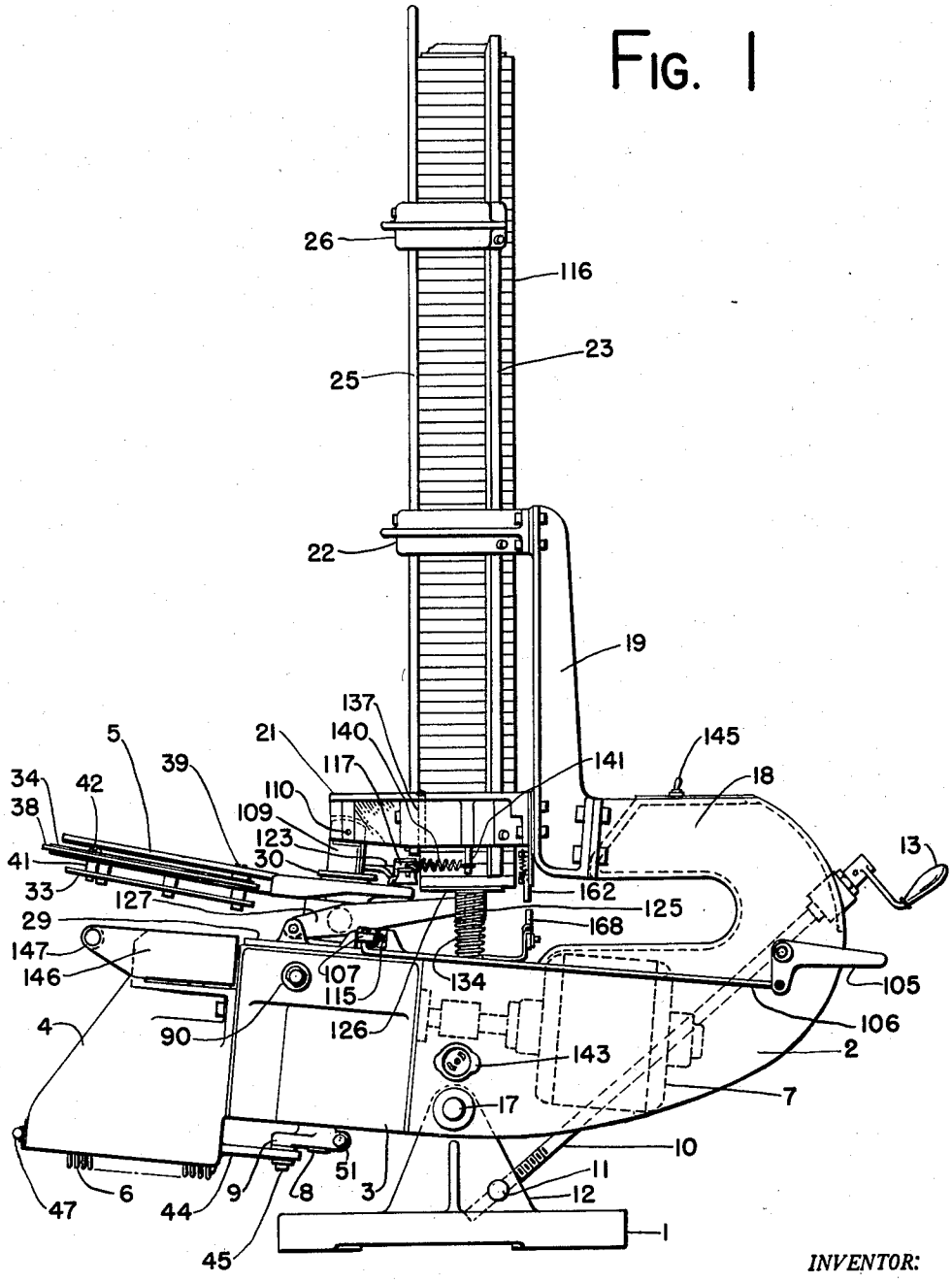
Feb. 23, 1960 H. C. FOSTER 2,925,812

TARGET THROWING APPARATUS

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FIG. 1



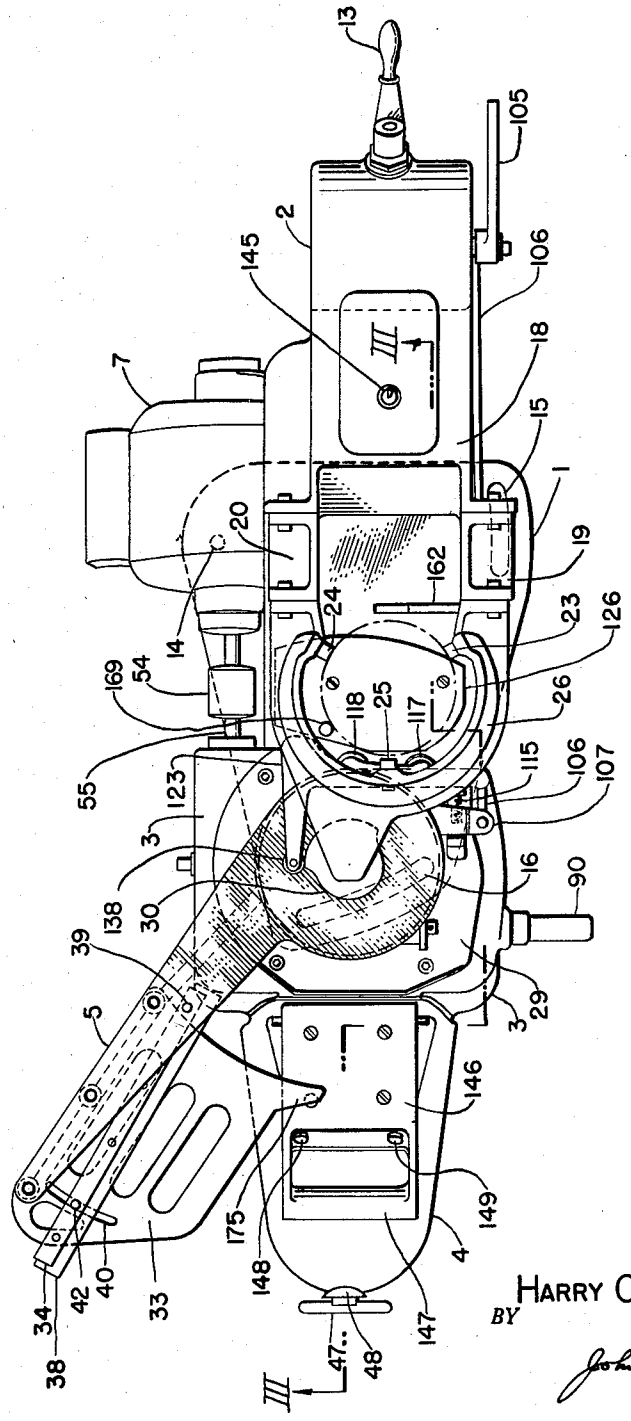
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TARGET THROWING APPARATUS

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FIG. 2



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TARGET THROWING APPARATUS

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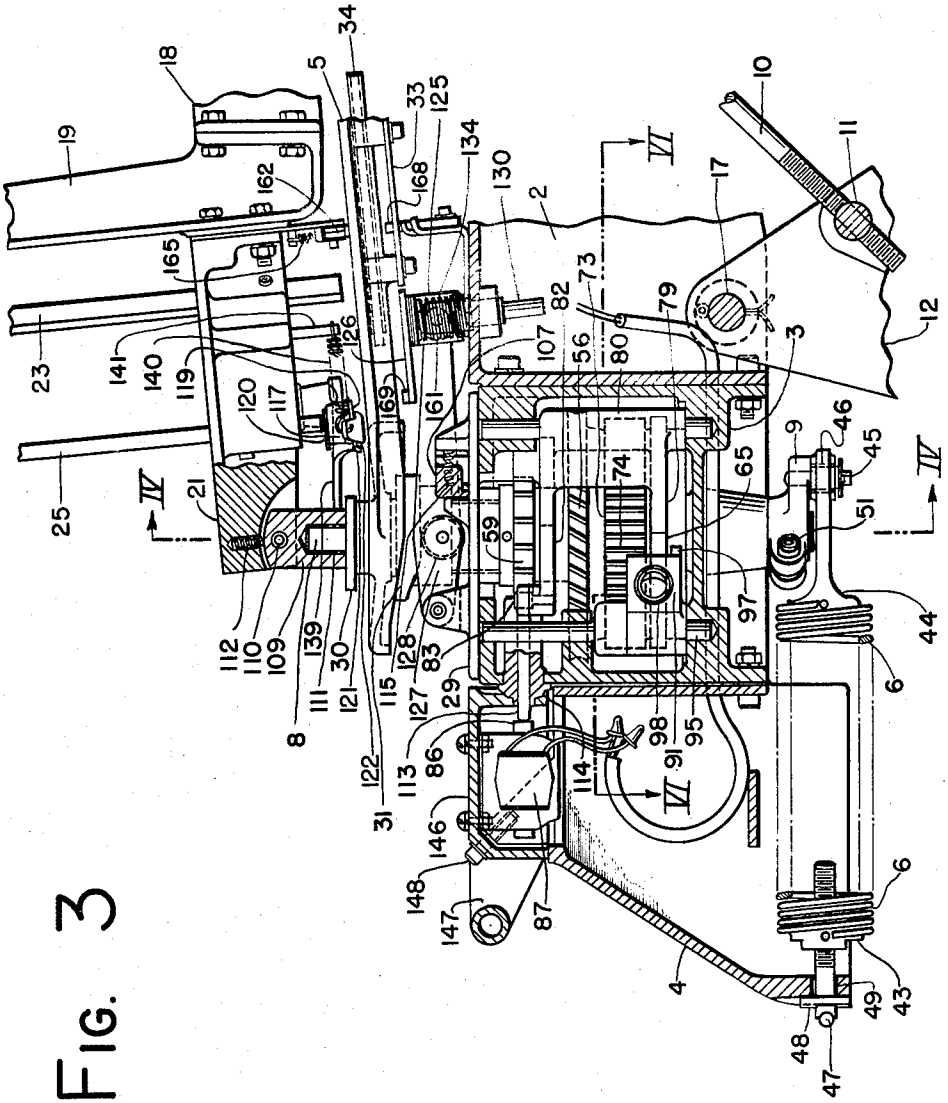


FIG. 3

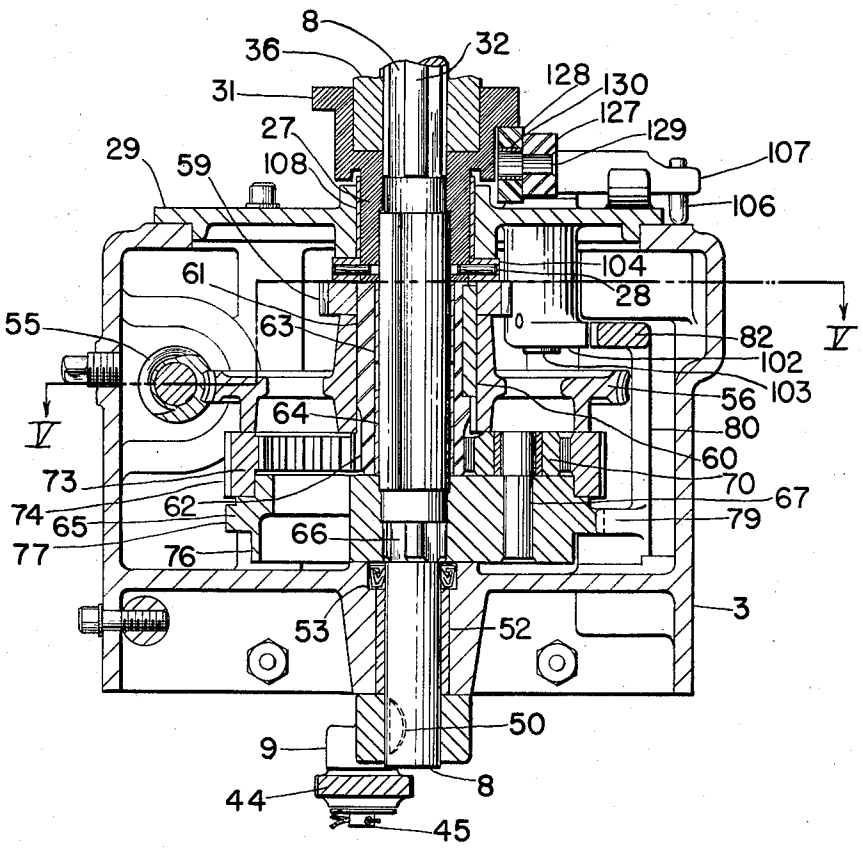
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TARGET THROWING APPARATUS

