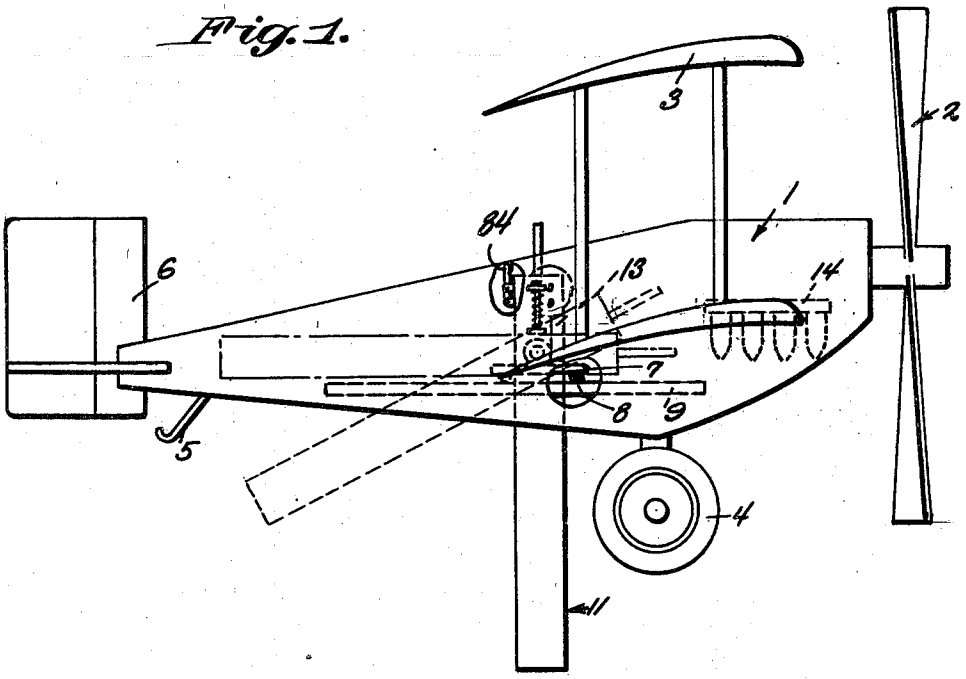
Nov. 5, 1929. G. A. SCHWOEBEL 1,734,501

GUN

Filed June 27, 1927 2 Sheets-Sheet 1

Fig. 1.



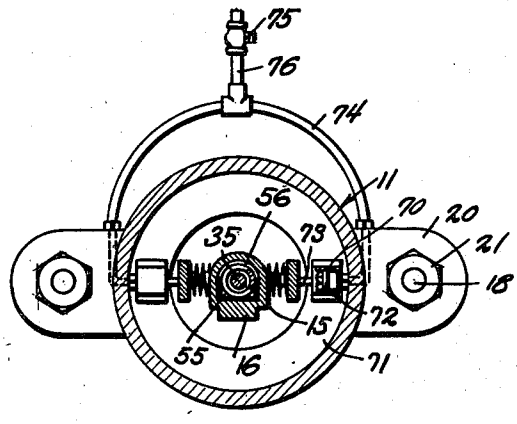


Fig. 5.

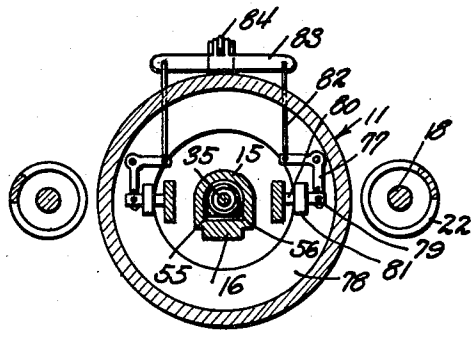


Fig. 6.

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Fig. 2.

