Sept. 22, 1953 G. H. DARRELL 2,652,820

TARGET THROWING MACHINE

Filed Jan. 10, 1950 7 Sheets-Sheet 1

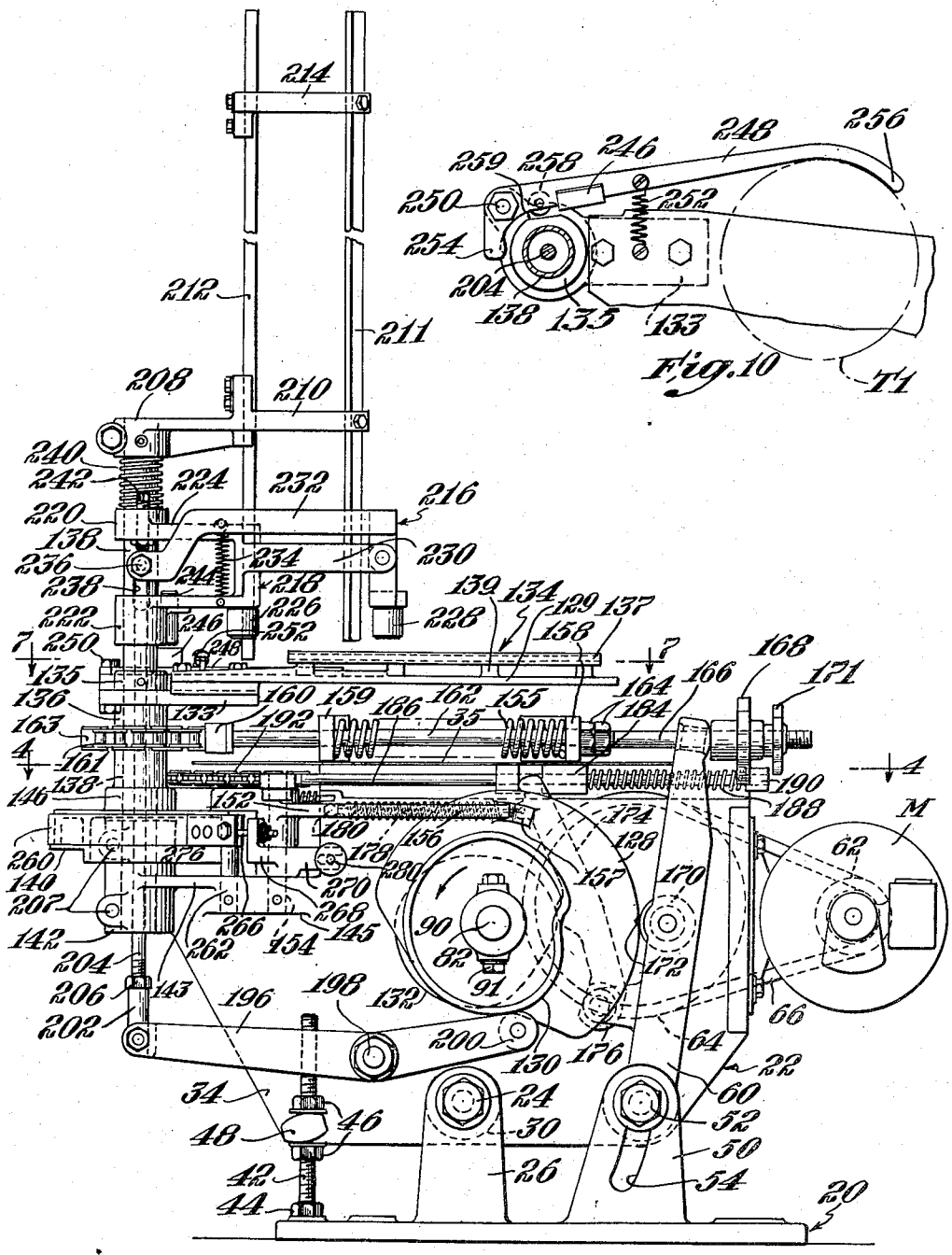


Fig. 1

Fig. 10