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FIG. 4



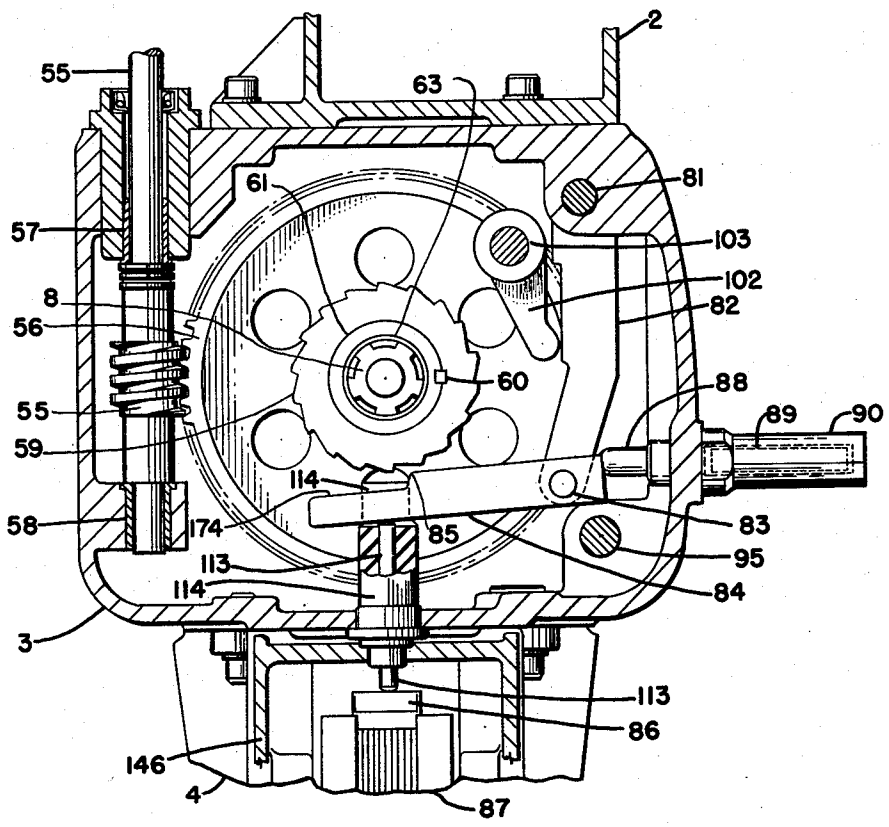
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TARGET THROWING APPARATUS

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FIG. 5



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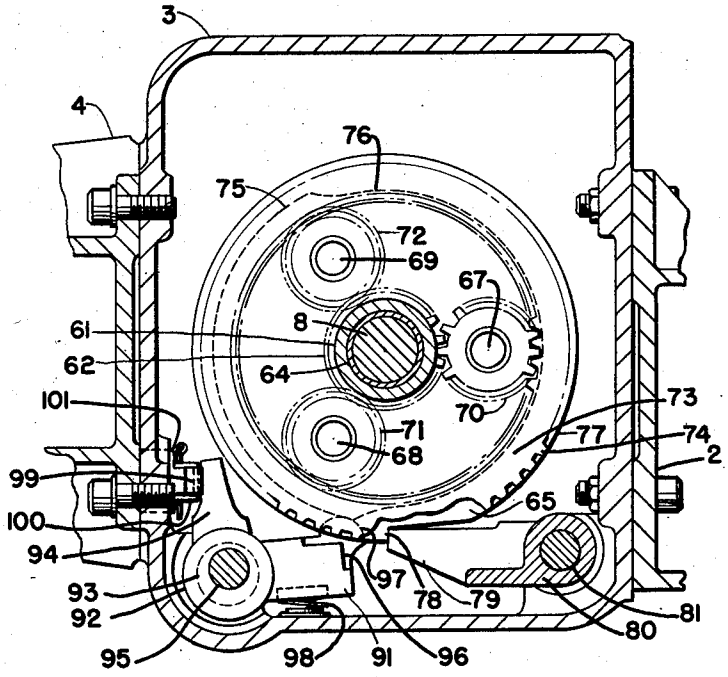
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FIG. 6



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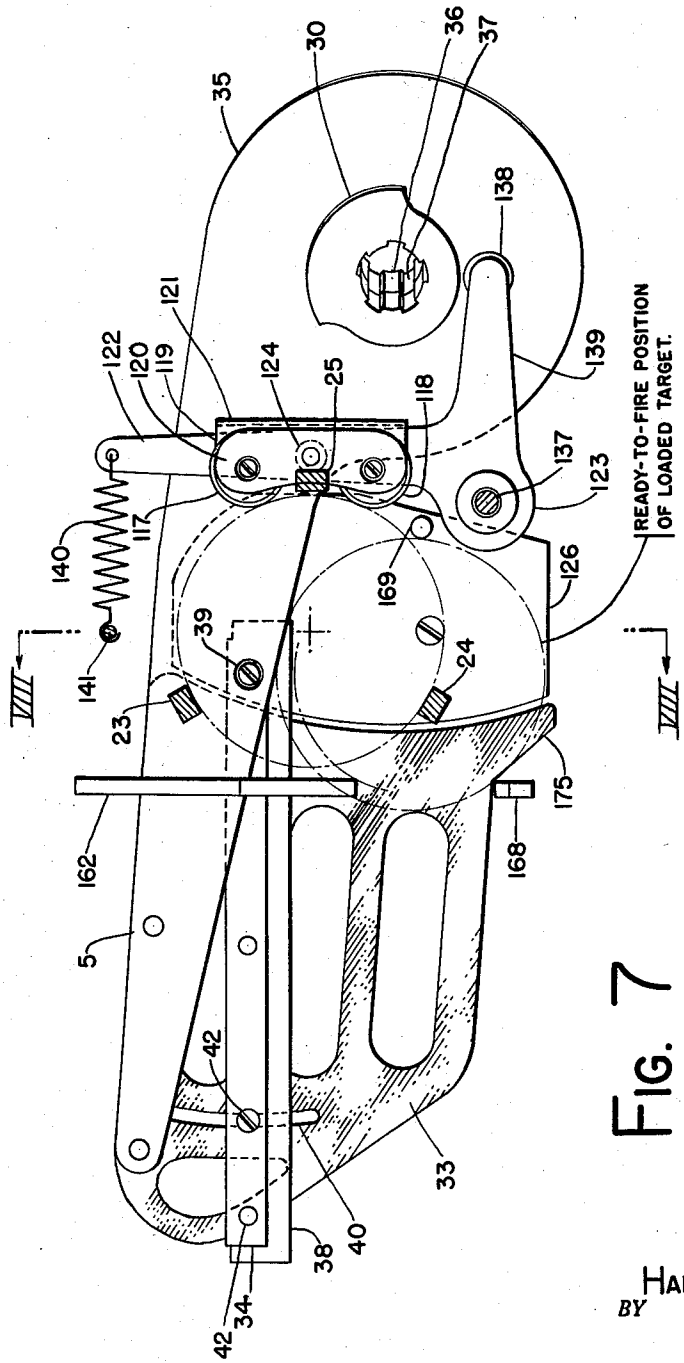


FIG. 7

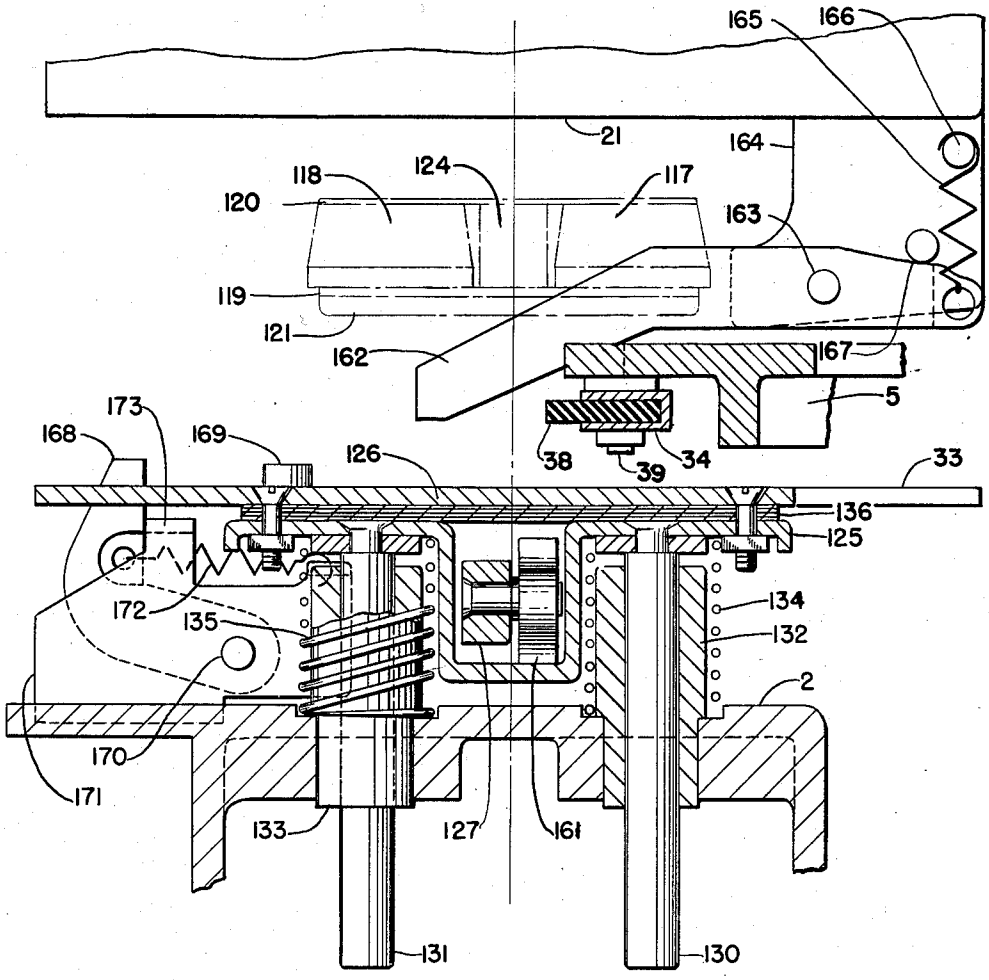
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TARGET THROWING APPARATUS