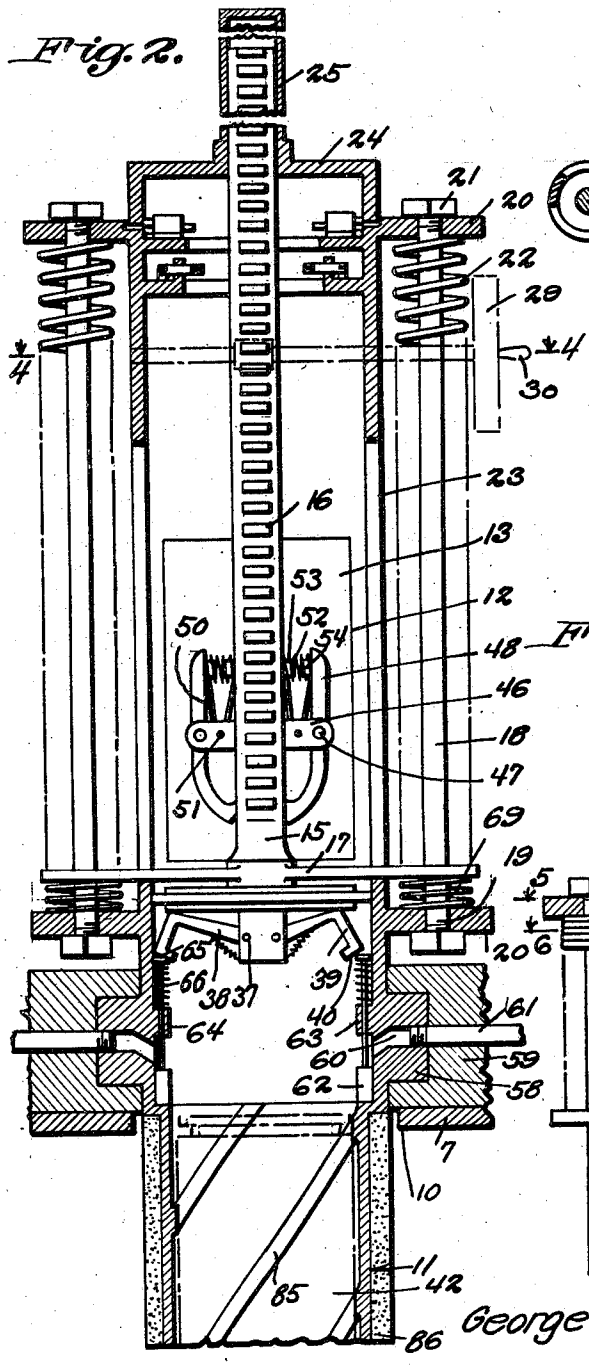


Fig. 4.

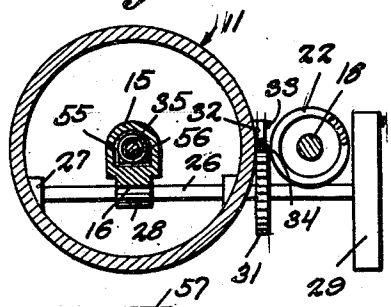
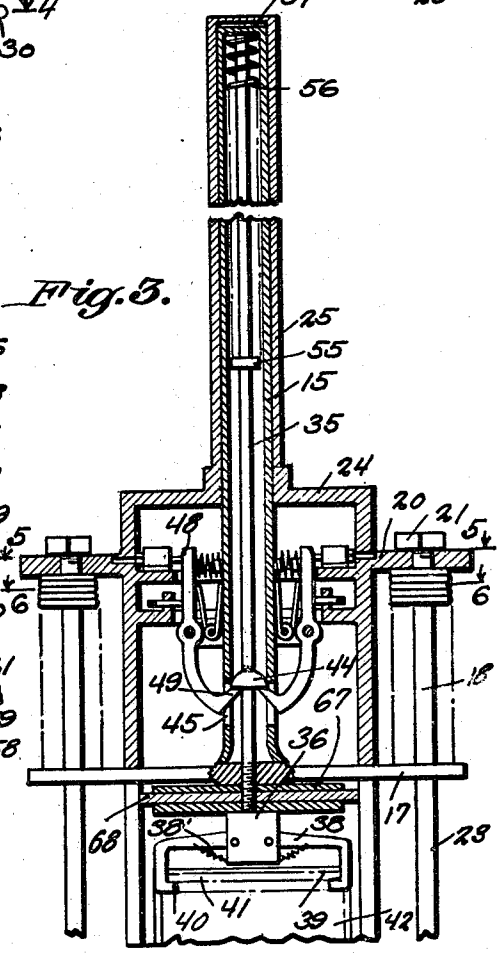


Fig. 3.



