

July 10, 1945.

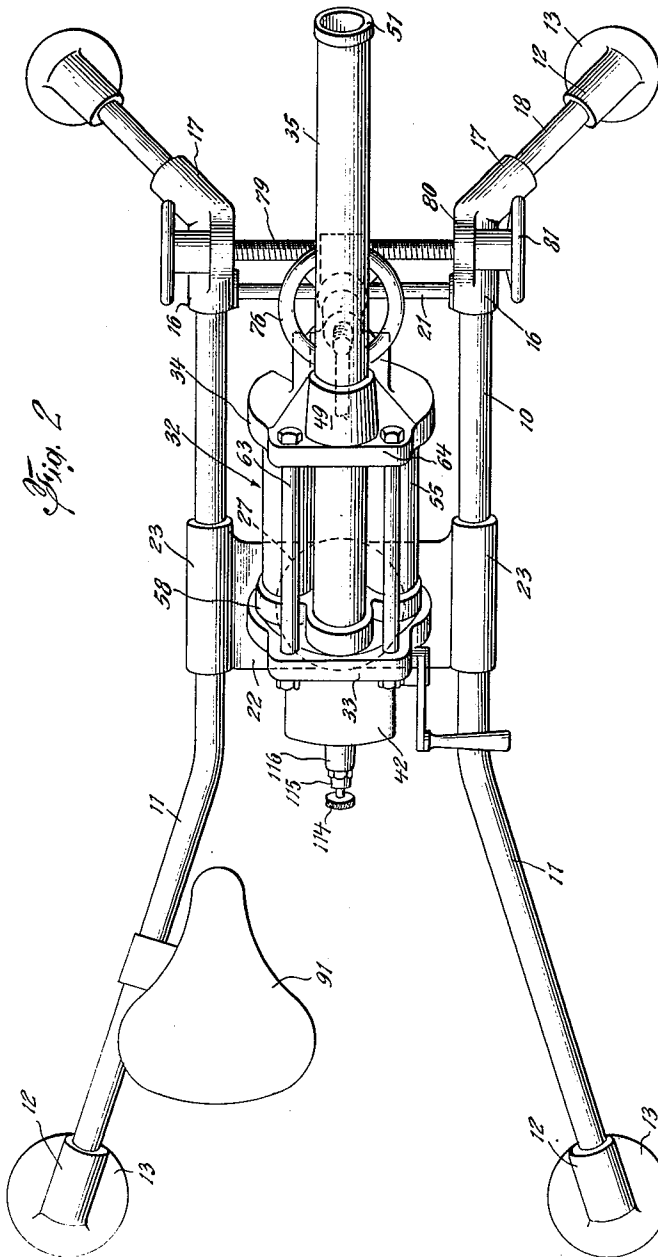
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2,380,024