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FIG. 8

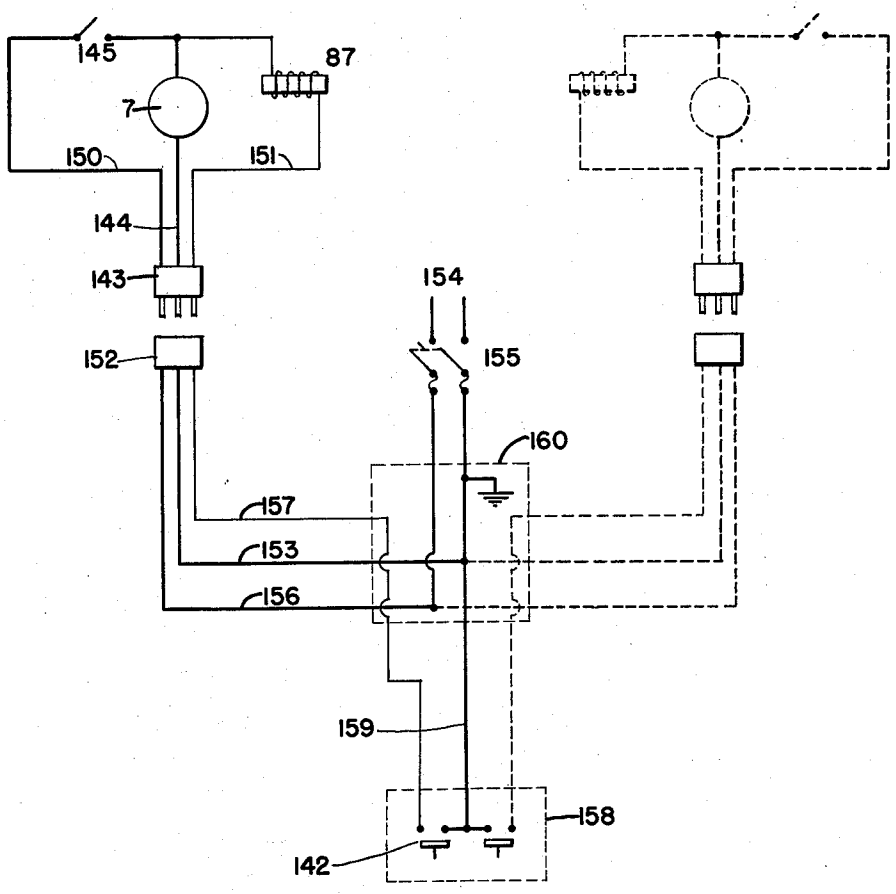


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TARGET THROWING APPARATUS

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FIG. 9



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United States Patent Office 2,925,812
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2,925,812

TARGET THROWING APPARATUS

Harry Clark Foster, Rosewood Heights, Ill., assignor to Olin Mathieson Chemical Corporation, a corporation of Virginia

Application June 16, 1954, Serial No. 437,191

29 Claims. (Cl. 124—8)

This invention relates to target traps of the type for projecting clay targets or "pigeons" or the like into the air and more specifically to a target throwing apparatus suitable for use in the sport of skeet shooting with a target magazine and an automatic target loading and throwing arm cocking mechanism.

In the art of skeet shooting or the like, in which target throwing traps are positioned both on the left and on the right of the shooting field, it is obviously desirable that the two traps required not be loaded and cocked throughout the game by hand since this requires the continual presence and attention of two operators. Heretofore, various kinds of automatic magazine-loading types of traps devised have used electric motors with a coupling mechanism such as gear reducers, sprockets, chains and clutches together with a target magazine carrying one or more stacks of clay targets. Prior traps of this type are generally cumbersome largely on account of the gear transmission system necessary to transfer the power intermittently from the electric motor. Traps of this type suffer from further disadvantages in that they have an unnecessarily complex magazine feed and are characterized by excessive movement of the stack of targets which results in too much target breakage.

Therefore it is one of the objects of my invention to provide a target throwing trap having a new and improved mechanism adapted to keep the target trap loaded automatically from a magazine without the need for manual loading and supervision by operators and attendants. Another object is to provide a target throwing trap having a compact mechanism of low inertia and utmost dependability for efficiently transmitting the power required intermittently as desired to throw the target, cock the trap, and control the holding and releasing of the target carrier or throwing arm. A still further object of my invention is to provide a new and improved target throwing machine adaptable for holding a large supply of frangible targets with substantially complete elimination of target breakage. Another object is to provide in a target throwing trap a mechanism for delivering the targets from a magazine to a target throwing mechanism with a minimum of movement and without excessive impact. Another object is to provide in a target throwing trap means for accomplishing smooth operation throughout the cocking cycle. Yet another object is to provide a new and improved target throwing apparatus for skeet shooting or the like. Other objects, features and advantages of my invention will become apparent from the following description of a preferred embodiment thereof and the accompanying drawing, in which:

Figure 1 is a side elevational view of a preferred embodiment of the invention taken at the moment immediately after a target has been thrown;

Figure 2 is a plan view of the embodiment of Figure 1;

Figure 3 is a fragmentary cross-sectional view in elevation taken on line III—III of Figure 2; with the arm shown returned to the retracted or cocked position;

Figure 4 is a fragmentary cross-sectional elevational view taken on line IV—IV of Figure 3 the better to illustrate certain details of the holding, cocking transmission and release mechanism involved;

Figure 5 is a fragmentary cross-sectional plan view taken on line V—V of Figure 4;

Figure 6 is a fragmentary cross-sectional plan view taken on line VI—VI of Figure 3;

Figure 7 is a partial plan view of the embodiment of Figure 1 showing the throwing arm in cocked position in relationship to the escapement mechanism and the target feed shelf;

Figure 8 is an elevational fragmentary view partly in cross-section taken on line VIII—VIII of Figure 7 to better illustrate the structure below the magazine at the throwing arm 5; and

Figure 9 is a diagrammatic view of the electric power and control system employed with the embodiment illustrated in Figure 1.

In accordance with this invention, there is provided a trap powered by a continuously running motor which engages the trap mechanism through a clutch system to cock a spring, which upon being released rotates the target throwing arm to effect throwing of the target, which is then followed by automatic loading of another target to the throwing arm as the result of continued movement of the mechanism. The sequence of target throwing, cocking of the main spring of the trap, and reloading of the target throwing arm occurs substantially automatically in the apparatus upon release of the target throwing arm by the operator.

The apparatus of this invention may be described generally as comprising a base 1, a frame 2, a gear housing 3, a mainspring housing 4, a target carrier or throwing arm 5, a mainspring 6, and an electric motor 7 which supplies power for cocking the trap. Frame 2, housing 3 and housing 4 are fixed together by any suitable fastening means so as to constitute in effect a single frame. Power is supplied from the continuously operating motor to the cocking mechanism and the holding and the releasing mechanism the latter of which are contained in the gear housing 3. The target carrier or throwing arm 5 is mounted for rotation upon the upper end of a shaft 8 to which is imparted a rotational thrust for throwing the target by means of the mainspring 6 disposed protectively under the mainspring housing 4.

The cocking, holding, releasing and target loading mechanism is a compact unit contained in and associated with the gear housing 3. The motor continuously turns one gear in the epicyclic gear train in the gear housing 3 while the rest of the train may be set into operation to cock the throwing arm intermittently following each throwing operation. In accordance with this invention a portion of the gear train is held stationary while the rest of it is permitted to idle during the time the trap is in cocked position. Upon actuation of the release mechanism the cocking mechanism is adapted to transmit power from the motor throughout the entire gear train at a suitable speed reduction through the main shaft 8 to the mainspring 6. The gear train rotates the main shaft 8 to tension the mainspring 6 until the mainspring crank 9 attached to the lower end of shaft 8 is beyond the out dead center after which the shaft 8 and carrier arm 5 are turned ahead some further distance without shock to the cocked position whereupon the carrier is held cocked and the gearing is again set to idle. As the target carrier proceeds to the cocked position, a target is automatically fed to the carrier or throwing arm 5 ready for launching. The target is thrown when the release mechanism is actuated electrically from a remote position.

In order that the elevation at which the targets are ejected may be controlled, there is provided an elevation

adjustment screw 10 mounted rotatably but not slidably on frame 2 with respect to the length of the screw or crank shaft, one end of which, passes threadedly through a swivel 11 pivotally carried by uprights 12 integral with base 1 and the other end of which is provided with a crank handle 13.

The invention will be better understood from the following more detailed description with reference to the embodiment of the invention illustrated in the drawing.

As is shown most clearly in Figures 1 and 2, the entire trap is mounted upon a base 1 which is provided with means such as holes 14, 15 and 16 the latter two of which are arcuately slotted for attaching the base adjustably to any suitable support and which is also provided with a pair of upright supports 12 upon which there is mounted pivotally the C-frame 2 by means of elevation pivot pin 17 which passes through the upper part of the uprights 12. Frame 2 carries motor 7 and also the gear housing 3. Mounted on the upper arm 18 of C-frame 2 is a right magazine support 20 and a left magazine support 19 to which there is attached by suitable means a lower magazine bracket 21 and an intermediate magazine bracket 22 which in turn carry guide rails 23, 24 and 25. These three guide rails, including rear guide rails 23 and 24 and the front rail 25, define the magazine space for holding a stack of nested targets. Near their upper ends the rails are attached to an upper magazine bracket 26. Attached to the front of the gear housing 3 is the mainspring housing or apron 4 which protectively covers and also provides a mount for one end of the mainspring 6 which provides the sudden thrust of throwing power needed to project a target in desirable fashion. The other end of the mainspring 6 is attached to the mainspring crank 9 which in turn imparts a rotational thrust to the main shaft 8 passing through the gear housing 3 and journaled at its lower end in the bottom of housing 3. The upper end of main shaft 8 is indirectly journaled through the hub 27 of feed cam 31 in the gear housing cover 29 from which the shaft protrudes sufficiently to carry the escapement cam 30, the carrier or throwing arm 5 with its other components and target feed cam 31 all by means of a splined fitting 32 at the upper end of the shaft 8.

The target carrier of throwing arm 5 has a carrier plate 33 and a rubber or other resilient material faced rail 34. The arm 5 is formed with an upward tilt of about 5° as an extension of the circular disc portion 35 which is provided with a hub 36 internally splined at 37 for attachment to the splined fitting 32 of the main shaft 8. At the outer end of arm 5 and supported underneath it is a carrier plate 33 which supports the target in its initial travel during the throwing operation from the moment of firing to the moment when the target leaves the arm. Although plate 33 in this embodiment is attached to arm 5, it is to be understood that plate 33 could be a separate stationary member mounted on frame 2 and of suitable arcuate length to support the target while it is propelled by the rail 34. In this embodiment described, the leading edge of the plate 33 adjacent shelf 126 in cocked position is formed with a projection 175 to prevent interference with the trailing edge of the target in throwing. Depending from the carrier arm 5 is the angularly adjustable rail 34, having the resilient leading edge 38 and which is pivotably attached at the inner end to arm 5 at the fastener 39 to extend outwardly above the carrier plate 33 at least to the slot 40. Angular conrtol of the target trajectory and control of the levelness of the trajectory are attained by angular movement of the adjustable carrier rail 34 about pivot 39 to a desired position of the outer carrier rail support 41 as determined by the position of support fastener 42 in the arcuate slot 40 in the carrier plate 33. Slot 40 is of such length as to permit the rail 34 to be adjusted to an angle of lead or lag as necessary to correct for the effect of windage on levelness and direction. For example, a lagging rail causes a target discharge to the right with a tendency to a right tilt, whereas a leading rail causes a target discharge to the left with a tendency to a left tilt. To reduce the moment of inertia, the arm 5 is cast of a light metal such as a suitable magnesium alloy or the like and the light metal carrier plate 33, it will be noted from Figure 2 in particular, has a number of openings or cut out sections. It is to be noted that the rail 34 is adapted to be reversibly mounted to compensate for wear.

The main power for throwing the target with the sudden impact necessary is supplied at the lower end of the main shaft 8 by mainspring 6 the ends of which are threadedly secured to an adjustable internally threaded mainspring plug 43 at the front end and similarly to a second mainspring plug 44 at the rear for connection to the mainspring crank 9 as shown in Figure 3. The rear mainspring plug 44 is pivoted at one end to the crank 9 by means of mainspring crank stud 45 which is rotatable in crank stud bushing 46. The other or front mainspring plug 43 threadedly receives the T-headed mainspring adjusting screw 47 which in turn passes through mainspring swivel block 48 and through a slotted opening 49 in the frame 4. Screw 47 permits adjustment of the mainspring tension. The swivel block 48 permits lateral oscillation of the mainspring 6, without bending the spring. Mainspring 6 is a closely wound flat metal ribbon coiled edgewise, in order to permit a relatively heavy spring to be utilized in a longitudinally small space or length.