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Patented Nov. 5, 1929 1,734,501

UNITED STATES PATENT OFFICE

GEORGE A. SCHWOEBEL, OF BORDENTOWN, NEW JERSEY

GUN

Application filed June 27, 1927. Serial No. 201,772.

This invention relates to improvements in guns and more particularly to a gun designed for use on aeroplanes.

One of the objects of the invention is to provide a gun constructed for the firing of shells similar to those used by artillery, and in which gun the propelling means for the shell will be of a character to effect forcible ejection of the shell from the gun without imposing any material stress upon the aeroplane such as would be incident to the firing of an explosive charge.

Another object of the invention is to provide, in a gun of the type stated, novel means for engaging the shell and retaining the same within the barrel of the gun in a secure manner and which means will, at the same time be operable to immediately release the shell at the time it is ejected from the gun.

Another object of the invention is to provide a gun of the type referred to which may be employed in dropping shells onto objectives at which the gun is aimed and for firing or forcibly ejecting shells from the gun when the gun is positioned at an angle to the vertical, so that shells may be dropped directly vertically or may be discharged from the gun in a path at an angle to the vertical.

Another object of the invention is to so construct the gun and so mount the same that the gun may be conveniently loaded, aimed, and discharged without disturbing the equilibrium of the aeroplane upon which it is mounted.

While the accompanying drawings and the description which is to follow, constitute a disclosure of the preferred embodiment of the invention, it will be understood that various changes may be made within the scope of what is claimed.

In the accompanying drawings:

Fig. 1 is a side elevation of the gun embodying the invention mounted upon an airplane;

Fig. 2 is a vertical transverse sectional view through the upper portion of the gun, the parts being in the positions which they will assume at the moment the shell is released and ejected;

Fig. 3 is a similar view illustrating the parts in the positions which they will assume at the time the gun is loaded;

Fig. 4 is a horizontal sectional view taken substantially on the line 4—4 of Figure 2;

Fig. 5 is a horizontal sectional view taken substantially on the line 5—5 of Figure 3 looking in the direction indicated by the arrows;

Fig. 6 is a similar view on the line 6—6 of Figure 3 looking in the direction indicated by the arrows.

Figure 1 of the drawings illustrates the manner in which the gun embodying the invention is mounted upon an aeroplane, and in this figure the numeral 1 indicates the fuselage of the plane, the numeral 2 the propellers, the numeral 3 the wings, the numeral 4 the landing wheels, and the numeral 5 the landing fender which is located at the rear of the fuselage and is designed to contact the ground surface and prevent damage to the rudders indicated by the numeral 6. The gun is mounted upon a truck 7 supported by wheels 8, for travel along track rails 9 mounted within the fuselage, the truck having a central elongated opening 10 to accommodate the barrel of the gun, which barrel is indicated in general by the numeral 11. The barrel is provided in its upper portion with a breech opening indicated by the numeral 12. and a door 13 is hingedly or otherwise mounted upon the barrel and adjustable or movable into and out of position to close the opening, the shells to be fired or projected from the gun being preferably supported by a rack structure 14 mounted in advance of the truck 7, and the truck being designed to be shifted along the rails 9 to position to permit of the shells supported by the rack structure being successively introduced into the breech of the gun, in loading the gun.

The gun embodies means for gripping the head of the shell which is to be ejected from the gun and for holding the shell, initially, in an elevated position and this means includes a rack bar 15 provided upon one face with a longitudinal series of rack teeth 16, the bar being provided near its lower end with a cross piece 17 the ends of which slidably engage guide rods 18 having their upper and lower