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TARGET THROWING MACHINE

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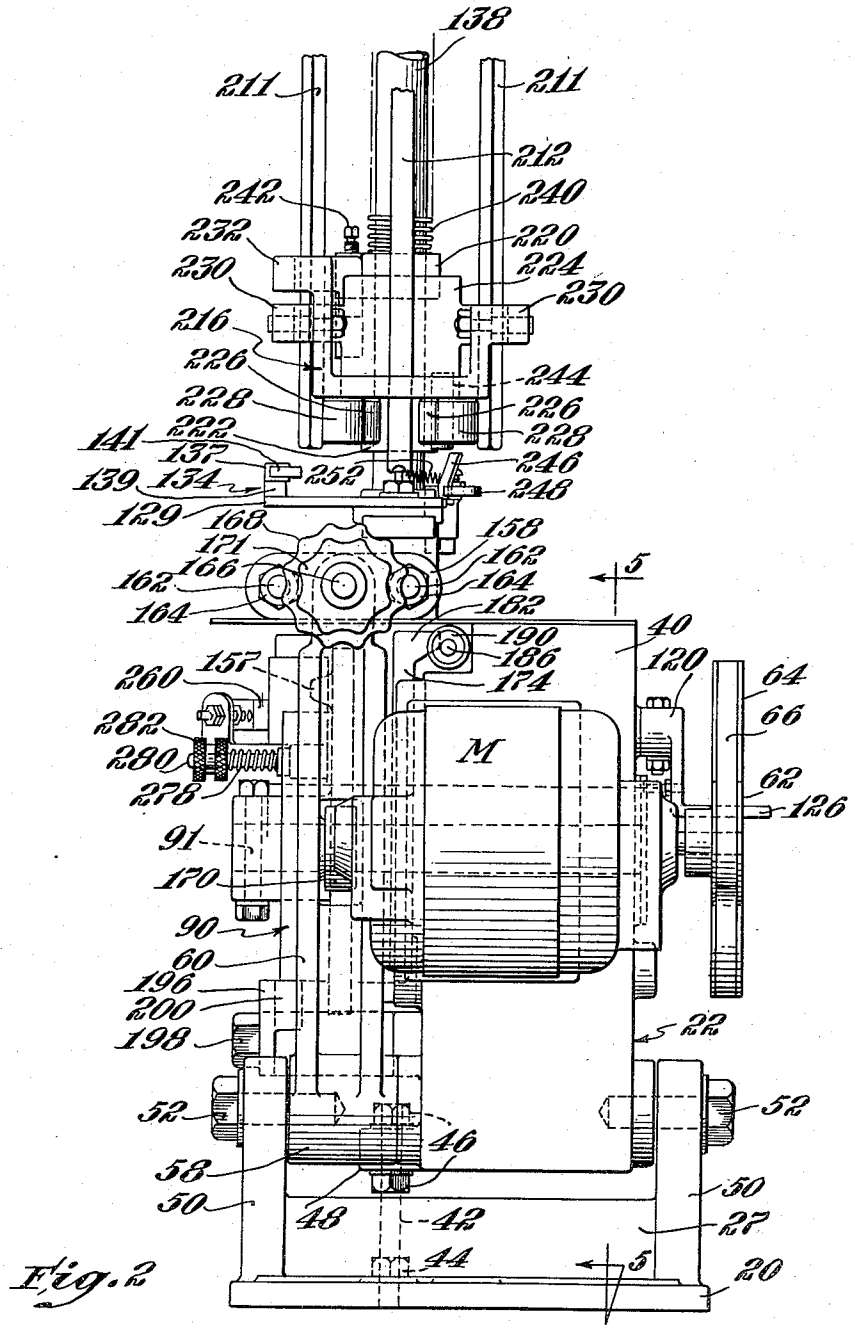


Fig. 2.