The mainspring crank 9 is fixedly attached at its hub to the lower end of the main shaft 8 by means of a key 50 and a clamp screw 51. The main shaft 8, as is shown in Figure 4, extends through the bottom of the gear housing 3 and is there rotatably supported in a main shaft lower bearing 52. Mounted in the bottom of the gear housing 3 above this bushing there is a main shaft oil seal 53 disposed between the main shaft 8 and the housing 3 to prevent loss of the oil bath contained in the housing. Upon expenditure of the throwing power stored up in the spring 6 at the conclusion of a target throwing operation, cocking power is automatically channeled from the continuously operating motor 7 through the flexible coupling 54 (Figure 2) and the worm drive shaft 55 to the epicyclic gear train in gear housing 3 by way of the worm wheel gear 56 (Figure 5).

In the gear housing 3, worm drive shaft 55 having a worm of sufficiently steep lead to avoid self-locking, is journaled in worm shaft bushings 57 and 58 (Figure 5). The worm wheel gear 56 and also the firing ratchet 59 are mounted fixedly by means of key 60 on the hub 61 of the sun gear 62. The hub 61 in turn is rotatably mounted by means of sun gear bushings 63 and 64 on the main shaft 8. Also located in housing 3 is the control cam 65 fixedly mounted by means of the lower splined fitting 66 on the rotatable main shaft 8. Carried on the control cam 65 are the planet studs 67, 68 and 69. Mounted rotatably on these studs are planet gears 70, 71 and 72. Confined between worm wheel gear 56 and control cam 65 and mounted rotatably on a shoulder of the control cam 65 is the internal ring gear 73 with the external ratchet 74. The planet gears 70, 71 and 72 are also in engagement with the sun gear 62 and the ring gear 73. Control cam 65 is provided at its lower end with a cam surface having a protuberant control portion cam surface 75 and a recessed control cam surface 76 generated by a shorter radius than that which generates the protuberant portion 75.

Control cam 65 also has a rim portion 77 in which is formed a holding notch 78 designed for coaction with a sear 79 formed on the lower portion of the sear member 80 which is rotatably carried by shaft 81 journaled in gear housing 3. The upper end of the sear member 80 is provided with an operating arm 82 linked by means of the firing bar stud 83 to one end of firing bar 84 adjacent to the other end of which, resting in slotted end of guide

114, there is provided a firing pawl shoulder or abutment 85 and a control extension 174. This end of the firing bar is adapted to be acted upon by the firing pin 113 slidably carried in firing pin guide 114 mounted on housing 3 under the impetus of plunger 86 of the release solenoid 87 so as to force pawl shoulder 85 into the teeth of the ratchet wheel 59. Extension 174 is a surface limiting the engagement of the shoulder 85 with wheel 59 and thus determines the extent of movement of bar 84. Pressing against the other end of firing bar 84 adjacent the stud 83 and tending to turn the bar 84 about stud 83 counterclockwise (Figure 5) against plunger 86, is the sear plunger 88 which is yieldably mounted against the sear spring 89 carried in an extension of the housing 3 known as a sear plunger bushing 90. Sear plunger 88 also functions through firing bar stud 83 to turn operating lever 82 clockwise so as to urge sear 79 into notch 78.

In order to reduce the weight and moment of inertia of the parts of the trap which turn in unison during the throwing operation so as to obtain the highest proportion of target throwing spring power, it will be noted (Figure 4) that the control cam 65 is almost entirely hollowed out except for three radial ribs each of which carries one of the planetary gears and connects the rim and cam portions of cam 65 to its hub portion. To further reduce its weight, the cam 65 may consist of a suitable light metal or alloy.

Also mounted in housing 3 is a cocking pawl 91 the hub 92 of which is pivotally mounted on the eccentric hub 93 of the hold back pawl 94 which in turn is pivotally mounted on and carried by the shaft 95. The upper end of the cocking pawl 91 is provided with a tooth 96 for engagement with the teeth or serrations of the external rachet 74 carried on the ring gear 73. When the tooth 96 of pawl 91 engages with the ratchet 74, the force of ring gear 73 on the cocking pawl 91 acting through the eccentric hub turns the hold back pawl 94 clockwise into engagement with the ratchet 74 (Figure 6). The lower end of cocking pawl 91 carries a follower 97 for engagement with the cam surfaces 75 and 76 of the control cam 65. One side of the end of hold back pawl 94 is also adaptable for engagement with the teeth or serrations of the ratchet 74 of the ring gear 73. Bearing against the back side of the cocking pawl is the cocking pawl spring 98, acting to thrust the cocking pawl 91 away from the wall of the gear housing into or toward both the ring 73 and control cam 65. The other side of the end of hold back pawl 94 is formed to act as an armature seating against a pawl holding permanent magnet 99, which is mounted on a non-magnetic member 101 carried by and extending into housing 3. Magnet 99 is fastened to member 101 by means of a U-shaped strap 100 having limited pivotal movement to aid both poles of magnet 99 to seat on pawl 94. However, the magnet may be rigidly mounted. The structure of the cocking pawl 91 and the hold back pawl 94 is such that in cooperation with the gearing these members prevent undesired acceleration and the shock movement which would result after the mainspring crank stud 45 has passed the out dead center at the conclusion of the cocking operation.

To permit manual operation of the trap for testing or the like, gear housing 3 also contains a trigger dog 102 pivotally mounted by means of trigger arm shaft 103 on gear housing cover 29 and adapted to be turned against the operating arm 82 of the sear member 80 (Figure 4), when the handle of the trigger 105 is puled up (Figure 1). Trigger 105 mounted pivotally outside frame 2 acting through the trigger pull rod 106 and the trigger arm 107, which is acted on by compression spring 115 and is disposed above gear housing cover 29 and is attached to the upper end of trigger arm shaft 103 to the lower end of which dog 102 it attached, causes the dog 102 to turn counter-clockwise (Figure 5) to press against operating arm 82 turning the sear member 80 and its sear 79 counter-clockwise so as to lift sear 79 out of the notch 78 in the rim of control cam 65 (Figure 6).

Suitably secured on gear housing 3 is a cover 29 in which hub 27 of target feed cam 31, mounted on main shaft 8, is rotatably mounted by means of an upper main bearing 108 (Figure 4). Separation of cover 29 and cam 31 is prevented by a feed cam collar 104 secured on the end of the hub 27 of cam 31 by means of feed cam collar pins 28. Target feed cam 31 has a well for receiving the hub of carrier arm 5 so as to permit a greater degree of engagement between arm 5 and main shaft 8 at the splined fitting 32.

As pointed out hereinbefore, the magazine structure consists of three magazine brackets 21, 22 and 26 of U-shape and three guide rails 23, 24 and 25. Although the magazine structure receives primary support from the magazine supports 19 and 20 to which the lower bracket 21 and the intermediate bracket 22 are attached, further support to minimize vibration is derived through a cylindrical magazine stabilizer body 109 which is connected pivotally but floatably by means of a pin 110 in a large hole (Figures 1 and 3) to the hollowed out forepart of the lower magazine bracket 21. The magazine stabilizer 109 is rotatably connected by means of magazine stabilizer bushing 111 to the upper end of the main shaft 8. The stabilizer 109 rests upon the target escapement cam 30 against which it is urged by stabilizer spring 112 carried in a recess in the forepart of the lower magazine bracket 21. Stabilizer 109 thus also serves to constrain the target escapement cam 30, the carrier arm 5, and to some extent the target feed cam 31 all three of which are in engagement with the splined fitting 32 at the upper end of main shaft 8. It is to be noted that the target feed cam 31 is already constrained axially on main shaft 8 by means of the gear housing cover 29 with the aid of feed cam collar 104 fixed on the end of cam hub 27 by pins 28.

A supply stack 116 of nested targets is carried in the magazine between magazine parallel guide rails 23, 24 and 25. At the lower end, rear guide rails 23 and 24 extend below the lower end of front guide rail 25. The space left at the lower end of front guide rail 25 is for entry of a pair of resilient escapement cushions 117 and 118. These cushions are carried between an escapement carrier base 119 and escapement carrier cover plate 120 which forms a sort of cushion carriage capable of slight oscillation as permitted by the clearance between the overhanging edge 121 of escapement carrier base 119 and the driven arm 122 of the escapement lever 123 upon which the carriage is pivotally mounted about the hub 124. Cushions 117 and 118 are thus adaptable to press against the lowermost target or against the second lowermost target of the supply stack 116, as will be explained hereinafter in connection with the operation of the trap.

Mounted on the feed shelf operating bracket 125 below the magazine is a target feed shelf 126 which coacts with the target feed arm 127 one end of which is pivoted on the gear housing cover 29 and carries rotatably intermediate the ends of arm 127 a feed cam roll 128 mounted on arm 127 by means of stud 129 and bushing 130 (Figure 4) which follows the profile of the target feed cam 31 and thereby controls the operation of the target feed shelf by means of feed shelf roll 161. Depending from and attached to bracket 125 are a pair of spaced feed shelf guide rods 130 and 131 which slidably engage with feed shelf guide bushings 132 and 133 which are mounted on and protrude from the upper surface of frame 2 at the feed shelf. Disposed about each bushing and guide rod is a feed shelf lifting spring such as springs 134 and 135 mounted in compression between bracket 125 and frame 2. Accurate positioning of the feed shelf 126 is obtained by interposition of feed shelf shims 136 between the shelf 126 and the

bracket 125. It is evident that the feed shelf 126 is raised by feed shelf lifting springs 134 and 135 and is lowered by target feed cam 31 in timed relationship with the rotation of carrier arm 5.

Release of the targets from the bottom of the stack in the magazine to shelf 126 is controlled by the escapement mechanism which comprises essentially escapement cushions 117 and 118, the escapement lever 123 pivotally mounted by means of escapement lever stud 137 on the lower magazine bracket 21, the escapement cam roll 138, and the target escapement cam 30 which is carried as stated hereinbefore on the splined fitting 32 at the upper end of main shaft 8.

When the target escapement cam roll 138, rotatably mounted on the end of the driving arm 139 of the escapement lever 123, is opposite the receding portion of target escapement cam 30, the lever 123 is free to turn counter-clockwise about stud 137 (Figures 2 and 7) under the force of escapement tension spring 140, one end of which is connected to the end of the driven arm 122 of lever 123 while the other end of spring 140 is connected to the escapement lever spring post 141 dependently mounted on lower magazine bracket 21, thus forcing resilient cushions 117 and 118 into engagement with the lower rim of a target at the bottom of the stack. This target and all the targets above it are thus secured against dropping by the forces exerted on the target by cushions 117 and 118 and the rear guide rails 23 and 24. When the escapement cam roll 138 rides on the protuberant portion of the cam surface of target escapement cam 30, lever 123 acting against spring 140 has been forced clockwise as far as possible, disengaging cushions 117 and 118 from the stack of targets 116. In this position the stack rests upon and is supported by the target feed shelf 126.

In association with the electrical system which provides both power and control for the trap and which includes the motor 7, there is a release solenoid 87 having a plunger 86 for pushing firing pin 113 slidably carried in the firing pin guide 114 mounted in gear housing 3 to initiate the throwing operation. Solenoid 87 is mounted by suitable fasteners under a solenoid housing 146 provided for convenience with a hand grip 147; and housing 146 in turn is mounted by means of screws 148 and 149 to mainspring housing 4 so as to become in effect a part of frame 2.