ends mounted in openings 19 formed in upper and lower pairs of lugs 20 formed upon the exterior of the barrel at the upper end thereof, nuts 21 being threaded onto the ends of the guide rods and bearing against the upper and under sides of the upper and lower lugs respectively, so as to secure the rods in position parallel to each other and to the axis of the barrel. Compression springs 22 are arranged upon the guide rods 18 and bear at their upper ends against the upper lugs 20 and at their lower ends against the ends of the cross piece 17, the tendency of these springs being to force the cross piece 17, and consequently the rack bar 15, in a downward direction. The cross piece 17 extends through slots 23 formed in the upper portion of the barrel of the gun, and the upper end of the barrel is closed by a head 24 to which is secured the lower end of a tubular housing 25 in which the upper portion of the rack bar is slidably guided. As illustrated in Figures 3, 4, 5 and 6 of the drawings, the rack bar 15 is of hollow formation, and the front of the bar is preferably flat and is provided with the rack teeth 16, the side walls of the rack being located in parallel planes and the rear wall being transversely curved as clearly shown in Figures 4, 5 and 6. The housing 25 is of course correspondingly formed, so that the rack is guided for vertical movement in the housing and held against rotation therein due to the non-symmetrical cross sectional contour of the rack and housing. In order that the rack may be elevated, a shaft 26 is rotatably mounted in suitable bearings 27 within the upper portion of the barrel adjacent the head 24 thereof, and a pinion of small diameter, indicated by the numeral 28, is fixed or formed upon this shaft and meshes with the teeth of the rack, a fly-wheel 29 being fixed upon the projecting outer end of the shaft 26, and a handle 30 being mounted upon the outer side of the fly-wheel near the periphery thereof, so that the shaft may be conveniently rotated by hand so as to effect elevation of the rack against the tension of the compression springs 22. In order that the rack may be held in its elevated position, a ratchet 31 is fixed upon the shaft 26, and a pawl 32 is pivotally mounted as at 33 upon the outer side of the barrel 11 and coacts with the ratchet wheel 31, the pawl resting by gravity in engagement with the ratchet wheel and being provided with a finger piece 34 by means of which it may be disengaged from the ratchet wheel under conditions to be presently explained.

The means heretofore referred to for gripping the shell and supporting the same in an elevated position comprises a plunger rod 35 which is threaded at its lower end into a block 36 which has pivotally mounted upon it, as at 37, shell gripping arms indicated by the numeral 38, these arms being provided at their outer ends with right angularly extending fingers 39 and the fingers being provided at their lower ends with inwardly projecting lugs 40 designed to engage in a groove 41 formed circumferentially in the head of the shell which is indicated by the numeral 42. Springs 38′ are connected to the arms 38 and to the block 36 and normally yieldably hold the arms in engaging position. The lower end of the plunger rod 35 is threaded at its lower end into the central portion of the cross piece 17, and a head 44 is formed or secured upon the said plunger rod 35 and is preferably of the substantially semi-spherical contour shown in Figure 3 of the drawings. The head 44 is located near the threaded lower end of the plunger rod 35, and the opposite side walls of the rack 15 are formed with vertical slots 45 located at opposite sides of the head. Pairs of spaced ears 46 are provided upon the outer side of the rack 15 at opposite sides thereof and pivotally mounted as at 47 between the ears of each pair is a detent lever 48 having a detent finger 49 at its lower end projecting through the respective slots 45 and adapted to engage beneath the head 44 when the plunger rod 35 is in the elevated position shown in Figure 3 of the drawings. A bowed wire spring 50 is mounted upon a pin 51 between each pair of ears and one arm of the spring bears against the adjacent side of the rack and the other arm against the adjacent side of the upper portion of the respective detent arm 48. Coil springs 52 are likewise interposed between the opposite sides of the rack and the upper ends of the detent levers 48 and are supported upon studs 53 and 54 carried respectively by the rack and the said ends of the detent levers, the springs 50 and 52 serving to force the upper ends of the levers outwardly and their lower ends inwardly so that when the plunger rod 35 is shifted upwardly in the rack, the rounded upper side of the head 44 thereof will ride between the detent fingers 49 and spread apart the lower ends of the levers 48, the said fingers 49 engaging against the flat under side of the head 44, automatically, through the action of the springs 50 and 52, as the head 44 passes the said fingers 49. A collar 55 of the same marginal contour as the cross sectional contour of the interior of the rack 15, is fixed upon the plunger rod 35 at a suitable point in its length, and a compression spring 56 is arranged upon the upper portion of the rod and bears at its lower end against the collar 55 and at its upper end against the closed upper end 57 of the rack, the tendency of the spring being to force the rod 35 downwardly.