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TARGET THROWING MACHINE

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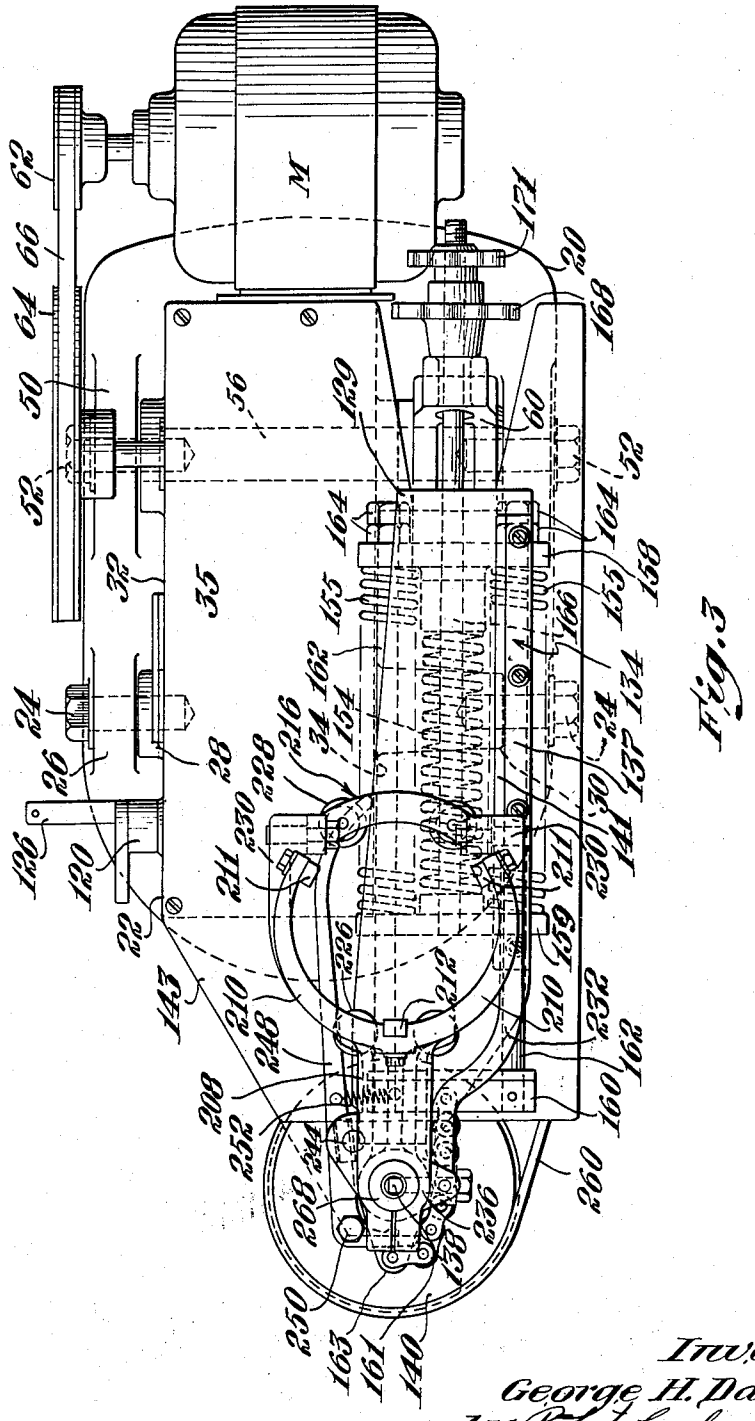


Fig. 3

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TARGET THROWING MACHINE

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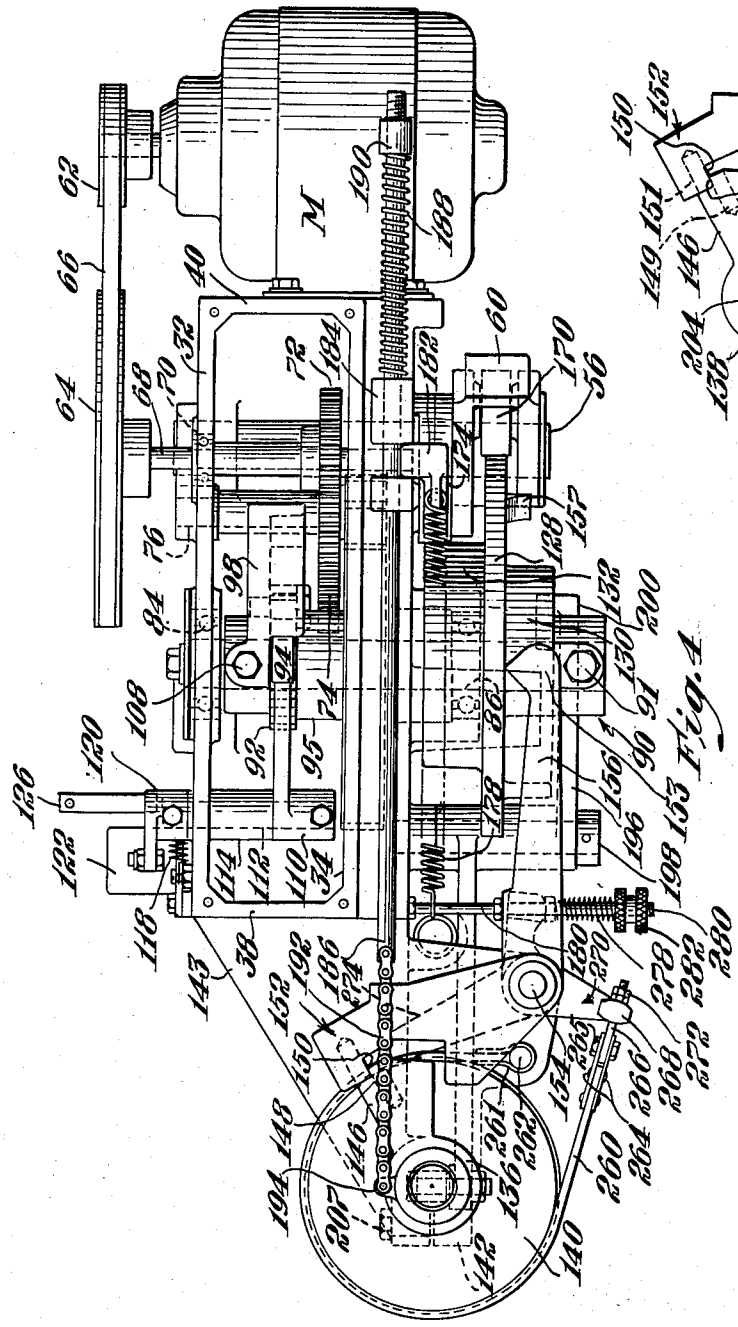