ROCKET GUN

Filed Aug. 15, 1941

4 Sheets-Sheet 2



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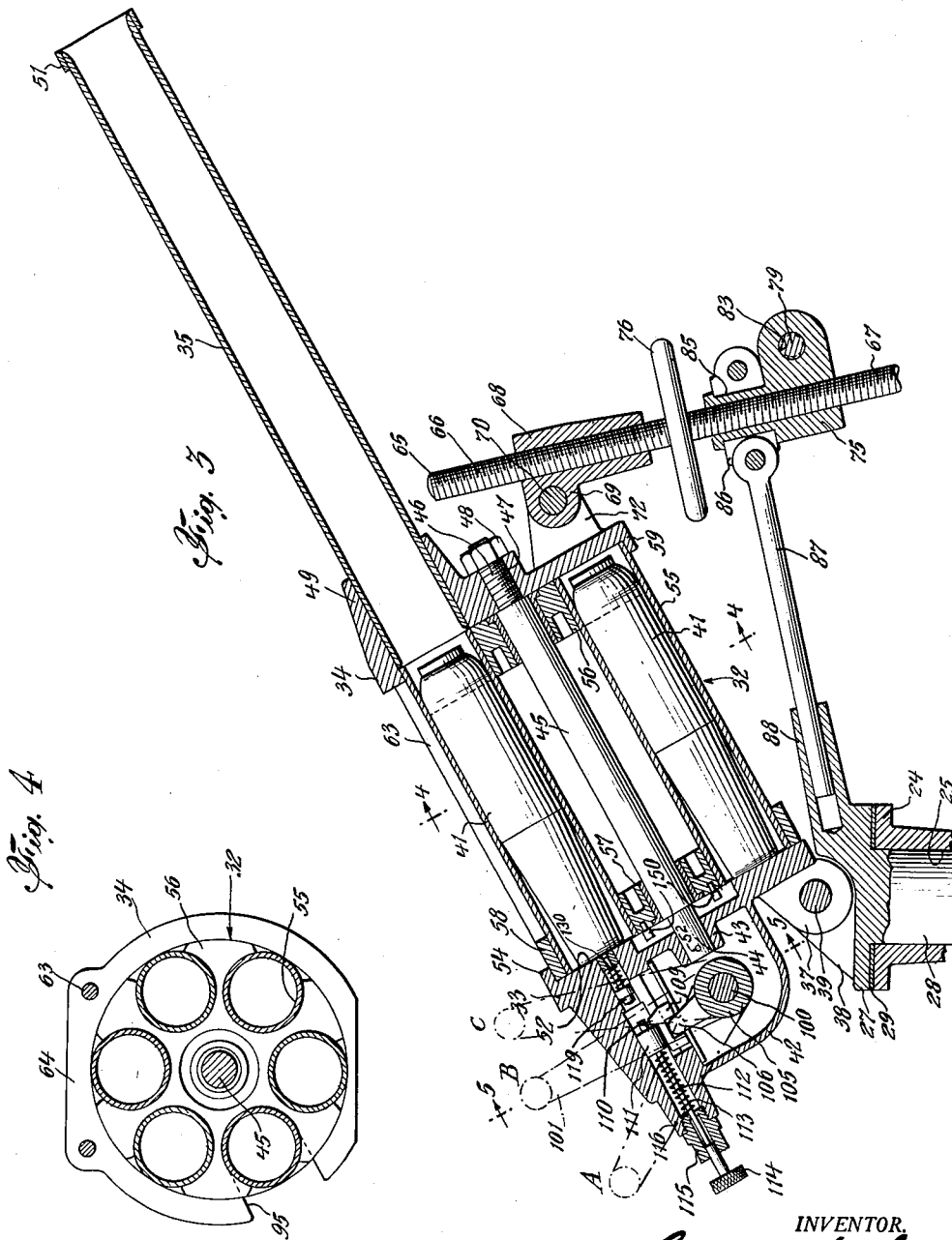
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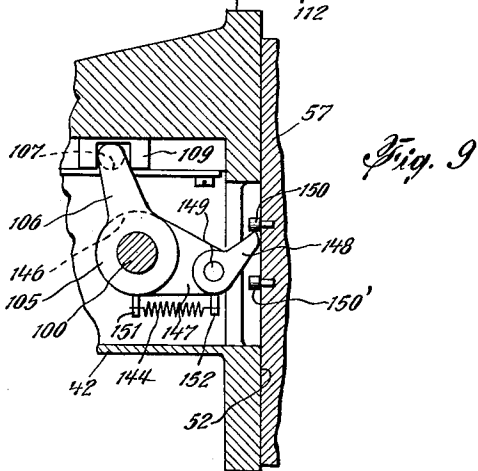
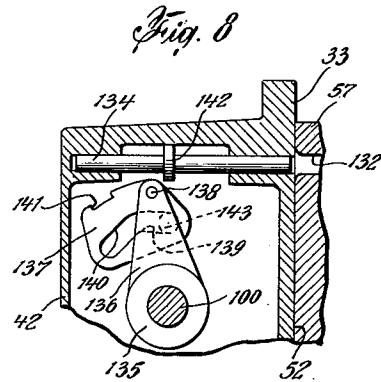
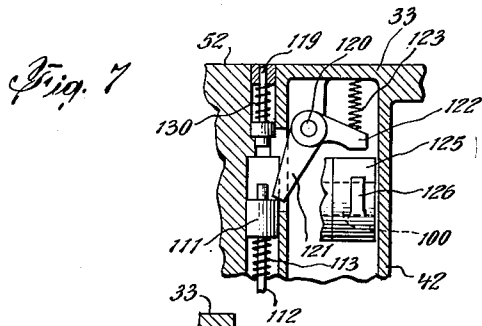
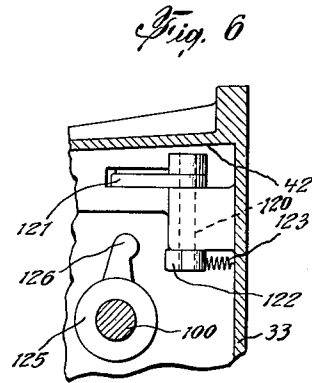
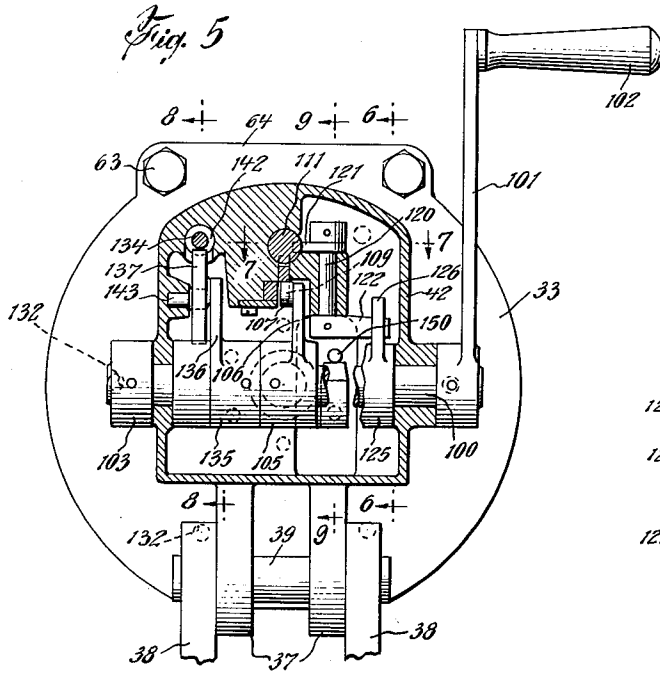
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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,380,024