At this point it will be understood that, with the parts in the elevated or retracted positions shown in Figure 3 of the drawings, the shell to be discharged may be readily introduced into the barrel of the gun by opening the door 13, and the head of the shell en-

gaged with the ends of the fingers 39 of the gripping arms 38. With the parts in this position, the springs 22 are compressed, the rack is in full elevated position, and the hooked ends 49 of the detent levers 48 are in engagement with the head 44 of the plunger rod 35 and hold this rod stationary, in an elevated position, with the rack.

The invention contemplates ejection of the shell from the barrel of the gun under the influence of the springs 22 and 56, the force of gravity, and compressed air behind the shell, means being provided for automatically admitting air under pressure into the gun barrel behind the shell, at the moment the shell is released by the gripping arms 38. With this end in view the invention contemplates the provision, upon the outer side of the barrel 11, of diametrically oppositely located trunnions 58 which are rotatably journaled in suitable bearings 59 upon the truck 7, the said trunnions having air inlet passages 60 formed axially therein, and pipes 61 being led from a source of compressed air supply (not shown) mounted in or upon the fuselage of the aeroplane and rotatably through openings in the bearings 59 and being threaded at their ends into the said air passages 60. Valves 62 are slidably mounted upon the inner side of the barrel of the gun and are provided with stems 63 slidably fitting through openings in bosses 64 formed upon the said inner side of the barrel, the stems being provided at their upper ends with heads 65, and compression springs 66 being arranged upon the stems and bearing at their upper ends against the said heads 65 and at their lower ends against the bosses 64 so as to normally hold the valves 62 in elevated position and closing the ports 60. The heads 65 of the valve stems 63 are located in the path of downward movement of the gripping fingers 39, so that when the plunger rod 35 of the rack is released, through the medium of means to be presently described, and which means coacts with the detent levers 48, the downward movement of the rod and the gripping arms 38 carried thereby will result in the lower ends of the gripping fingers 39 engaging the heads of the valve stems thus causing the fingers to disengage from the shell to release the same, and at the same time shifting the valves 62 and their stems 63 downwardly to the position shown in Figure 2 of the drawings so as to uncover the ports 60 and admit air under pressure into the barrel of the gun behind the shell and thus cause forceful delivery of the shell from the barrel of the gun, the force exerted by the springs 22 and 56, at the time of their expansion, together with the force of gravity, serving also to influence forceful discharge of the shell from the gun. In order to prevent the escape of compressed air through the slots 23, a piston head comprising spaced metal disks 67 and an intermediate packing disk 68, is secured upon the lower end of the plunger rod 35 between the block 36 and the central portion of the cross piece 17, the periphery of the disk 68 snugly fitting within the bore of the gun barrel and, at the time of opening of the valves 62, occupying a position below the lower ends of the slots 23, as clearly shown in Figure 2 of the drawings.

In order that the downward movement of the cross piece 17 may be cushioned, compression springs 69 are arranged upon the lower ends of the guide rods 18 and rest upon the upper sides of the lower lugs 20.

Figures 5 and 6 of the drawings illustrate two independently operable means either of which may be actuated, independent of the other, to effect actuation of the detent levers 48 to release the plunger rod 35. The means illustrated in Figure 5 and shown likewise in Figures 2 and 3, comprises a pair of small compressed air cylinders 70 mounted upon a supporting flange 71 which is of annular form and provided upon the inner surface of the barrel of the gun immediately below the head 24 at the upper end thereof. A piston 72 is arranged in each cylinder and is provided with a stem 73 projecting slidably through that end of the cylinder which is presented toward the upper end of the respective one of the levers 48, when the levers are in the elevated position shown in Figure 3. Compressed air pipes 74 are placed in communiaction with the opposite ends of the cylinders 70 and are connected by a suitable union with a main supply pipe 75 leading from the source of compressed air supply heretofore referred to, a valve 76 being interposed in the pipe 75 and being adapted to be manually opened, when it is desired to discharge the projectile, so as to admit compressed air to the cylinders and cause the pistons therein to move toward the axis of the barrel and exert pressure against the upper ends of the detent levers 48 thus causing the levers to disengage from the head 44 upon the plunger rod 35 and release this rod, the cross piece 17, and the block 36, carried thereby, for downward movement of the influence of the springs 22 and 56.