Fig. 4

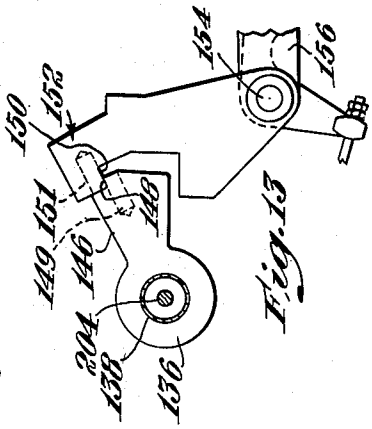


Fig. 13

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TARGET THROWING MACHINE

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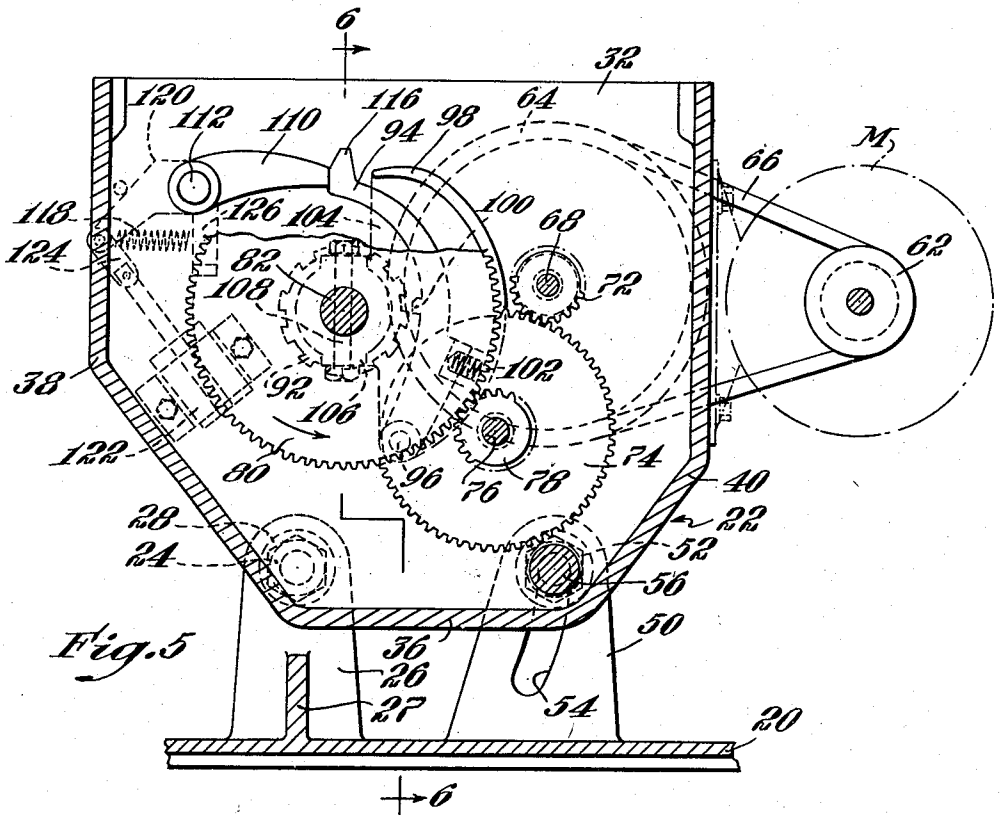


