed position without the aid of other returning means.

26. In an automatic gun, a barrel member, bolt means, a magazine for cartridges, said barrel member and bolt means being reciprocal one with respect to the other to move upon firing of the gun between closed and open positions, a chambered moveable member adapted to actuate under the force generated by firing a cartridge, and mounted relative to the barrel member for reciprocating motion between opened and closed positions, said moveable member bearing against the bolt member in its closed position to initiate movement of the bolt means to opening position upon firing of the gun, and means for narrowly limiting the movement of the moveable member so that it can position itself against the bolt means to initiate movement of the bolt means to opening position upon firing of the gun, and thereafter allow the bolt means as it approaches its closed position to return the moveable member to its closed position without the aid of other returning means.

27. In an automatic gun, a barrel member, bolt means, said barrel member and bolt member being reciprocal one with respect to the other to move upon firing of the gun between closed and open positions, a chambered moveable member adapted to actuate under the force generated by firing a cartridge, and mounted relative to the barrel member for reciprocating motion between opened and closed positions, said moveable member bearing against the bolt means in its closed position to initiate movement of the bolt means to opening position upon firing of the gun, means for narrowly limiting the movement of the moveable member so that it can position itself against the bolt means to initiate relative movement of the bolt means to opening position upon firing of the gun, and thereafter allow the bolt means as it approaches its closed position to return the moveable member to its closed position without the aid of other returning means, and a magazine for cartridges positioned on the gun rearwardly of the moveable member, when the bolt means is in opened position.

28. In an automatic gun, a barrel member, bolt means, said barrel and bolt means being reciprocal one with respect to the other to move upon firing of the gun between closed and open positions, a chambered moveable member adapted to actuate under the force generated by firing a cartridge and mounted relative to the barrel member for reciprocating motion between opened and closed positions, said moveable means bearing against the bolt means in its closed position to initiate movement of the bolt member to opening position upon firing of the gun, means for narrowly limiting the movement of the moveable member so that it can position itself against the bolt means to initiate relative movement of the bolt means to opening position upon firing of the gun, and thereafter allow the bolt means as it approaches its closed position to return the moveable member to its closed position without the aid of other returning means, a magazine for cartridges positioned upon the gun rearwardly of the vibrator when the bolt means is in opened position, spring means normally holding the bolt means in closed position.

29. In an automatic gun, a barrel member, a breech member including a reciprocating means adapted to move upon firing of the gun between opened and closed positions, a moveable member adapted to act under the force generated by firing a cartridge and mounted for reciprocating motion between opened and closed positions and engageable with a portion of said reciprocating means to initiate rearward movement of the reciprocating means on firing of the gun, and means for narrowly limiting the movement of the moveable member so that the duration of the movement of the moveable member is less than

the barrel time and unlocking time of a gun of the mechanically locked breech type, said moveable member during its movement positioning itself against the reciprocating means to initiate movement thereof to opening position upon firing of the gun and thereafter allow the reciprocating means as it approaches its closed position to return the moveable member to its closed position.

30. In an automatic gun, a magazine for cartridges, a barrel member, breech mechanism including reciprocating means, a chambered movable member adapted to act under the force generated by firing a cartridge and mounted with the barrel member for reciprocating motion relative thereto between open and closed positions and engageable with a portion of said breech mechanism reciprocating means in its closed position to initiate rearward movement of the reciprocating means to opening position upon firing of the gun, and means for narrowly limiting the rearward movement of the movable member in advance of the magazine, the duration of the movement of the movable member being less than the barrel time and unlocking time of the gun, said movable member positioning itself against the reciprocating means to initiate movement of the reciprocating means to opening position upon firing of the gun and thereafter allow the reciprocating means as it approaches its closed position to return the movable member to its closed position.

31. In an automatic gun of the mechanically locked breech type, a barrel, a breech mechanism including reciprocating bolt means, said bolt means having a predetermined locking and unlocking stroke, a reciprocating chambered vibrator cooperating with said bolt means and initiating rearward movement of the bolt means on firing of the gun, remaining locked with the bolt means until the latter is unlocked, said reciprocating vibrator being then free to move independently of the unlocked reciprocating bolt means, and means for delaying the unlocking of the bolt means from the vibrator after the vibrator has reached the limit of its reciprocating movement.