ROCKET GUN

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1 Claim. (Cl. 89—13)

This invention relates to new and useful improvements in ordnance, and shells therefor, and relates as well to an improved method of shell propulsion, the invention relating more particularly to an improved type of quick-firing gun for dispatching reaction-type shells having a self-contained propulsion charge.

One of the principal objects of the present invention is the provision of a novel gun which may be employed in field action, trench warfare, or wherever it is tactically important to throw projectiles, shrapnel, high explosive shells, fragmentation shells, pyrotechnic shells, shells carrying a photogenic charge, or in fact any type of shell ranging in weight from two to twenty pounds, or thereabouts, and having a firing range of from one to five miles, the gun of the present invention having means for throwing shells of this character accurately, effectively and in relatively rapid succession.

Another object of the present invention is to provide an ordnance piece which, though capable of handling shells of fair caliber and great destructive power, is relatively light in weight, easily dismantled and carried, and furthermore is relatively noiseless in operation.

A further object of the invention is to provide a novel piece of light-weight, readily-portable field artillery designed primarily for a new type of tactical operation calculated to administer surprise, demoralization and destruction to the enemy, particularly by virtue of the fact that the destructive power of the gun is comparable to that delivered normally by heavy artillery.

Yet another object of the invention is to provide a quick-firing gun which is light in weight, simple in construction, and which is self-contained, flexible and fully adjustable, and is adapted to be quickly brought into action under many different service conditions. A further object of the invention is to provide a powerful gun of the mortar or high-angle firing type that will readily and accurately dispatch projectiles of effective caliber over relatively long ranges for a gun having a smooth bore barrel.

In its preferred embodiment, the weapon includes a smooth bore gun barrel with which is associated a multi-cylinder magazine and novel operating and fire-control means all comprising a unit, which is mounted on any suitable type of carriage so as to afford rapid and accurate pointing in the vertical and horizontal planes. Although the gun is particularly designed for ammunition of the reaction or self-propelling type, it may nevertheless be used for other kinds of projectiles. A still further object of the inven-

tion is the provision of a novel weapon of the type described which is especially useful as an anti-tank gun, the exploding shell being capable of effectively crippling a tank due to its high explosive charge. The gun of the present invention is particularly useful in mountainous countries where the terrain prevents the use of heavy artillery.

A still further object of the present invention is the provision of an improved self-propelled or reaction-type projectile which is particularly adapted to be discharged from a smooth-bore gun barrel, the missile being capable of being dispatched accurately over a relatively long range.

Another object of the invention is to provide a projectile of this type which may be launched or fired safely and accurately from a gun of light weight and simple construction, the projectile having novel means for imparting rotation thereto relative to its longitudinal axis. A still further object of the invention is the provision of a novel method of propelling a shell of the reaction type having a self-contained explosive charge.