Fig. 5

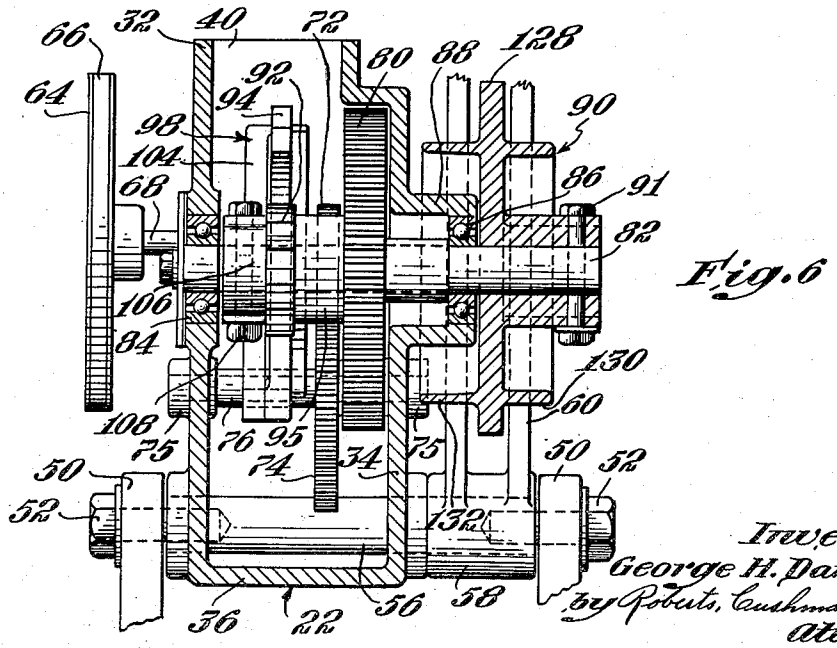


Fig. 6

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TARGET THROWING MACHINE

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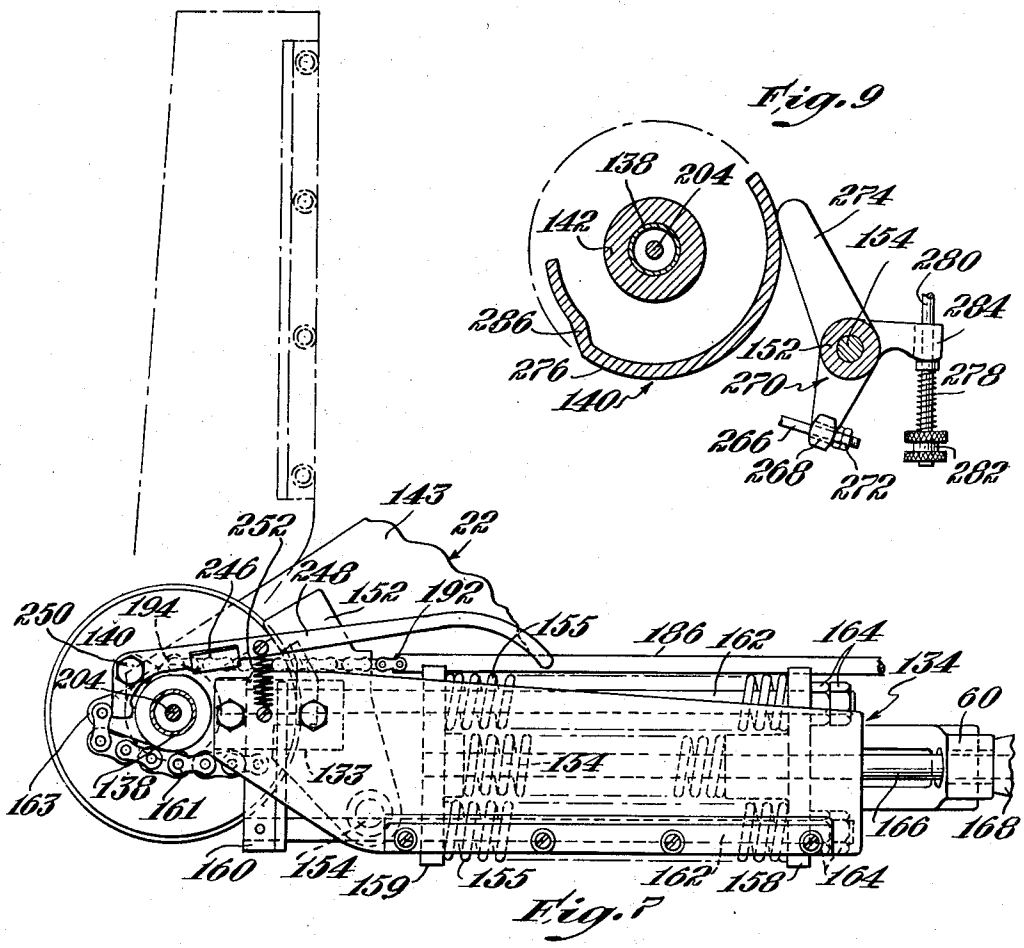