32. In an automatic gun of the mechanically locked breech type, a barrel, a breech mechanism including reciprocating bolt means, said bolt means having a predetermined locking and unlocking stroke, and a reciprocating chambered vibrator mounted in the barrel and engageable with said bolt means and initiating rearward movement of the bolt means on firing of the gun, remaining locked with the bolt means until the latter is unlocked, said reciprocating vibrator being then free to move independently of the unlocked reciprocating bolt means, and means for delaying the unlocking of the bolt means from the vibrator after the vibrator has reached the limit of its reciprocating movement.

33. In an automatic gun of the mechanically locked breech type, a barrel member, a bolt, said barrel member and bolt being reciprocal one with respect to the other to move between proximal and spaced positions, said bolt having a predetermined locking and unlocking stroke, a chambered reciprocating vibrator cooperating with said bolt and initiating opening movement of said bolt on firing of the gun, remaining locked with the bolt until the latter is unlocked, said reciprocating vibrator being then free to move independently of the unlocked bolt, and means for delaying the unlocking of the bolt from the vibrator after the vibrator has reached the limit of its reciprocating movement.

34. In an automatic gun of the mechanically locked breech type, a barrel, a breech mechanism including reciprocating bolt means, said bolt means having a predetermined locking and unlocking stroke, a reciprocating moveable member adapted to position cartridges and to initiate rearward movement of the bolt means on firing of the gun, and means for delaying the unlocking of the bolt means from the moveable member after the latter has initiated the rearward movement of the bolt means and reached the limit of its reciprocating movement.

35. In an automatic gun of the mechanically locked breech type, a barrel member, a bolt member, said barrel member and bolt member being reciprocal one with respect to the other to move between proximal and spaced positions, the bolt member having a predetermined locking and unlocking stroke, and a reciprocating moveable member having a gas contact area adapted to act under the influence of expanding gases and initiate movement of said bolt member on firing the gun, and means for delaying the unlocking of the bolt member from the moveable member after the latter has initiated opening movement of the gun mechanism and reached the limit of its reciprocating movement.

36. In a gun having a gas locked breech, the combination of a barrel member, bolt means of the inertia type having a predetermined required inertia, said barrel member and bolt means being reciprocal one with the other to move between proximal and spaced positions, and a chambered movable member associated with the barrel member and having a limited reciprocating movement relative to the movement of the bolt means, said movable member having a gas contact area predetermined in accordance with the predetermined required inertia of the bolt means and adapted to receive expanding gases from the firing of a cartridge, the force produced by said expanding gases acting on said predetermined gas contact area and being sufficient to overcome the predetermined inertia of the bolt means and lock the movable member and bolt means together during rearward movement for a given time interval against separation by the recoiling force resulting from firing ammunition, the time interval being that required for the movable member to complete its limited movement and produce during such movement a gas locked breech.

37. In an automatic gun, bolt means, a barrel having a bore provided at its rear end with a stationary cartridge chamber, an annular gas chamber surrounding the stationary cartridge chamber, the barrel bore being in port communication with the annular gas chamber, and a gas operated moveable member having an annular piston formed thereon surrounding the stationary cartridge chamber and adapted to reciprocate in the gas chamber, said gas operated moveable member initiating rearward movement of the bolt means upon firing of the gun.

38. In an automatic gun, a barrel member, an ammunition carrier, bolt means, said barrel member and bolt means being reciprocal one with respect to the other to move upon firing of the gun to closed and open positions, a chambered movable unit member arranged to initiate movement of the bolt means to opening position upon firing of the gun, said chambered moveable member comprising a plurality of units loosely positioned

adjacent one another so as to allow the moveable member to elongate on firing of the gun.

39. In the herein described automatic gun, a barrel, a breech mechanism including reciprocating means, a vibrator provided with an area exposed to the explosion gases produced by firing of the gun, said vibrator having a relatively minute stroke compared to the stroke of the reciprocating means and engageable with a portion of said reciprocating means but not mechanically locked thereto to initiate rearward movement thereof upon firing of the firearm, and means for narrowly limiting the rearward movement of the movable member after the latter has imparted to the breech mechanism the required operating energy, said means operating substantially immediately after the initiation of the rearward movement of the reciprocating means, the duration of the movement of the movable member being less than the barrel time.