The electric wiring system of the trap may be described best with reference to Figure 9 for two such identical traps inasmuch as two traps are required for the game of skeet. In the drawing a second wiring system identical with the first is shown in broken lines for a second trap identical with that described herein. The wiring system of the trap itself is all carried within the parts 2, 3 and 4 and is connected to the three-pronged power inlet receptacle 143. As shown in the drawing one of the power lines 144 is connected to one side of the motor 7. The other side of the motor 7 is connected to one side of the solenoid 87 and to one side of master switch 145, the other side of which is connected to the other power line 150. The operation of the motor 7 is controlled by means of master switch 145 which is accessibly mounted on the upper arm 18 of C-frame 2 (Figures 1 and 2), and which is normally closed during the period of operation of the trap. The other side of the solenoid 87 is connected to the third or control line 151. Power line 144 is connected at receptacle 143 by means of power inlet connector or plug 152 to insulated external power line 153 which leads to a source of power 154 by way of double pole fused disconnect switch 155. The other power line 150 similarly is connected to the other insulated external power line 156 leading from switch 155. Control line 151 similarly is connected at receptacle 143 to line 157 which leads to a special skeet release switch mechanism 158 to which one of the power lines 153 is also connected by insulated lead wire 159. For convenience power lines 153 and 156 and control line 157 located externally of the trap may be all contained in a single insulated cable extending from the power inlet plug 152 to the junction box 160 common to the two traps employed. In like fashion the other trap is electrically connected to the electric power source 154 and to the special skeet release switch mechanism 158. Switch mechanism 158, connected to wiring in junction box 160 by a suitable insulated three conductor electric cable, is adapted to operate either one or the other of the traps or both simultaneously at the will of the operator who is located remotely from the positions at which the two traps are located. It is to be noted that when master switch 145 is open, both motor 7 and release solenoid 87 are deactivated. This is a safety feature in that the arm 5 may not then be released by closing control contacts 142 of switch mechanism 158 with a possibility of injury to anyone at the trap.

With the trap in cocked position with a target emplaced upon the carrier arm plate 33 from the stack 116 in the magazine, the target is thrown by momentarily closing the electric contact 142 of the release switch 158 (Figure 9), whereupon release solenoid 87 is energized and its plunger 86 pushes firing pin 113 against the end of firing bar 84 causing firing pawl shoulder or tooth 85 to engage with and be moved to the right by ratchet wheel 59 which is continuously turned counter-clockwise (Figure 5). Thus moved, firing bar 84, acting through firing bar stud 83, exerts a force on the end of operating arm or lever 82 of the sear member 80 which as a result is turned to lift the sear 79 out of notch 78 formed in the rim 77 of control cam 65 (Figures 3, 4 and 6). This releases the control cam 65, main shaft 8, target feed cam 31, throwing arm 5 and target escapement cam 30 to turn counter-clockwise in unison leaving arm 5 free to throw the target from the carrier plate 33 under the impetus of tensioned mainspring 6 acting from a point at which mainspring crank stud 45 is about 30° following out dead center. During the first part of the target throwing or firing operation, the follower 97 of the cocking pawl 91 rides the protuberant portion 75 of cam 65 holding the cocking pawl tooth 96 from clattering along the teeth of ratchet 74 of ring gear 73 which during firing also turns counter-clockwise in the same direction as arm 5, main shaft 8, and continuously turning sun gear 62 inasmuch as the control cam 65 carrying the planetary gears 70, 71 and 72 is turning with main shaft 8 far more rapidly under the impetus of mainspring 6 than the rate at which the planetary gears are caused to turn about planet gear studs 67, 68 and 69 under the impetus of the sun gear 62 driven by the motor 7.

At the beginning and for about the first 50° of the throwing operation target feed cam 31, acting through feed cam roll 128, target feed arm 127, and feed bracket or shelf operating roller 161, holds the target feed shelf 126 at the lower end of its travel at which shelf 126 is in line with the carrier plate 33 of rotating arm 5. At about 50° of the turning cycle of the arm measured from the cocked position, feed cam 31 begins to permit elevation of the feed shelf 126 which at about 130° of rotation arrives at the top position which is slightly below the bottom target of the stack 116. When the arm 5 and cams 30 and 31 arrive at about the 135° mark of angular travel, target escapement cam 30 causes the target escapement cushions 117 and 118 to begin opening. At the 150° position the cushions are retracted and the escapement is fully open and permits the entire stack 116 to drop a slight distance of not more than about $\frac{3}{32}$ of an inch to upraised feed shelf 126. With the stack 116 thus supported, escapement cam 30 at about the 260° point of angular travel causes the shelf 126 and the stack 116 carried thereon to lower gradually a further distance (about $\frac{3}{8}$ of an inch) equal to slightly less than the height of the rim of one target (about $\frac{15}{32}$ of an inch) so

as to position the second target from the bottom of the stack **116** supported on shelf **126** opposite the opened escapement cushions **117** and **118**. At this position, which occurs at from about the 280° to about the 300° position of angular travel, escapement cam **30** permits the cushions **117** and **118** to close on the target second from the bottom, after which feed shelf cam **31** lowers the shelf **126** carrying only a single target by about ⅞ of an inch to a position in line with the carrier plate **33** to aid in supporting the target just a moment before arm **5** arrives at the loading position below supported stack **116** at a point displaced from cocked and ready-to-fire position by about 15° of angular travel. It is to be noted that the greatest target transfer movement is a movement of but a single supported target and not the entire stack. It is to be further noted that feed shelf **126** in coming up to take down a target from the stack stops just a bit short of meeting with the stack so as not to bump it, which would be likely to break one or more of the frangible targets.

Before target feed shelf **126** is lowered from its elevated position, at about the 250° mark of angular travel of the arm **5**, the main shaft **8**, as indicated by the position of crank stud **45**, has shot beyond in dead center by about 100° and begins to oscillate back or clockwise together with control cam **65**. This sudden incipient movement of reversal causes planetary gears **70**, **71** and **72** to tend to reverse ring gear **73** and drive it clockwise. But since reversal of ring gear **73** is prevented by the cocking pawl **91**, inasmuch as at this position of the parts, follower **97** of the pawl has dropped opposite the receding portion **76** of control cam **65** and permits cocking pawl spring **98** to force tooth **96** of the pawl against ratchet **74** of gear **73**, the only action of ring gear **73** is to exert a force on the cocking pawl **91** which causes a torque force on the hold back pawl **94** and brings about clockwise (Figure 6) movement of pawl **94** so that it too engages with ratchet **74** of gear **73**, which under these circumstances of the mechanism is secured in stationary position. With ring gear **73** thus held stationary, rotation of the sun gear **62** causes planetary gears **70**, **71** and **72** to move their studs **67**, **68** and **69** in the counter-clockwise direction carrying control cam **65**, main shaft **8** and the throwing arm **5** until mainspring crank stud **45** arrives at the out dead center at which position mainspring **6** is fully tensioned. However at about 15° following out dead center position which corresponds to about 15° of angular movement before throwing arm **5** arrives at the cocked ready-to-fire position, the target carried by descending target feed shelf **126** is picked up by carrier plate **33** and moved along by frictional forces with plate **33**. It is to be noted that with the escapement cushions **117** and **118** fully closed upon the lowermost target of those remaining in the stack **116**, final descent of target feed shelf **126** has begun at about the 300° position of angular movement of arm **5** and cams **30** and **31**, measured from the cocked position.

As soon as stud **45** passes beyond out dead center, the tendency of mainspring **6** in view of the stationary position of ring gear **73**, held by pawl **94**, is to cause the planetary gears **70**, **71** and **72** to turn ahead rolling upon the internal teeth of the stationary ring gear **73** faster than motor **7** drives them. As a result, the effort of mainspring **6** is to drive motor **7** which in turn effects dynamic braking of the main shaft **8** and the arm **5** and the other parts carried on shaft **8**. This feature of the mechanism of this invention eliminates the shock which ordinarily would occur just prior to and at placement of arm **5** in cocked ready-to-fire position. Such shock would disrupt the proper positioning of the target on the carrier plate **33**.

When the control cam **65** during cocking has been turned to allow sear **79** to fall into notch **78**, arm **5** has arrived at the cocked or ready-to-fire position. Here follower **97** has engaged with protuberant portion **75** of cam **65** and has lifted pawl **91** from ratchet **74** of gear **73**. This permits gear **73** to turn clockwise again; and as a result of the change in direction, hold back pawl **94** is ejected from ratchet **74**. Magnet **99** then engages with the pawl **94** and keeps it disengaged from ratchet **74** until the next cycle.

It is to be noted (Figure 8) that the loaded target on carrier arm **5**, just before the arm arrives in the last mentioned position, which is to say the ready-to-fire position, comes into contact with the target feed finger **162** pivotally mounted at **163** on a depending feed finger bracket **164** carried by lower magazine bracket **21**. Target feed finger **162** is yieldably held in position by spring **165** one end of which is attached to the feed finger spring post **166** mounted on bracket **164** and the other end of which is attached to one end of the target feed finger **162** which is properly positioned by bearing against feed finger stop **167** also mounted on bracket **164**. Feed finger **162** is adapted to be turned up out of the way when carrier arm **5** is released to project the target. Until the target however is released feed finger **162** serves to guide the single target upon plate **33** to the ready-to-throw position against target stop finger **168** and target guide button **169** located fixedly on target shelf **126** (Figure 7). Stop finger **168** which serves to hold the target in the ready-to-throw position is pivotally mounted by means of pivot **170** on bracket **171** which in turn is mounted on the frame **2**. Target stop finger **168** is yieldably held to project upwardly into position by means of spring **172** one end of which is attached to finger **168** while the other is attached to bracket **171**. Proper positioning of finger **168** is assured by a projection **173** from bracket **171** (Figure 8). It is to be observed that when release switch **142** is closed to cause carrier arm **5** and its plate **33** and rail **34** to go into throwing operation, feed finger **162** moves up out of the way to clear arm **5** and stop finger **168** is turned down as carrier plate **33** passes over it. Under these circumstances the loaded target is free to commence movement on plate **33** along rail **34** and be thrown.

When the master switch **145** of the trap is open, in which condition motor **7** is stopped, the trap after firing is inoperable and throwing arm **5** is in the fired position as shown in Figures 1 and 2. In this position, mainspring crank stud **45** is standing at the in dead center while within the gear housing **3** the control cam **65** is positioned so as to dispose notch **78** about 150° counter-clockwise from the cocked position shown in Figure 6. At this condition of the trap, sear **79** is resting upon the rim **77** of the control cam **65** out of notch **78** and at the same time follower **97** of the cocking pawl **91** is disposed beyond the trailing end of the protuberant portion **75** at the leading or initial portion of the recessed portion **76** of the control cam **65** which permits the cocking pawl finger **96** to rest in the ratch teeth **74** of ring gear **73** under the force of compressed cocking pawl spring **98** while the hold back pawl **94** also rests in the ratchet teeth **74** into which it had been moved during the last previous manual firing operation as the stud **45** began to move back toward in dead center. With the parts of the mechanism thus positioned, it is evident that when the master switch **145** of the trap is closed, the first thing that happens as soon as the motor **7** has gone into continuous operation, is that sun gear **62** acting through planetary gears **70**, **71** and **72**, rolls the planetary gears, the control cam **65** and the arm **5** counter-clockwise (Figure 2) until sear **79** falls into notch **78**, just before which time follower **97** on cocking pawl **91** rides up on protuberant portion **75** of control cam **65** causing the finger **96** of cocking pawl **91** to be disengaged from ratchet **74** of ring gear **73**. This gear **73** then goes into clockwise motion the first effect of which is to throw the hold back pawl **94** toward magnet **99** which serves as a detent keeping hold back pawl **94** out of the ratchet of the idling ring gear **73**. It is to be noted that on the

first cocking stroke from the fired position, a target is fed from the magazine just as if the arm 5 had previously been cocked and gone through a complete cycle.