In the drawings:

Fig. 1 is a side elevation of a complete gun representing one embodiment of the present invention.

Fig. 2 is a top plan view thereof.

Fig. 3 is a broken vertical section taken through the center of the gun shown in Figs. 1 and 2.

Fig. 4 is a section taken on line 4—4 of Fig. 3 and showing certain details of the magazine assembly.

Fig. 5 is a section taken on line 5—5 of Fig. 3 and showing certain details of the gun loading and firing mechanism.

Figs. 6, 7, 8 and 9 are broken sections taken on lines 6—6, 7—7, 8—8 and 9—9, respectively, of Fig. 5, such being vertical sections with the exception of Fig. 7, which is a horizontal section.

Fig. 10 is a broken side elevation of a slightly modified barrel construction having heat-diffusing fins.

The gun mount illustrated particularly in Figs. 1 and 2 includes a pair of spaced, tubular frame members 10 formed with outwardly bent, rear terminal portions 11. These rear terminal portions are received at their ends in a socket 12 formed integrally with a shoe 13 having downwardly extending prongs 14. At its forward end each tubular frame member 10 is received in a head member 16 formed with an angular forward extension 17 which receives forward legs 18, the lower ends of which are likewise received within sockets 12 of shoes 13. Tubular frame members

10 are maintained in their spaced relation at their forward ends by means of a transverse supporting bar 21 which is rigidly secured at its opposite terminals to head members 16, as shown in Fig. 2. Spaced rearwardly from transverse supporting bar 21 is a transverse frame member 22 having opposed sleeve portions 23 which receive tubular frame members 10, thus giving approved rigidity to the frame structure constituting the gun mount.

The gun mechanism is mounted for horizontal, pivotal movement on a centrally disposed, upwardly extending base portion 24 formed integrally with transverse frame member 22 and having a relatively large central bore 25 therein. Gun-supporting plate 27 is mounted on the upper surface of base portion 24, such gun support having a downwardly extending, vertical trunnion 28 which is received within bore 25. An anti-friction washer 29 is preferably positioned between the upper surface of base portion 24 and the lower surface of gun support 27.

The firing unit includes a rotatable magazine 32, frame elements 33 and 34 which support the rotatable magazine, and a barrel 35. Frame element 33 is formed at its lower end with a plurality of spaced lug portions 37 which are pivotally mounted between a pair of spaced, upwardly extending lug portions 38 formed integrally with supporting plate 27, a shaft 39 passing through the several lug portions. Frame element 33 further includes a housing 42 for the firing mechanism, and a central boss 43 which receives a reduced end portion 44 of a shaft 45 providing a journal support for the magazine, a pin 52 securing shaft 45 within boss 43. At its forward end shaft 45 is formed with a reduced, threaded portion 46 which is received within a central aperture 47 in forward frame element 34, and is secured therein by means of a nut 48. The barrel 35 is positioned within a sleeve portion 49 formed integrally with frame element 34, and if desired, this barrel may be made removable. At its forward end barrel 35 is provided with a ring 51 to protect the muzzle.

The magazine assembly comprises a plurality of spaced, tubular elements 55 which receive shells 41 and which are maintained in their spaced relation at their forward ends by means of a specially formed, circular plate or spider 56, and at their rear ends are secured by means of a plate 57 formed with an external band 58, shown particularly in Fig. 2. The forward face 52 of frame member 33 serves as the breech element or firing head, and since the shell-receiving, tubular members 55 have relatively thin walls, it is desired to increase the area of surface contact between the revolving member and front face 52 serving as the firing head. This is accomplished by the provision of band 58 which may be in the form shown, or may be a circular member engaging a still larger portion of surface 52. In order to increase the resistance to any of the combustion gases which may escape, frame element 33 is formed with an annular flange 54, and a similar flange 59 is formed integrally with frame element 34 (Fig. 3). Frame elements 33 and 34 are supported in their spaced relationship by shaft 45, and also by a pair of tie bars 63 which are received within apertures in upper extensions 64 of such frame elements.