40. In the herein described automatic gun, a barrel, a breech mechanism including reciprocating means, a chambered movable member provided with an area exposed to the explosion gases and having a relatively minute stroke compared to the stroke of the reciprocating means, said movable member being engageable with a portion of said reciprocating means but not mechanically locked thereto to initiate rearward movement thereof upon firing of the firearm, a cartridge magazine located adjacent the forward end of the reciprocating means, and means to limit rearward movement of the movable member to a position in advance of the cartridges in the magazine when the movable member has imparted to the breech mechanism the required operating energy, said means operating substantially immediately after the initiation of the rearward movement of the reciprocating means, the duration of the movement of the movable member being less than the barrel time.

41. In a gun of the class described, a barrel, a breech mechanism including reciprocating means, a chambered movable member provided with an area exposed to the explosion gases and having a relatively minute stroke compared to the stroke of the reciprocating means, said movable member being engageable with a portion of said reciprocating means but not mechanically locked thereto to initiate rearward movement thereof upon firing of the firearm, means for narrowly limiting rearward movement of the movable member substantially immediately after the initiation of the rearward movement of the reciprocating means, the duration of the movement of the movable member being less than the barrel time, and spring means urging said reciprocating means forwardly into engagement with the movable member.

42. In a gun of the class described, a barrel, breech mechanism reciprocating means, a chambered vibrator provided with an area exposed to the explosion gases and having a relatively minute stroke compared to the stroke of the bolt, said vibrator being attached to the barrel for limited reciprocatory movement relative thereto, said vibrator bearing against the reciprocating means in free engagement therewith to initiate rearward movement of the reciprocating means upon firing of the gun, means for narrowly limiting rearward movement of the movable member substantially immediately after the initiation of the rearward movement of the reciprocating means, the duration of the movement of the movable member being less than the barrel time, and spring means urging said reciprocating means forwardly to bear against the vibrator and force the same into its forward position.

43. In a gun of the class described, a barrel, breech mechanism reciprocating means, a vibrator provided with an area exposed to the explosion gases and having a relatively minute stroke compared to the stroke of the bolt and attached to the barrel for limited reciprocatory movement relative thereto, said vibrator bearing against the reciprocating means in free engagement therewith but not mechanically locked thereto to initiate rearward movement of the reciprocating means upon firing of the gun, a cartridge supporting chamber in said vibrator alined with the bore of the barrel and normally closed by the forward portion of the reciprocating means, means for narrowly limiting rearward movement of the vibrator substantially immediately after the initiation of the rearward movement of the reciprocating means forwardly to bear against the vibrator and force the same into its forward position, the duration of the movement of the movable member being less than the barrel time.

44. In a gun of the class described, a barrel provided with a bore and cartridge chamber, bolt means for closing the rear end of the cartridge chamber of the barrel, a gas chamber laterally spaced from the bore of the barrel, a gas vent leading from the bore of the barrel to the gas chamber, a gas operated movable member operating in said chamber and having a minute stroke as compared to the stroke of the bolt means, and means for narrowly limiting the rearward movement of the gas operated movable member when the latter has imparted to the bolt means the required operating energy, said means operating immediately after the initiation of the rearward movement of the bolt means.

45. In the herein described automatic gun of the mechanically locked breech type, a barrel, a breech mechanism including reciprocating bolt means, said bolt means having a delayed unlocking action functioning prior to its actual unlocking chambered movement, a movable member having a relatively minute stroke compared to the stroke of the bolt and engageable with a portion of said bolt to initiate rearward movement of the bolt upon firing of the firearm, means for narrowly limiting the rearward movement of the movable member when the latter has imparted to the breech mechanism the required operating energy, bolt carrier means which continue to open and unlock the bolt means after the termination of the rearward movement of the movable member, and having a delayed unlocking action with reference to the bolt means, said bolt carrier means engaging with the bolt means at the end of the delayed unlocking stroke and unlocking the bolt means from the movable member.

46. In a gun of the kind described, a barrel having a bore and provided with a stationary cartridge chamber at its rear end, said barrel being chambered forwardly from its rear extremity and having a reduced end wall, a sleeve fixed to said barrel, and a movable member in engagement with said sleeve for reciprocatory movement relative thereto and having its forward end spaced from the reduced end wall of the barrel to form a pressure chamber, the barrel bore being in port communication with the pressure chamber.