The means illustrated in Figure 6 and likewise in Figures 2 and 3, for actuating the detent levers 48, is a purely mechanical means and comprises a pair of angle levers 77 mounted upon a flange 78 which is provided upon the inner side of the wall of the barrel of the gun preferably immediately below the flange 71, one arm of each of the angle levers being slotted and connected by a pin 79 with a plunger 80 slidably mounted in a suitable bearing 81 upon the said flange 78, the inner end of the plunger being in position to coact with the upper end of the respective one of the detent arms 48. Rods 82 are connected to the ends of the other arms

of the angle levers 77 and to a cross bar 83 which is located exteriorly of the gun barrel, the said rods being extended slidably through openings in the wall of the barrel. An actuating lever 84 is mounted upon the exterior of the barrel and is operatively connected at one side of its pivot with the cross bar 83 and is provided at the other side of its pivot with a hand grip whereby it may be conveniently rocked to effect a pull upon the rods 82 thus simultaneously rocking the angle levers 77 to project the plungers 80 inwardly and cause corresponding movement of the upper ends of the detent levers 48, thereby disengaging the fingers 49 from the head 44 and releasing the plunger rod 35.

It will be understood at this point that either of the devices above described may be employed for actuating the releasing mechanism of the gun so as to effect discharge of the shell therefrom.

The bore of the barrel 11 is preferably rifled as indicated by the numeral 85, and the barrel is preferably provided with a covering or sheet 86 of rubber which extends from a point immediately below the trunnions 58 to the muzzle of the barrel.

In the use of the gun, and assuming that the same has been loaded and that the parts of the shell releasing and ejecting mechanisms are in the positions shown in Figure 3 of the drawings, either of the releasing mechanisms shown in Figures 5 and 6 is actuated so as to effect disengagement of the detent levers 48 from the head 44 of the plunger rod 35. The springs 22 and 56 will then immediately act to force the rod downwardly together with the cross piece 17, the piston head, and the block 36, and at the moment the lower ends of the fingers 39 of the gripping arms 38 engage the heads 65 at the upper ends of the valve stems 63, the stems and valves will be moved downwardly and, when the movement of the valves is arrested, the gripping arms 38 will be swung upwardly thus disengaging their lugs 40 from the groove in the shell and releasing the shell, the air under pressure being at this moment admitted to the barrel by way of the ports 60 to effect forceful discharge of the shell from the barrel, the shell having likewise acquired considerable momentum through the downward thrust exerted by the springs 22 and 56, and the shell being likewise impelled by the force of gravity. It will be understood that the rack 15 is maintained in an elevated position, during this operation, and it will likewise be understood that immediately upon release of the shell, the cross bar 17 will be elevated by the springs 69 so that the lower ends of the gripping fingers 39 will disengage from the heads at the upper ends of the valve stems thus permitting the valves 62 to close under the influence of the springs 66. In reloading the gun, the pawl 32 is disengaged from the ratchet wheel 31 and the shaft 26 is reversely rotated to lower the rack 15 and as the rack is lowered, to assume the position shown in Figure 2 of the drawings, the detent fingers 49 will ride over the rounded upper surface of the head 44, as previously explained, and the ends of the fingers will subsequently engage beneath the head as shown in Figure 3, thus locking the plunger rod 35 for elevation with the rack when the shaft 26 is again rotated, through the medium of the fly-wheel 29 and crank handle 30, the shell to be discharged being introduced into the barrel upon opening of the door 13, and being engaged by the lugs 40 of the gripping fingers 39 as previously explained.

Having thus described the invention, what I claim is:

1. In a gun of the class described, a barrel, a rack longitudinally movable in the barrel and of hollow form, a shaft mounted transversely of the barrel, a pinion upon the shaft meshing with the rack, a plunger rod mounted for longitudinal movement in the rack, a spring urging the rod in a downward direction longitudinally in the rack, means carried by the said plunger rod for gripping engagement with a projectile within the barrel, means carried by the rack for holding the said plunger rod retracted against the tension of said spring, means manually operable to render the holding means inactive, and means in the path of movement of the projectile gripping means to render the same inactive upon movement of the plunger rod under the influence of the said spring.