Fig. 7

Fig. 9

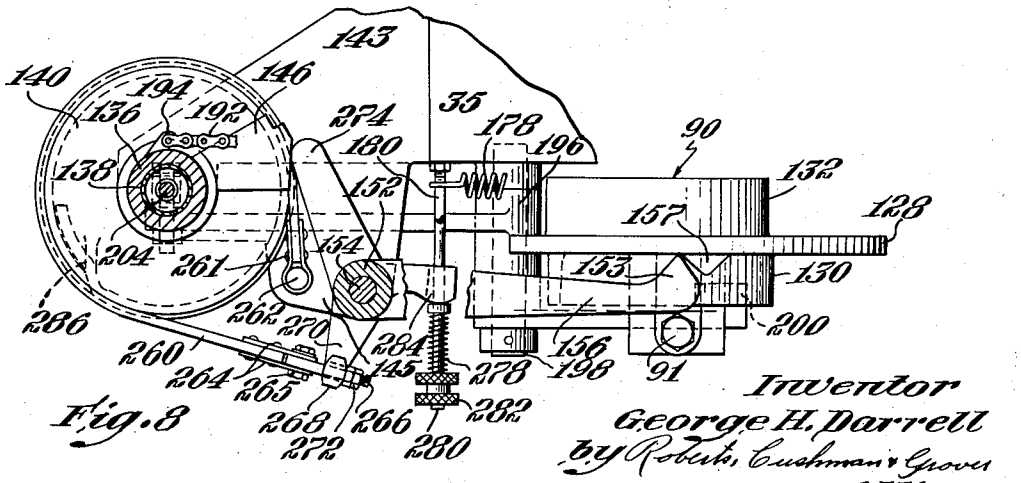


Fig. 8

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TARGET THROWING MACHINE

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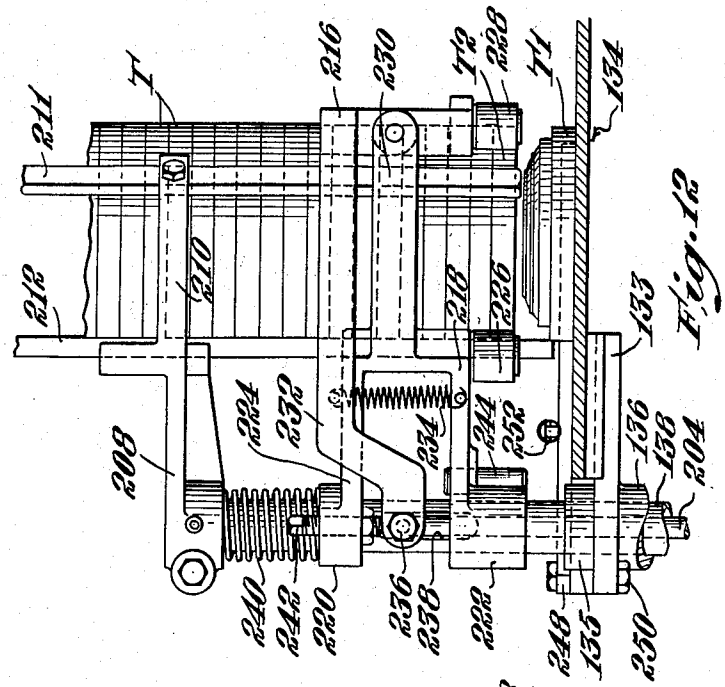