47. In a gun of the class described, barrel means, bolt means, and a chambered movable member provided with a gas contact area and

interposed between the barrel means and bolt means, said movable member being adapted to initiate rearward movement of the bolt means upon firing of the gun, means for limiting the duration of the rearward movement of the chambered member to less than the barrel time of the gun, said means including a threaded movable member, and means on said barrel means interengagingly mounted with respect to the threaded movable member.

48. In a gun of the class described, barrel means, bolt means, a movable member adapted to initiate rearward movement of the bolt means upon firing of the gun, means for limiting the duration of the movement of the movable member to less than the barrel time and unlocking time of the gun, said means including a threaded movable member, and means on said barrel means interengagingly mounted with respect to the threaded movable member.

49. In a gun of the class described, barrel means, bolt means, a chambered movable member provided with a gas contact area and interposed between the barrel means and bolt means, said movable member being adapted to initiate rearward movement of the bolt means upon firing of the gun, means for limiting the duration of the rearward movement of the chambered member to less than the barrel time and unlocking time of the gun, said means including a threaded movable member, and means on said barrel means interengagingly mounted with respect to the threaded movable member.

50. In a gun having a gas locked breech, the combination of bolt means of the inertia type having a predetermined required inertia, a chambered movable member cooperating therewith having a reciprocating movement relative to the movement of the bolt means and provided with a gas contact area predetermined in accordance with the predetermined inertia of the bolt means, said gas contact area being sufficient when acted upon by the expanding gases resulting from the firing of a cartridge to produce in conjunction with said gases a force preponderating over the recoiling force tending to separate the bolt means from the movable member upon firing of the ammunition and thereby locking the bolt means and movable member together during the rearward movement of the movable member.

51. In a gun having a gas locked breech, the combination of bolt means of the inertia type having a predetermined required inertia, a chambered movable member cooperating therewith having a limited reciprocating movement relative to the movement of the bolt means and provided with a gas contact area predetermined in accordance with the predetermined inertia of the bolt means, said gas contact area being sufficient when acted upon by the expanding gases resulting from the firing of a cartridge to produce in conjunction with said gases a force preponderating over the recoiling force tending to separate the bolt means from the movable member upon firing of the ammunition, and thereby locking the bolt means and movable member together during the rearward movement of the chambered movable member, and means for limiting the duration of the rearward movement of the movable member to less than the barrel time of the gun.

52. In a gun having a gas locked breech, the combination of bolt means of the inertia type having a predetermined required inertia, a chambered movable member cooperating therewith having a limited reciprocating movement relative to the movement of the bolt means and provided with a gas contact area predetermined in accordance with the predetermined inertia of the bolt means, said gas contact area being sufficient when acted upon by the expanding gases resulting from the firing of a cartridge to produce in conjunction with said gases a force preponderating over the recoiling force tending to separate the bolt means from the movable member upon firing of the ammunition, and thereby locking the bolt means and movable member together during the rearward movement of the chambered movable member, and means for limiting the duration of the rearward movement of the movable member to less than the barrel time and the unlocking time of the gun, said means including auxiliary limiting means on said movable member.

53. In a gun of the class described comprising a barrel member, a receiver member, reciprocating means in said receiver member, connecting members between the barrel and the receiver member, a threaded movable actuator having a gas contact area, means on one of said members interengagingly mounted, with the threads of the actuator for reciprocating movement thereof, said actuator acting to initiate rearward movement of the reciprocating means upon firing of the firearm.

54. In a gun of the class described adapted for firing a cartridge, a barrel, bolt means, means for firing the cartridge, a movable member provided with an area exposed to the explosion gases, and means for bringing the expanding gases generated by firing of a cartridge in contact with said movable member and cause the latter to initiate rearward movement of the bolt means, and means for limiting the duration of the initial rearward movement of the movable member to less than the barrel time of the gun.

55. In a gun of the class described adapted for firing a cartridge, a barrel, bolt means, means for firing the cartridge, a movable member provided with a cartridge chamber and an area exposed to and acted on by the expanding gases generated by the firing of the cartridge, the movable member initiating rearward movement of the bolt means, and means for limiting the duration of initial rearward movement of the movable member to less than the barrel time of the gun.