Elevation of the gun barrel is obtained by means of a lead screw 65 formed with a threaded portion 66 at one end thereof, and an oppositely threaded portion 67 at its opposite end. The upper thread-

ed portion is received within a threaded sleeve 68 having a lug 69 through which a pin 70 passes, the pin also passing through a lug 72 formed integrally with frame member 34. The lower threaded portion 67 of the screw 65 is received within a threaded sleeve 75 somewhat similar to sleeve 68, such lead screw having a centrally disposed hand wheel 76 keyed thereto. Horizontal adjustment of the barrel is obtained by means of a threaded lead screw 79 which is journaled at its opposite ends in upper extensions 80 of head members 16, and a hand wheel 81 is keyed to such lead screw at one end thereof.

Lead screw 79 is received in a threaded aperture 83 in sleeve 75, and it will accordingly be seen that as hand wheel 81 is rotated in one direction or the other, the gun barrel is moved to the right or to the left, and as hand wheel 76 is rotated sleeve members 68 and 75 are drawn toward or away from each other, thus lowering or elevating the gun barrel. It will accordingly be seen that a simple, effective, rapid and close adjustment is afforded in both the vertical and horizontal planes. This affords the gun pointer easy means of sighting the gun barrel, which means are within reach of either side of the weapon.

In order to more effectively transmit horizontal movement of sleeve 75 through rotation of lead screw 79 to the gun frame structure, such sleeve is provided with a collar 85 formed with a lug 86 which is pivotally connected with a rod 87, such rod being freely movable longitudinally in a sleeve 88 formed integrally with plate 27. The rear end of radius rod 87 is made freely slidable in sleeve 88 in order to compensate for changes in radius as lead screws 65 and 79 are rotated. A gun sight of any suitable design is indicated at 90, such sight being located in a position convenient to the operator who sits upon a saddle 91 mounted on one of the frame members 11. Shells 41 are introduced into tubular members 55 through an aperture 95 formed in frame element 34, as shown in Fig. 4.

The firing mechanism includes a shaft 100 provided at one end thereof with an arm 101 having a handle 102, such shaft being journaled in housing 42, as shown in Fig. 5. The opposite end of the shaft is provided with a collar 103 keyed thereto. The mechanism of the gun is so designed that movement of arm 101 backward and then forward through an arc of about 45° performs all the functions of bringing a shell into registry with the barrel, cocking the hammer, justifying the registry of the shell chamber with the gun barrel, locking the mechanism in justified position, and firing the shell from the gun. In Fig. 3 arm 101 is indicated in broken lines in three positions designated "A," "B" and "C," respectively. Keyed or otherwise secured to shaft 100 is a collar 105 formed with an arm 106 having a roller 107 at its outer end. This roller engages and moves a sliding hammer retractor 109, which, by means of a projection 110, engages hammer head 111. The hammer assembly further includes a rod 112 carrying the firing spring 113 and being provided with an external knob 114 at its rear end, such rod being journaled for longitudinal movement in a bonnet 115 supported in a boss 116 at the rear of housing 42.

Prior to firing, arm 101 normally occupies position "B" (Fig. 3). When this arm is drawn rearwardly to position "A," the hammer retractor 109 and hammer 111 are in the position shown in Fig. 3, spring 113 carried on rod 112 being compressed and in position to deliver an impact against firing

pin 119. When arm 101 is moved forward, retractor 109 is also moved forward to permit the hammer to strike firing pin 119, which, however, does not take place until arm 101 is moved forward through about the last 15° of the stroke. In other words, hammer 111 is retained in its rearward position by means of the mechanism shown, particularly in Figs. 6 and 7. This mechanism includes a vertical shaft 120 journaled in housing 42 and provided at its upper end with a hammer-retaining detent 121, and at its lower end with an arm 122, a spring 123 normally urging shaft 120 in a clockwise direction when viewed as in Fig. 7.

Shaft 100 carries a second collar 125 keyed thereto formed with a finger 126 thereon, and such finger occupies a position relative to arm 122, shown in Fig. 6, when arm 101 is at or about position "B" in Fig. 3. The movement of arm 101 from position "B" to position "C" causes finger 126 to engage arm 122, thus rocking shaft 120, which, in turn, moves detent 121 out of the path of hammer 111, allowing the same to strike the firing pin, thereby exploding the shell primer. In order to keep the inner end of firing pin 119 out of the path of the rotatable magazine, a small spring 130 is employed. Hammer spring 113 is preferably so proportioned that when compressed and suddenly released, it drives the hammer forward with a sharp blow against the firing pin. However, its length when released is not sufficient to cause the hammer to remain in the extreme firing position and overcome the firing pin retraction effect by smaller spring 130.