Fig. 12

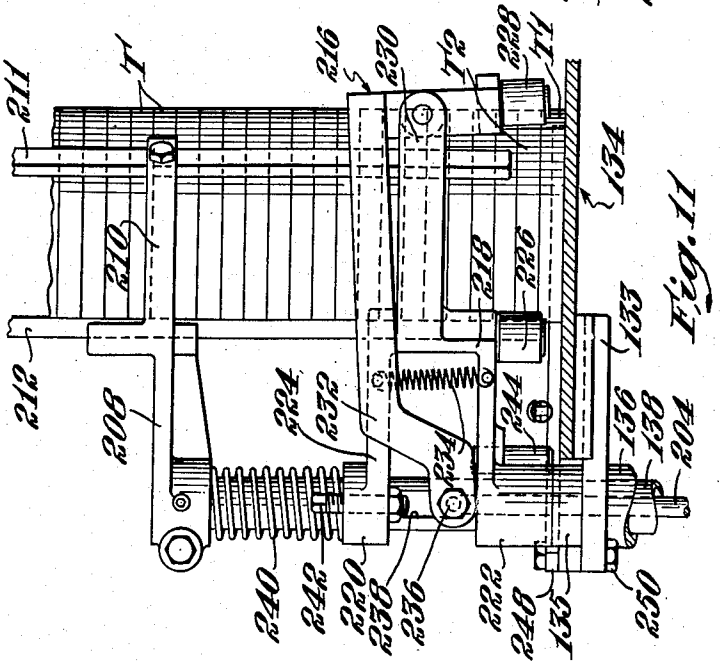


Fig. 11

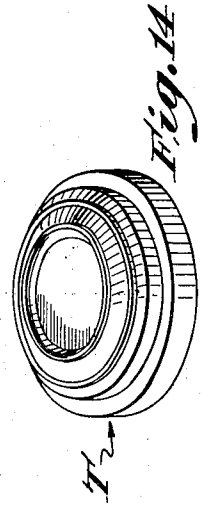


Fig. 14

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2,652,820

UNITED STATES PATENT OFFICE

2,652,820

TARGET THROWING MACHINE

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Application January 10, 1950, Serial No. 137,741

10 Claims. (Cl. 124—8)

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This invention relates to target throwing traps and more particularly to power operated traps of the type wherein targets are automatically fed from a magazine to a throwing arm. A trap of this kind is described in the inventor's Patent No. 2,531,613, issued November 28, 1950, and the present inventions are to a considerable extent improvements on the patented trap.

Objects of this invention are to provide a target throwing trap which is automatic in operation, which operates rapidly and smoothly, which does not jam, which keeps target breakage to a minimum, which operates with a minimum of vibration and shock, which does not require a permanent base, which has provision for adjustment of the flight angle of the targets, which is simple and rugged in construction, and which advances the art of target throwing generally.

In one aspect the invention contemplates a target trap comprising a pivotally mounted throwing arm which is moved by one or more main power springs from a set position, wherein the targets to be thrown are successively placed either directly upon the arm or upon a carrier plate associated therewith, to a target releasing position. The throwing arm is restrained in the set position by locking means until tripped preferably by means operated by the power source which also supplies the power for the remaining elements of the trap, so that the main power springs rapidly rotate the throwing arm to the target releasing position. To reduce the vibration and shock to a minimum, the arm is decelerated by a brake after it moves by the target releasing position. The power source, which is preferably an electric motor, drives timed means for timing the sequence of operation of the various elements of the trap during the operating cycle. After the throwing arm or carrier has been stopped by the brake, the power-actuated timed means or power transmitting assembly releases the spring loading means, to enable the return of the carrier without stressing the power springs. Thereafter, the power transmitting assembly acts to stress or cock the power springs and to effect the delivery of a target from the magazine to the carrier.