56. In a gun of the class described adapted for firing a cartridge, a barrel, bolt means, means for firing the cartridge, a movable member provided with an area exposed to the explosion gases, and means for bringing the expanding gases generated by firing of a cartridge in contact with said movable member and cause the latter to initiate rearward movement of the bolt means, and means for limiting the duration of the initial rearward movement of the movable member to less than the barrel time and the unlocking time of the gun.

57. In a gun of the class described adapted for firing a cartridge, a barrel, bolt means, means for firing the cartridge, a movable member provided with a cartridge chamber and an area exposed to and acted on by the expanding gases generated by the firing of the cartridge, the movable member initiating rearward movement of the bolt means, and means for limiting the duration of initial rearward movement of the movable member to less than the barrel time and the unlocking time of the gun.

58. An automatic firearm having breech mechanism and ammunition feeding means of such weight and resistance as to normally require large caliber ball ammunition to operate the same, said ammunition being typified by .45 caliber; the combination of a stationary sub-caliber barrel bored for use with ball ammunition sub-caliber to the ammunition normally required to operate said firearm having large caliber parts, said sub-caliber ammunition being typified by .22 caliber, bolt means including a bolt, a reciprocating actuator provided with means for chambering a sub-caliber cartridge of the type referred to, said actuator being provided with an area in contact with the explosion gases, said area being proportioned to magnify the effect of the kinetic energy of expanding gases produced by the firing of sub-caliber ball ammunition of the type specified, the force produced by the contact of the explosion gases with the so-proportioned gas contact area overcoming the resistance of the breech mechanism, ammunition feeding means and bolt means of the herein specified firearm normally requiring large caliber ammunition, as typified by .45 caliber, and to function said moving parts as satisfactorily as if large caliber ammunition of the type herein specified were used.

59. An automatic firearm having breech mechanism and ammunition feeding means of such weight and resistance as to normally require large caliber ball ammunition to operate the same; the combination of a stationary sub-caliber barrel bored for use with ball ammunition sub-caliber to the ammunition normally required to operate said firearm having large caliber parts, bolt means including a bolt, means for chambering a sub-caliber cartridge, firing means for said cartridge, and a separate movable member positioned in non-alignment with the bore of the barrel, the latter being provided with an area in contact with the explosion gases resulting from the firing of the sub-caliber cartridge, said area being proportioned to magnify the effect of the kinetic energy of expanding gases produced by the firing of the sub-caliber ammunition, the force produced by the contact of the explosion gases with the so-proportioned area of the movable member overcoming the resistance of the breech mechanism, ammunition feeding means, and bolt means of the firearm.

60. An automatic firearm having breech mechanism and ammunition feeding means of such weight and resistance as to normally require large caliber ball ammunition to operate the same, said ammunition being typified by .45 caliber; the combination of a stationary sub-caliber barrel bored for use with ball ammunition sub-caliber to the ammunition normally required to operate the said firearm having large caliber parts, said sub-caliber ammunition being typified by .22 caliber, bolt means including a bolt, a reciprocating actuator provided with means for chambering a sub-caliber cartridge of the type referred to, said actuator being provided with an area in contact with the explosion gases, said area being proportioned to magnify the effect of the kinetic energy of expanding gases produced by the firing of sub-caliber ball ammunition of the type specified, the force produced by the contact of the explosion gases with the so-proportioned gas contact area overcoming the resistance of the breech mechanism, ammunition feeding means and bolt means of the herein specified firearm normally requiring large caliber ammunition, as typified by .45 caliber, and to function said moving parts as satisfactorily as if large caliber ammunition of the type herein specified were used.

61. In a firearm of the reciprocating bolt type originally designed to fire large caliber ammunition and modified to fire sub-caliber ammunition, the combination therewith of a sub-caliber unit comprising a barrel, a sleeve thereon adapted to fit in the frame of the firearm, and a vibrator carried by the sleeve for limited reciprocatory movement relative thereto and adapted to bear against the slide of the firearm upon the slide being in a loaded position, said vibrator functioning to magnify the effect of the kinetic energy of expanding gases produced by firing sub-caliber ammunition, thereby enabling the firearm to function as satisfactorily with sub-caliber ammunition as it would with large caliber ammunition.

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