While the hold back pawl 94 has been described with a magnetic detent, it is to be understood that the detent may consist instead, for example, of a lever attached to the upper end of hold back pawl 94 and which lever in turn is linked at its end by means of a pin movably to a detent plunger mounted slidably in a receptacle in gear housing 3 so as to engage one or the other of its two grooves with a pair of oppositely disposed detent balls. With this alternate construction, the force of ratchet 74 on cocking pawl 91 when the momentum of the arm has been dissipated causes the hold back pawl 94 and its lever to turn clockwise (Figure 6) and push the detent plunger into its receptacle until the detent balls engage with one of the grooves to hold pawl 94 in. Thereafter, with the cocking pawl 91 out of engagement with ratchet 74, the movement of ring gear 73 causes the hold back pawl 94 and its lever to turn counter-clockwise pulling the detent rod out of its receptacle until the detent balls cammed out of the first groove fall into the second. As a modification, the plunger may be provided only with one groove, i.e. the second, to hold pawl 94 out. Alternately, the outer tip of pawl 94 may be provided with a spring loaded protruding ball engageable with an opposing arcuate surface and a depression formed in a juxtaposed extension of housing 3 so as to hold pawl 94 out when the ball falls into the depression until cammed out by the action of cocking pawl 91. In still another form, the detent may consist of a spring loaded sliding latch mounted on housing 3 and adapted to be cammed into engagement with a sloping projection on the hold back pawl 94 and to be cammed out of engagement when pawl 94 is urged into ratchet teeth 74. Other equivalent detent mechanism may be employed for the function desired.

From the foregoing description it is obvious that in accordance with this invention a new and compact electrically operated target throwing apparatus with desirable operating characteristics is provided. The apparatus of this invention has the further advantage of automatic loading of targets from a desirably large supply of them in the magazine without the frequent and constant supervision of an operator. Another advantage of the target throwing trap is that target movement both in the magazine and while in transit from the magazine to the throwing arm is gentle so as to virtually eliminate the danger of target breakage. The trap is characterized by smooth operation so as not to interfere with the proper emplacement of the target on the throwing arm. In the event that a defective target should for any reason break, the magazine and loading arrangement is such as to be self-clearing and will suffer no interference with the target feed operation. It will be noted that with the trap structure provided there is no need for constant adjustment and maintenance since practically all the working parts which carry the load are sealed in the oil bath of the housing and are of a sturdy and dependable mechanical nature. Nevertheless, all desirable adjustments such as that of spring tension and angles are available and easily accomplished in the trap. The trap is adapted to be most easily loaded initially while in the fired position shown in Figures 1 and 2, which is the safest, after which targets may be added to the nearly depleted supply stack at infrequent intervals as needed with complete safety and without interrupting the continued operation of the trap. Thus, it is quite apparent that the apparatus of this invention is advantageous in the art of skeet shooting and that the objects and advantages are accordingly accomplished.

Since many other embodiments of this invention may occur to those skilled in the art, it is to be understood the foregoing is intended by way of illustration of a preferred embodiment and not as a limitation of the scope of the present invention except as set forth in the appended claims.

What I claim as my invention is:

1. In a target throwing trap, the combination of a supporting base, a frame mounted for angular movement about a substantially horizontal axis on said base for altering the angle of elevation at which the targets are ejected from the trap, a spring actuated throwing arm movably mounted on said frame, motor operated means for cocking said spring and returning said throwing arm to the target loading and ready-to-fire positions in the same direction as the throwing movement, means for supplying targets, escapement means for releasing supporting and conveying targets one at a time to said arm from said supply means ahead of the arm as it approaches the loading position, means for positioning the released target for throwing, means for preventing target damaging impact movement of said arm between the target loading and the ready-to-fire positions, means for varying the angle relative to the arm at which the target is ejected from said arm to provide levelness of said ejected target and to minimize deviations from the straight-away target trajectory, control means for automatically actuating said cocking means when the spring power has spent itself and the arm is in the fired position, and means for firing said trap.

2. In a target throwing trap having a supporting base, a frame pivotally mounted about a substantially horizontal axis on said base, a spring actuated light weight target throwing arm having a main shaft mounted rotatably on said frame and means for supplying targets to said arm, the improvement comprising a compact mechanism having a minimum of inertia for holding, throwing, cocking, loading targets one-at-a-time from said supply means to said arm and releasing said trap, and a motor for operation of the trap, said mechanism including a uniaxial arrangement of said shaft, an intermittently driving and controlling epicyclic gear train connected at one end to said motor and the other to a relatively light weight driving member fixed on said shaft and disengageable by said train from said motor, a target feed cam and a target escapement cam, thereby offering the least inertial resistance to said throwing.

3. In a target throwing trap, the combination of a supporting base, a frame mounted for angular movement about a substantially horizontal axis on said supporting base for altering the angle of elevation at which the targets are ejected from the trap, a spring actuated throwing arm movably mounted on said frame, a motor for operating said trap, means for cocking said spring and returning said throwing arm to the target loading and ready-to-fire positions successively all in the same direction as the throwing movement, means for releasably holding said arm in the ready-to-fire position, means for supplying targets, escapement and transfer means for releasing targets one at a time to said arm from said supply means to said moving arm in the loading position, means for finally positioning the released target on said moving arm in the ready-to-fire position, arm decelerating control means responsive to the spring becoming fully cocked for preventing target damaging impact movement of said arm with said target between the target loading and the ready-to-fire positions, means for releasing said arm to throw a target, and control means for automatically actuating said cocking means when the spring throwing power has spent itself.

4. In a target throwing trap having a rotatable throwing arm and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine mounted on said trap, target escapement and transfer means for supplying targets to said arm, from said magazine, a main shaft having secured thereon said

throwing arm and a crank connecting said shaft to said mainspring, a sun gear rotatably mounted about said main shaft and adapted to be continuously driven by said motor, a control cam mounted on said main shaft to turn with said main shaft, planetary gears rotatably carried by said control cam and engaging with said sun gear, an internal ring gear rotatably mounted about and engaging with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion and also having a circumferential rim with a notch, said internal ring gear having circumferentially disposed ratchet teeth, a ratchet wheel fixedly mounted on the hub of said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating lever, a movable firing pin, a firing bar pivotally linked adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam, means for urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of the control cam being adapted by coaction with said cocking pawl follower to permit the cocking pawl tooth to engage with the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting the sun gear to put the planetary gears into revolution and the control cam into motion so as to drive the throwing arm toward the cocked position, and a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages with the ring gear ratchet, said hold back pawl when engaging with said ring gear ratchet being adapted to hold the ring gear stationary after said mainspring crank has been driven beyond dead center toward the cocked position, said sear being adapted to fall into the notch of said control cam under the force of said sear plunger thereby holding the throwing arm at the cocked position.

5. In a target throwing trap having a frame, a rotatable throwing arm, and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine for supplying targets to said arm, a main shaft rotatably mounted on said frame and carrying secured on one end of said shaft said throwing arm while the other end of said shaft is connected to said mainspring by means of a crank, motor driven means for automatically cocking the spring and returning said throwing arm to the cocked position, means for releasably holding said arm in the cocked position and for releasing said arm to throw a target, loading means for transferring a target from said magazine to the arm before release in cooperation with said cocking means, said loading means comprising a target feed cam mounted on said main shaft, a target escapement cam mounted on said shaft, escapement cushions carried by a pivotally mounted lever adapted to be pivoted by said escapement cam to carry said cushions into and out of engagement with the periphery of a target adjacent the bottom of the stack of targets carried in said magazine, a target feed shelf adapted to be moved into slightly spaced proximity with the lowermost target in said magazine by means of a pivotally mounted lever adapted to be pivoted by said target feed cam in timed relationship with said target escapement cam and with said target cocking, holding, releasing and throwing operations, said feed and escapement cams being adapted after the arm is released to first elevate the target feed shelf near to the bottom of the stack and then to disengage said escapement cushions from the lowermost target of the stack, thereby enabling the stack to come to rest upon the feed shelf, after which said shelf actuated by said feed cam and with the stack supported thereon is lowered a sufficient distance to permit said escapement cushions actuated by said escapement cam to thereafter engage with the second from the bottom target in the magazine thereby supporting the remaining targets in the magazine above and including the second from the bottom target as the shelf and the target are lowered further to enable the throwing arm as it is being brought to the cocked position to receive said target.

6. In a target throwing trap having a frame, a rotatable throwing arm, and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine for supplying targets to said arm, a main shaft rotatably mounted on said frame and carrying secured on one end of said shaft said throwing arm while the other end of said shaft is connected to said mainspring by means of a crank, motor driven means for automatically cocking the spring and returning said throwing arm to the cocked position, means for releasably holding said arm in the cocked position and for releasing said arm to throw a target, loading means for transferring a target from said magazine to the arm before release in cooperation with said cocking means, said loading means comprising a target feed cam mounted on said main shaft, a target escapement cam mounted on said shaft, resilient escapement cushions carried by a pivotally mounted lever adapted to be pivoted by said escapement cam to carry said resilient cushions into and out of engagement with the periphery of a target adjacent the bottom of the stack of targets carried in said magazine, a target feed shelf adapted to be moved into slightly spaced proximity with the lowermost target in said magazine by means of a pivotally mounted lever adapted to be pivoted by said target feed cam in timed relationship with said target escapement cam and with said target cocking, holding, releasing and throwing operations, said feed and escapement cams being adapted after the arm is released to first elevate the target feed shelf near to the bottom of the stack and then to disengage said escapement cushions from the lowermost target of the stack, after which the said shelf is lowered a sufficient distance to permit said escapement cushions to thereafter engage with the second from the bottom target in the magazine thereby supporting the remaining targets in the magazine above and including the second from the bottom target as the shelf and the target are lowered further to enable the throwing arm as it is being cocked to receive said target.

7. In a target throwing trap having a rotatably mounted target throwing arm a main power spring for moving the arm by means of a crank and a shaft from a cocked position to effectuate throwing of the target, the combination comprising a continuously operating electric motor, automatic mechanism for cocking the trap with said motor so as to bring the arm to the cocked position at a point beyond out dead center of said crank in the same direction as the throwing rotational movement, and target loading means including a magazine for holding a plurality of targets and escapement and feed members operated by said motor for delivering targets to said

arm one at a time during the cocking operation, said cocking mechanism including means for dynamic braking of said arm with said motor during the cocking operation in its movement corresponding to the crank movement between out dead center and the cocked position of said arm.

8. In a target throwing trap having a rotatably mounted target throwing arm and a main power spring for moving the arm by means of a crank and a shaft from a cocked position to effectuate throwing of the target, the combination comprising a continuously operating motor, a cocking mechanism engageable by said motor at the termination of the throwing stroke of said arm for returning the arm to the cocked position as a continuation of and in the same direction as the throwing stroke to a point beyond out dead center of said crank, a magazine for holding a plurality of targets in a substantially upwardly extending stack, target escapement means engageable with the periphery of a target in said stack for supporting the stack, shelf means engageable with the lowermost target in said stack, first means for disengaging the escapement means from said stack in synchronism with the rotation of said arm when said shelf is in juxtaposition with and slightly below the lowermost target of the stack, a second means for lowering said shelf and stack supported thereon sufficiently to position the second from the bottom target of the stack opposite said escapement means, said first means being adapted to again bring the escapement means into engagement with the stack at the second from the bottom target in synchronism with the rotation of said arm, after which said second means is adaptable to disengage said lowermost target carried on said shelf from the stack and lower it to a position at which the target can be taken up by the arm.

9. In a target throwing trap having a rotatably mounted target throwing arm and a main power spring for moving the arm by means of a crank and a shaft from a cocked position to effectuate throwing of the target, the combination comprising a motor, mechanism for automatically cocking the trap, a magazine disposed in a fixed position on said trap with respect to said shaft for holding a plurality of targets and means operable in synchronism with said throwing arm for feeding targets one at a time from the magazine to substantially the same loading position on the arm, said arm including a target guiding rail adjustable with respect to said arm to effectuate discharge of targets at a position which may be varied in the range from an angle of lag to one of lead by said adjustment of said rail.