2. In a gun of the class described, a barrel, a member longitudinally movable in the barrel, a spring urging the member in one direction, means for retracting the member against the tension of the spring, means for holding the member in retracted position, means operable to coact with the last mentioned means to render the same inactive, projectile gripping means carried by the said member to grip and support a projectile within the barrel, means for supplying a fluid under pressure to the barrel, and a valve for controlling the supply of said fluid actuated by the projectile gripping means and constituting an abutment for said means to actuate the same and render the said means inactive, in the movement of the said member under the influence of the spring, whereby to effect release of the projectile and opening of the valve substantially simultaneously.

3. In a gun of the class described, a barrel, a rack longitudinally movable in the barrel, means coacting with the rack and operable to retract the same, a plunger rod movable longitudinally in the rack, means urging the rod in the direction of the discharge end of the barrel, coacting means upon the said rack and the rod for connecting the rod with the rack for retraction therewith, means operable

to render the said connecting means inactive, and projectile engaging and retaining means carried by the said plunger rod.

4. In a gun of the class described, a barrel, a rack longitudinally movable in the barrel, means coacting with the rack and operable to retract the same, a plunger rod movable longitudinally in the rack, means urging the rod in the direction of the discharge end of the barrel, coacting means upon the said rack and the rod for connecting the rod with the rack for retraction therewith, means operable to render the said connecting means inactive, projectile engaging and retaining means carried by the said plunger rod, and means arranged in the path of movement of the last mentioned means for rendering the same inactive whereby to release the projectile upon movement of the plunger rod under the influence of the moving means.

5. In a gun of the class described, a barrel, a rack longitudinally movable in the barrel, a plunger rod movable longitudinally with respect to the rack, means coacting with the rack and operable to retract the rack, a cross member connected with the plunger rod and extending through the barrel, springs coacting with the said cross member and urging the same in a direction to project the plunger rod in the direction of the muzzle end of the barrel, means operable to connect the plunger rod with the rack for retraction therewith, projectile engaging and retaining means carried by the plunger rod, and means for rendering the connecting means inactive.

6. In a gun of the class described, a barrel, a rack longitudinally movable in the barrel, a plunger rod movable longitudinally with respect to the rack, means coacting with the rack and operable to retract the rack, a cross member connected with the plunger rod and extending through the barrel, springs coacting with the said cross member and urging the same in a direction to project the plunger rod in the direction of the muzzle end of the barrel, means operable to connect the plunger rod with the rack for retraction therewith, projectile engaging and retaining means carried by the plunger rod, means for rendering the connecting means inactive means for admitting a fluid under pressure into the barrel, a piston head carried by the plunger rod and spaced with respect to the fluid pressure inlet, and a valve for controlling the admission of fluid under pressure into the said barrel, the valve being normally in a closed position and engageable by the projectile engaging and retaining means to be actuated to open position and constituting, in its open position, an abutment for the said engaging and retaining means to render the same inactive.

7. In a gun of the class described, a barrel, means operating within the barrel for holding a projectile in retracted position therein, means for admitting a fluid under pressure into the barrel behind the projectile, a valve for controlling the admission of the fluid under pressure, and means normally holding the valve in closed position, the valve being engageable by an element of the said holding means whereby to be moved to open position, and, in its open position, constituting an abutment for said element to render the holding means inactive.

8. In a gun of the class described, a barrel, a member longitudinally movable in the barrel, a spring urging the member in one direction, means for retracting the member against the tension of the spring, means for holding the member in retracted position comprising pivoted detent levers, means normally holding the levers active, fluid pressure operated means for rendering the levers inactive, and releasable means carried by the member for gripping a projectile within the barrel.

9. In a gun of the class described, a barrel, a member longitudinally movable in the barrel, a spring urging the member in one direction, means for retracting the member against the tension of the spring, means for holding the member in retracted position comprising a pivoted detent lever coacting with the said member, means yieldably holding the lever in active position, a plunger for coaction with the said member to render the same inactive, means for actuating the plunger, and releasable means carried by the member for gripping a projectile within the barrel.

In testimony whereof I affix my signature.

GEORGE A. SCHWOEBEL.