For the purpose of justifying and locking the magazine in correct position for firing, a series of equally-spaced index holes 132 are formed in the rear face of the magazine about its axis. As shown in Fig. 8, a locking bar 134 is so positioned within housing 42 that it may be caused to enter one of such holes for the purpose set forth. For the operation of this locking means, a third collar 135 is secured to shaft 100, such collar supporting an arm 136 which carries a cam structure 137 pivoted thereto at 138. This cam structure is formed with a slot 139 having an angular extension 140. The upper surface of the cam structure is provided with a jaw 141 which engages a collar 142 carried by locking bar 138. A stationary pin 143 is positioned within slot 139.

The operation of this portion of the mechanism is as follows: Arm 136 occupies the position shown in Fig. 8 when arm 101 is at position "A." As arm 101 is moved forwardly from position "A" to position "B," carrying with it arm 136, no arcuate movement of cam structure 137 relative to arm 136 occurs. When, however, fixed pin 143 engages angular extension 140 of slot 139, the cam structure moves upwardly wherein jaw 141 engages collar 142, thus moving locking bar 134 into one of holes 132 of the rotatable magazine. This movement of the locking bar 134 occurs only during movement of arm 101 from position "B" to position "C," which represents approximately the last 15° of the forward or firing stroke of the arm. It will also be apparent that locking bar 134 is completely withdrawn from hole 132 during the rearward movement of arm 101 from position "C" to position "B." Jaw 141 is made wider than collar 142 for timing reasons. If desired, bar 134 may be spring held in unlocked position, or may be retained by friction means.

For the purpose of moving the magazine angularly to bring another shell up to position for firing, the mechanism shown particularly in Fig.

9 is employed. Shaft 100 carries a fourth collar 146 keyed thereto provided with an arm 147, at the outer end of which a pawl 148 is pivoted at 149. A spring 144 is fixed at one end thereof to a projection 151 on collar 146, and is secured at its opposite end to a projection 152 on pawl 148, thus urging the pawl in a clockwise direction, when viewed as in Fig. 9. The rear surface of the rotatable magazine 32 is provided with a plurality of equally-spaced pins 150', one being provided for each shell chamber. These pins are located relatively close to the axis of the rotatable magazine.

Arm 147 is shown in Fig. 9 in the position it occupies when arm 101 is in position "A." Assuming that arm 101 has been drawn back to this extreme position, it will be seen that pawl 148 has engaged one of pins 150 which was originally in the position of pin 150' and moved it to its position shown at 150, thus having brought a shell into firing position with respect to gun barrel 35. When arm 101 is moved forward, as in approaching the firing position, arm 147 will be moved downward, carrying pawl 148 considerably below the position of pin 150', and upon arm 101 being moved backward subsequently, the pawl will move idly in its upward travel before engaging another of the pins and moving the same to the final position shown at 150.

Shell-receiving elements 55 are illustrated in connection with the preferred embodiment of the present invention, and inasmuch as no housing encloses such elements ample opportunity for air-cooling even during rapid firing is afforded. It will be appreciated, of course, that any suitable water-cooling means may also be provided, if desired. Likewise, barrel 35 may be received in a collar 154 which is somewhat longer than sleeve 49 of the preferred embodiment, and such collar may include a plurality of radial heat-radiating fins 155. If desired, fins of this character may also be used on the shell-receiving elements 55.

It will be further apparent that whereas the preferred embodiment of the present invention is designed for support on a gun mount of the type disclosed, nevertheless any other type of mount may be provided, and if the gun is made exceedingly light in weight, it may also constitute a shoulder weapon, particularly in view of the fact that the recoil from a shell of the type herein-after described is not considerable. It will also be understood that the firing, magazine-rotating, locking and sighting elements described herein are illustrative only and are not to be taken in any limiting sense.

What I claim is:

In combination with a gun provided with a rotatable magazine having a plurality of tubular shell-supporting elements and a gun barrel, a spring-pressed hammer, a firing pin, and means for intermittently rotating the magazine to successively position the shell-supporting elements in alignment with the barrel, fire-control means comprising a manually-movable rock-shaft, a plurality of fingers carried thereby, hammer-cocking means connected with one of said fingers during rearward movement of the shaft, magazine-locking means actuated by another of said fingers during forward movement thereof, hammer-releasing means actuated by a third finger when the shaft has reached its maximum forward position, and magazine-rotating means associated with a fourth finger for actuation during return movement of the shaft.

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