10. In a target throwing trap having a rotatable throwing arm and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine mounted on said trap for supplying targets to said arm, a main shaft having secured thereon said throwing arm and a crank connecting said shaft to said mainspring, a sun gear rotatably mounted about said main shaft and adapted to be continuously driven by said motor, a control cam mounted on said main shaft to turn with said main shaft, planetary gears rotatably carried by said control cam and engaging with said sun gear, an internal ring gear rotatably mounted about and engaging with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion and also having a circumferential rim with a notch, said internal ring gear having circumferentially disposed ratchet teeth, a ratchet wheel fixedly mounted on the hub of said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating lever, a movable firing pin, a firing bar pivotally linked adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam, means for urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of the control cam being adapted by coaction with said cocking pawl follower to permit the cocking pawl tooth to engage with the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting the sun gear to put the planetary gears into revolution and the control cam into motion so as to drive the throwing arm toward the cocked position, a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages with the ring gear ratchet, said hold back pawl when engaging with said ring gear ratchet being adapted to hold the ring gear stationary after said mainspring crank has been driven beyond dead center toward the cocked position, said sear being adapted to fall into the notch of said control cam under the force of said sear plunger thereby holding the throwing arm at the cocked position, said holding back pawl being adapted thereupon to be disengaged from said ring gear ratchet upon reversal of said ring gear, and target escapement and feed means for releasing a target from said magazine and depositing the target ahead of the throwing arm before said arm is released for the next throwing operation.

11. In a target throwing trap having a rotatable throwing arm and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine mounted on said trap, target escapement and transfer means for supplying targets to said arm, from said magazine, a main shaft having secured thereon said throwing arm and a crank connecting said shaft to said mainspring, a sun gear rotatably mounted about said main shaft and adapted to be continuously driven by said motor, a control cam mounted on said main shaft to turn with said main shaft, planetary gears rotatably carried by said control cam and engaging with said sun gear, an internal ring gear rotatably mounted about and engaging with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion and also having a circumferential rim with a notch, said internal ring gear having circumferentially disposed ratchet teeth, a ratchet wheel fixedly mounted on the hub of said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating lever, a movable firing pin, a firing bar pivotally linked adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the

notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam, means for urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of the control cam being adapted by coaction with said cocking pawl follower to permit the cocking pawl tooth to engage the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting the sun gear to put the planetary gears into revolution and the control cam into motion so as to drive the throwing arm toward the cocked position, a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages with the ring gear ratchet, said hold back pawl when engaging with said ring gear ratchet being adapted to hold the ring gear stationary after said mainspring crank has been driven beyond dead center toward the cocked position, said sear being adapted to fall into the notch of said control cam under the force of said sear plunger thereby holding the throwing arm at the cocked position and detent means for keeping said hold back pawl disengaged from said ring gear ratchet while the arm is cocked and during the throwing operation.

12. In a target throwing trap having a rotatable throwing arm and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine mounted on said trap, target escapement and transfer means for supplying targets to said arm, from said magazine, a main shaft having secured thereon said throwing arm and a crank connecting said shaft to said mainspring, a sun gear rotatably mounted about said main shaft and adapted to be continuously driven by said motor, a control cam mounted on said main shaft to turn with said main shaft, planetary gears rotatably carried by said control cam and engaging with said sun gear, an internal ring gear rotatably mounted about and engaging with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion and also having a circumferential rim with a notch, said internal ring gear having circumferentially disposed ratchet teeth, a ratchet wheel fixedly mounted on the hub of said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating lever, a movable firing pin, a firing bar pivotally linked adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam, means for urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of control cam being adapted by coaction with said cocking pawl follower to permit the cocking pawl tooth to engage with the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting the sun gear to put the planetary gears into revolution and the control cam into motion so as to drive the throwing arm toward the cocked position, a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages with the ring gear ratchet and out of engagement with said ring gear ratchet when the motion of said control cam is stopped by said sear, said hold back pawl when engaging with said ring gear ratchet being adapted to hold the ring gear stationary after said mainspring crank has been driven beyond dead center toward the cocked position, said sear being adapted to fall into the notch of said control cam under the force of said sear plunger thereby holding the throwing arm at the cocked position, and magnetic detent means for keeping said hold back pawl disengaged from said ring gear ratchet while the arm is cocked and during the throwing operation.

13. In a target throwing trap having a rotatably mounted target throwing arm and a main power spring for moving the arm by means of a crank and a shaft from a cocked position to effectuate throwing of the target, the combination comprising a motor for operating the trap, a mechanism for automatically cocking the trap, a magazine adapted for holding a plurality of targets in a substantially upwardly extending stack arrangement, and means for permitting the stack to advance downwardly without excessive impact by increments the total of which is substantially equal to the height of the rim of a target nearly all of which height is in stack supported relationship except for a relatively small increment and all independently of said arm, and for transferring targets from the bottom of the advanced stack one at a time in supported relationship independently of said stack as a further increment to said target throwing arm.

14. In a target throwing trap having a frame, a rotatable throwing arm, and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine for supplying targets to said arm, a main shaft rotatably mounted on said frame and carrying secured on one end of said shaft said throwing arm while the other end of said shaft is connected to said mainspring by means of a crank, motor driven means for automatically cocking the spring and returning said throwing arm to the cocked position, means for releasably holding said arm in the cocked position and for releasing said arm to throw a target, loading means for transferring a target from said magazine to the arm before release in cooperation with said cocking means, said loading means comprising a target feed cam mounted on said main shaft, a target escapement cam mounted on said shaft, escapement cushions carried by a pivotally mounted lever adapted to be pivoted by said escapement cam to carry said cushions into and out of engagement with the periphery of a target adjacent the bottom of the stack of targets carried in said magazine, a spring supported target feed shelf adapted to be moved into slightly spaced proximity with the lowermost target in said magazine by means of a pivotally mounted lever adapted to be pivoted by said target feed cam in timed relationship with said target escapement cam and with said target cocking, holding, releasing and throwing oeprations, said feed and escapement cams being adapted after the arm is released to elevate the target feed shelf near to the bottom of the stack and then to disengage said escapement cushions from the lowermost target of the stack, after which the said shelf is lowered a sufficient distance to permit said escapement cushions to thereafter engage with the second from the bottom target in the magazine thereby

supporting the remaining targets in the magazine above and including the second from the bottom target as the shelf and the target are lowered further to enable the throwing arm as it is being cocked to receive said target.

15. In a target throwing trap having a frame, a rotatable throwing arm, and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine for supplying targets to said arm, a main shaft rotatably mounted on said frame and carrying secured on one end of said shaft said throwing arm while the other end of said shaft is connected to said mainspring by means of a crank, motor driven means for automatically cocking the spring and returning said throwing arm to the cocked position, motor operated means for releasably holding said arm in the cocked position and for releasing said arm to throw a target, loading means for transferring a target from said magazine to the arm before release in cooperation with said cocking means, said loading means comprising a target feed cam mounted on said main shaft, a target escapement cam mounted on said shaft, escapement cushions carried by a pivotally mounted lever adapted to be pivoted by said escapement cam to carry said cushions into and out of engagement with the periphery of a target adjacent the bottom of the stack of targets carried in said magazine, a yieldably supported target feed shelf adapted to be moved into slightly spaced proximity with the lowermost target in said magazine by means of a pivotally mounted lever adapted to be pivoted by said target feed cam in timed relationship with said target escapement cam and with said target cocking, holding, releasing and throwing operations, said feed and escapement cams being adapted after the arm is released to elevate the target feed shelf near to the bottom of the stack and then to disengage said escapement cushions from the lowermost target of the stack, after which the said shelf is lowered a sufficient distance to permit said escapement cushions to thereafter engage with the second from the bottom target in the magazine thereby supporting the remaining targets in the magazine above and including the second from the bottom target as the shelf and the target are lowered further to enable the throwing arm as it is being cocked to receive said target.

16. In a target throwing trap having a target throwing arm rotatably mounted on a frame the combination comprising a source of power for operating the trap, a magazine of the stack arrangement type carried on said frame for supplying targets to said arm, a main shaft rotatably mounted on said frame and carrying secured on said shaft said throwing arm, means driven by said power source and operable through said main shaft for automatically cocking the trap whereby said throwing arm is returned without reversal to the cocked position after a target has been thrown, means included in said cocking means for releasably holding said arm in the cocked position and for releasing said arm to throw a target, and loading means driven by said power source for delivering targets from said magazine to the arm before release in cooperation with said cocking means, said loading means comprising target feed control means driven by said shaft, target escapement control means driven by said shaft, escapement means operated by said escapement control means to move into and out of engagement with a target carried in said magazine adjacent the discharge end of the stack of targets, target feed means carried movably on said frame and adapted to be moved into slightly spaced proximity with the endmost target in said magazine by said target feed control means and with said target, cocking, holding releasing and throwing operations, said escapement and feed control means being adapted after the arm is released to first move the target feed means into said spaced proximity with respect to the discharge end of the stack and then to disengage said escapement means from the endmost target of the stack thereby enabling the stack to come to rest against the feed means after which said feed means actuated by said feed control means and with the stack in contiguity therewith is moved a sufficient distance to permit said escapement means actuated by said escapement control means to thereafter engage with at least the second from the endmost target in the magazine thereby restraining the remaining targets in the magazine back of and including the second from the endmost target after which the feed means and the target remaining and deposited thereon to be fired are moved further to enable the throwing arm as it is being brought to the cocked position to receive said target.

17. The target throwing trap of claim 16 including means for adjusting the position of said target feed member with respect to said arm.

18. In a target throwing trap having a frame, a rotatable throwing arm, and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine for supplying targets to said arm, a main shaft rotatably mounted on said frame and carrying secured on one end of said shaft said throwing arm while the other end of said shaft is connected to said mainspring by means of a crank, motor driven means operable through said main shaft for automatically cocking the spring and returning said throwing arm without reversal to the cocked position, means for releasably holding said arm in the cocked position and for releasing said arm to throw a target, motor driven loading means for delivering targets from said magazine to the arm before release in copperation with said cocking means, said loading means comprising a target feed cam drivably mounted on said main shaft, a target escapement cam drivably mounted on said shaft, escapement cushions carried by a pivotally mounted lever adapted to be pivoted by said escapement cam to carry said cushions into and out of engagement with a target carried in said magazine adjacent the bottom of the stack of targets, a target feed shelf movably mounted on said frame and adapted to be moved into slightly spaced proximity with the lowermost target in said magazine by means of a pivotally mounted lever adapted to be pivoted by said target feed cam in timed relationship with said target escapement cam and with said target cocking, holding, releasing and throwing operations, shim means for adjusting the position of said target feed shelf, said feed and escapement cams being adapted after the arm is released to first elevate the target feed shelf near to the bottom of the stack and then to disengage said escapement cushions from the lowermost target of the stack, thereby enabling the stack to come to rest upon the feed shelf, after which said shelf actuated by said feed cam and with the stack supported thereon is lowered a sufficient distance to permit said escapement cushions actuated by said escapement cam to thereafter engage with the second from the bottom target in the magazine thereby supporting the remaining targets in the magazine above and including the second from the bottom target after which the shelf and the targets are lowered further to enable the throwing arm as it is being brought the the cocked position to receive said target.

19. In a target throwing trap having a target throwing arm, the combination comprising a source of power for operating the trap, a magazine holding a plurality of targets in a stack arrangement, a mechanism for cocking the trap automatically without reversal of said arm and means for automatically permitting the stack to advance without excessive mpact by increments the total of which is substantially equal to the height of the rim of a target and substantially all the way in supported relationship and for automatically transferring targets in a further increment in said relationship from the discharge end of the advanced stack one at a time to said target throwing arm.

20. In a target throwing trap having a target throwing arm, the combination comprising a motor for operating the trap, a magazine holding a plurality of targets in a stack arrangement, a motor operated mechanism for cocking the trap automatically and motor operated means for automatically permitting the stack to advance without excessive impact by increments the total of which is substantially equal to the height of the rim of a target and substantially all the way in supported relationship and for automatically transferring targets in a further increment in said relationship from the discharge end of the advanced stack one at a time to said target throwing arm and means for firing the trap manually from a position adjacent the trap and electrically operated means for firing the trap from a position remote from the trap.

21. In a target throwing trap having a rotatable throwing arm and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine for supplying targets to said arm, a main shaft having secured thereon said throwing arm and a crank connecting said shaft to said mainspring, a sun gear rotatably mounted about said main shaft and adapted to be continuously driven by said motor, a control cam mounted on said main shaft to turn with said main shaft, planetary gears rotatably carried by said control cam and engaging with said sun gear, an internal ring gear rotatably mounted about and engaging with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion and also having a circumferential rim with a notch, said internal ring gear having circumferentially disposed ratchet teeth a ratchet wheel fixedly mounted on the hub of said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating lever, a movable firing pin, means operable from a position remote from the trap for actuating said firing pin whereby a target can be released by an operator located at said remote position, means manually operable at the trap for acting on said operating lever whereby said sear member may be actuated by an operator adjacent the trap in lieu of said means for actuating said firing pin from a remote position, a firing bar pivotally linked adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam, means for urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of control cam being adapted by coaction with said cocking pawl followers to permit the cocking pawl tooth to engage with the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting the sun gear to put the planetary gears into revolution and the control cam into motion so as to drive the throwing arm toward the cocked position, and a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages with the ring gear ratchet, said hold back pawl when engaging with said ring gear ratchet being adapted to hold the ring gear stationary after said mainspring crank has been driven beyond dead center toward the cocked position, said sear being adapted to fall into the notch of said control cam under the force of said sear plunger thereby holding the throwing arm at the cocked position.

22. In a target throwing trap having a rotatable throwing arm and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine for supplying targets to said arm, a main shaft having secure thereon said throwing arm and a crank connecting said shaft to said mainspring, a sun gear rotatably mounted about said main shaft and adapted to be continuously driven by said motor, a control cam mounted on said main shaft to turn with said main shaft, planetary gears rotatably carried by said control cam and engaging with said sun gear, an internal ring gear rotatably mounted about and engaging with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion and also having a circumferential rim with a notch, said internal ring gear having circumferentially disposed ratchet teeth, a ratchet wheel fixedly mounted on the hub of said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating lever, a movable firing pin, electrically operated thrust means for actuating such firing pin, a firing bar pivotally linked adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam, means for urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of control cam being adapted by coaction with said cocking pawl follower to permit the cocking pawl tooth to engage with the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting the sun gear to put the planetary gears into revolution and the control cam into motion so as to drive the throwing arm toward the cocked position, and a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages with the ring gear ratchet, said hold back pawl when engaging with said ring gear ratchet being adapted to hold the ring gear stationary after said mainspring crank has been driven beyond dead center toward the cocked position, said sear being adapted to fall into the notch of said control cam under the force of said sear plunger thereby holding the throwing arm at the cocked position.

23. In a target throwing trap having a rotatable throwing arm and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of a motor for operating the trap, a magazine for supplying targets to said arm, a main shaft having secured thereon said throwing arm and a crank connecting said shaft to said mainspring, a sun gear rotatably

mounted about said main shaft and adapted to be continuously driven by said motor, a control cam mounted on said main shaft to turn with said main shaft, planetary gears rotatably carried by said control cam and engaging with said sun gear, an internal ring gear rotatably mounted about and engaging with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion and also having a circumferential rim with a notch, said internal ring gear having circumferentially disposed ratchet teeth, a ratchet wheel fixedly mounted on the hub of said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating lever, a movable firing pin, a solenoid for operating said firing pin from a position remote from the trap, a pivotally mounted trigger dog for acting on said operating arm of the sear member, a manually operable trigger mounted on the trap for actuating said trigger dog whereby the trap can be operated from a position adjacent the trap independently of said remotely controlled solenoid, a firing bar pivotally linked adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam, means for urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of control cam being adapted by coaction with said cocking pawl follower to permit the cocking pawl tooth to engage with the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting sun gear to put the planetary gears into revolution and the control cam into motion so as to drive the throwing arm toward the cocked position, and a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages with the ring gear ratchet, said hold back pawl when engaging with said ring gear ratchet being adapted to hold the ring gear stationary after said mainspring crank has been driven beyond dead center toward the cocked position, said sear being adapted to fall into the notch of said control cam under force of said sear plunger thereby holding the throwing arm at the cocked position.

24. A trap having a rotatably mounted target throwing arm comprising a target rail mounted parallel to said arm with angular adjustability on said arm to effectuate discharge of targets therefrom at a position which may be varied by adjustment of said rail wherein said target throwing arm is mounted for rotation in one direction and wherein the trap includes a magazine having means for delivering a target to the arm in the loading position ahead of the ready-to-fire position, yieldably mounted retractable means operating on the targets for guiding a target delivered from said magazine toward the ready-to-fire target position on the arm, yieldably mounted retractable stop means operating on the targets subsequent to said first means for finally positioning said target at said ready-to-fire target position, and guide means effective from a predetermnied position back of the target radially of said arm whereby said target is provided with 3-point constraint in said ready-to-fire target position with respect to said stop means, rail and guide means, said retractable means being adapted to be rocked out of the way of said arm during the throwing step.

25. A trap according to claim 5 which includes a retractable target feed finger yieldably mounted on said frame for guiding a target deposited from said magazine toward the ready-to-fire target position on the arm, a retractable target stop finger yieldably mounted on said frame operating on the target subsequent to said feed fiinger for finally positioning said target at said ready-to-fire target position with respect to the arm, and a guide member on said shelf effective from a predetermined position back of the target radially of said arm whereby said target is provided with 3-point constraint in said ready-to-fire position with respect to said stop finger, arm and guide member, said fingers being adapted to be rocked out of the way of said arm during the throwing step.

26. In a target throwing trap, the combination of a supporting base, a frame mounted for angular movement about a substantially horizontal axis on said supporting base for altering the angle of elevation at which the targets are ejected from the trap, a spring actuated throwing arm movably mounted on said frame, a motor for operating said trap, means for cocking said spring and returning said throwing arm to the target loading and ready-to-fire positions, means for releasably holding said arm in the ready-to-fire position, means for supplying targets one at a time to said arm, escapement means for releasing a target from said supply means to the arm in the loading position, means for positioning the released target in the ready-to-fire position, means for releasing said arm to throw a target, and control means for automatically actuating said cocking means when the spring throwing power has spent itself, and means for angularly moving said frame with respect to said base, said moving means consisting of a swivel shaft mounted pivotally on said base in substantially parallel spaced relationship with respect to said horizontal axis, a crankshaft one end of which engages threadedly with an internally threaded bore extending transversely through said swivel shaft and the other end of which passes rotatably through said frame and carries crank means for turning said crank shaft which is mounted with constraint against movement of said frame along the length of said crankshaft.

27. The trap of claim 4 wherein driving power from the motor is transmitted to said sun gear by means of a driving worm engaged with a worm wheel fixedly mounted on the hub of said sun gear, said worm and worm wheel gear having gear teeth of sufficiently steep lead to avoid self-locking whereby said motor is always permitted to start without miximum load.

28. In a target throwing trap having a rotatable throwing arm and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of an electric motor for operating the trap, a magazine for supplying targets to said arm, a main output shaft having thereon said throwing arm and a crank connecting said shaft to said mainspring, a sun gear rotatably mounted about said main shaft, and adapted to be continuously driven by said motor, a control cam mounted on said main shaft to turn with said mainshaft, planetary gears rotatably carried by said control cam and meshing with said sun gear, an internal ring gear rotatably mounted about and meshing with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion, and also having a circumferential rim with a notch, said internal ring gear having circumferentially disposed ratchet teeth, a ratchet wheel fixedly mounted on said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating lever, a movable firing pin, a firing bar pivotally linked

adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for limited engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam means for yieldably urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of the control cam being adapted by coaction with said cocking pawl follower to permit the cocking pawl tooth to engage with the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting the sun gear to put the planetary gears into revolution, and the control cam into motion so as to drive the throwing arm toward the cocked position, a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages with the ring gear ratchet, said hold back pawl when engaging with said ring gear ratchet being adapted to hold the ring gear stationary after said mainspring crank has been driven beyond dead center during the cocking operation, said sear being adapted to fall into the notch of said control cam under the force of said sear plunger thereby holding the throwing arm at the cocked position target escapement and feed means for releasing a target from said magazine and advancing it to the throwing arm before said arm is released for the next throwing operation, and detent means for keeping said hold back pawl disengaged from said ring gear ratchet while the arm is cocked and during the throwing operation, said magazine having a cantilever support on said trap with the free end of said support being slidably anchored with respect to the axis of said shaft to minimize magazine vibration.

29. In a target throwing trap having a rotatable throwing arm, and a mainspring for moving the arm from a cocked position to the target throwing position, the combination of an electric motor for operating the trap, a magazine for supplying targets to said arm, a main output shaft rotatably mounted on said frame and carrying secured on one end of said shaft said throwing arm while the other end of said shaft is connected to said mainspring by means of a crank, a sun gear rotatably mounted about said mainshaft, a driven worm gear wheel fixedly carried on the hub of said sun gear and adapted to be continuously driven through an input worm by said motor, said worm gear wheel and worm having gear teeth of sufficient lead to prevent self-locking, a control cam mounted on said main shaft and adapted to turn with said mainshaft, planetary gears rotatably carried by said control cam and meshing with said sun gear, an internal ring gear mounted about and meshing with said planetary gears, said control cam having a disk cam with a protuberant portion and a receding portion, and also having a circumferential rim with a single notch, said internal ring gear having circumfentially disposed ratchet teeth, a ratchet wheel fixedly mounted on the hub of said sun gear, a sear member having a sear adapted to engage with said notch in the rim of said control cam for holding said throwing arm in the cocked position, said sear member having an operating arm, a movable firing pin, a firing bar pivotally linked adjacent one end of said bar to the end of said operating lever and having adjacent the other end of said bar a shoulder adapted for limited engagement with said ratchet wheel when said bar is pivoted by said firing pin about the end of said lever, a sear plunger acting on said firing bar and adapted to hold the shoulder of said firing bar out of engagement with said ratchet wheel until moved in by the firing pin and also adapted to act on the operating lever of said sear member to urge the sear into the notch of the control cam, said ratchet wheel being adapted when in contact with said shoulder of said firing bar to move said operating lever of said sear member so as to disengage the sear from the notch in said control cam thereby releasing the throwing arm for throwing a target, a cocking pawl having a follower adapted to ride on said protuberant and receding portions of said control cam and also having a tooth adapted to engage with the ratchet of said ring gear when said follower is opposite the receding portion of said control cam, means for urging said cocking pawl toward said ring gear ratchet and control cam, said receding portion of the control cam being adapted by coaction with said cocking pawl follower to permit the cocking pawl finger to engage with the ring gear ratchet when the momentum of the released throwing arm is dissipated thereby holding the ring gear stationary and permitting the sun gear to put the planetary gears into revolution, and the control cam into motion so as to drive the throwing arm toward the cocking position, a hold back pawl adapted to be moved into engagement with the ring gear ratchet when the cocking pawl tooth engages into a ring gear ratchet, said hold back pawl engaging with said ring gear ratchet being adapted to hold the ring gear stationary after mainspring crank has been driven beyond dead center throwing the cocking operation, said gear being adapted to fall into the notch of said control cam under the force of said sear plunger thereby holding the throwing arm at the cocked position target escapement and feed means for releasing a target from said magazine and advancing it to the throwing arm before said arm is released for the next throwing operation, and detent means for keeping said hold back pawl disengaged from said ring gear ratchet while the arm is cocked and during the throwing operation, said magazine being supported on said trap.

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