In a further aspect the timed means comprises a plurality of cammed surfaces selectively coupled to the motor by means of a clutch which upon engagement causes the cammed surfaces to complete one operating cycle before releasing. During this operating cycle one of the cammed surfaces releases the spring loading means after the arm has been moved to the

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target releasing position so that a second cammed surface can operate a lever to return the throwing arm to the set position wherein the arm is restrained by the locking means, for example a detent, as a third cammed surface operates the gripping means of the target magazine. The first cammed surface then operates the spring loading means to exert a loading force upon the main springs. Because of the large force exerted by the main springs, the detent locking the arm in the set position is preferably tripped by power operated means for example by a finger moved by an element of the timed means.

In another aspect the throwing arm has a rail extending along one side thereof as a guide for the target as it is thrown. One end of the arm has a hollow sleeve which surrounds a shaft projecting from the frame of the trap in a substantially vertical direction so that the arm can pivot between the set position and the target releasing position. A spring biased finger is pivotally connected to the arm adjacent the sleeve so that a cammed surface moves the finger from under the bottom target in the magazine when the arm is in the set position and the gripping means lowered to place a target upon the arm, the finger being released upon raising of the gripping means to force the target against the rail so that the target has a spinning motion imparted thereto by the rail upon movement of the arm to the target releasing position.

In one specific aspect the brake comprises a brake drum secured to the sleeve of the throwing arm and having a braking surface surrounded by a brake band having one end secured to the frame. The other end of the brake band is fastened to one arm of a bell crank which is pivotally connected to the frame. A spring is provided to urge the bell crank in such a direction as to tighten the band upon the brake surface thus applying the brake. A second arm of the bell crank bears against a cammed surface carried by the brake drum. This cammed surface is arranged to maintain the bell crank against the force of the spring in such position that the brake is released as the throwing arm moves to the target releasing position whereupon the cammed surface permits the crank to move to tighten the band gradually thus decelerating the arm after it has proceeded beyond the target releasing position.

In a further specific aspect the target magazine includes gripping means having a stationary jaw and a pivotally mounted movable jaw op-

positely disposed to grip the bottom target of a stack held by the magazine. The stationary jaw is normally held by the upper end of a supporting member so that the stack is out of the path of the throwing arm. The arm of the member is also pivotally connected to the movable jaw in such a manner as to keep the jaw closed thereby to support the stack of targets. During the portion of the operating cycle in which the target is deposited upon the throwing arm (or associated carrier plate), the supporting member is moved downwardly by a linkage which is operated by the timed means thereby to lower the target stack. When the bottom target is adjacent the throwing arm, the stationary jaw contacts a stop so that further travel of the linkage moves the supporting member to open the movable jaw thus depositing the target stack upon the arm. The return movement of the linkage closes the movable jaw upon the next to the bottom target and then raises the stack out of the path of the arm.

Further objects will be apparent from a consideration of the following description and the accompanying drawings, wherein:

Fig. 1 is a side elevation view of the target throwing trap in the set or cocked position;

Fig. 2 is an end elevation view of the trap shown in Fig. 1;

Fig. 3 is a plan view of the trap shown in Fig. 1;

Fig. 4 is a sectional view on line 4—4 of Fig. 1 with the gear box cover removed;

Fig. 5 is a partial sectional view on line 5—5 of Fig. 2;

Fig. 6 is a sectional view on line 6—6 of Fig. 5;

Fig. 7 is a partial sectional view on line 7—7 of Fig. 1;

Fig. 8 is a partial sectional view on line 8—8 of Fig. 1;

Fig. 9 is a fragmentary sectional view showing the details of the brake operating mechanism;

Fig. 10 is a fragmentary view showing the details of the finger for positioning the targets upon the throwing arm;

Fig. 11 is a fragmentary view showing the target magazine lowered and the gripper jaw open to deposit the bottom target upon the throwing arm;

Fig. 12 is a fragmentary view showing the target magazine raised and the gripper jaw closed on the next to the bottom target of the stack;

Fig. 13 is a fragmentary view showing the details of the latch for restraining the throwing arm in the set position; and

Fig. 14 illustrates a target or bird of the type thrown by the trap.

Referring to Figs. 1 and 2, the target trap chosen for the purpose of illustration comprises a base 20 having two upwardly projecting bosses 26 whereupon is pivotally carried a frame 22. Added rigidity for the bosses 26 is provided by a connecting web 27 (Fig. 2). The pivotal connection between the bosses 26 and the frame 22 is made by bolts 24 which pass through apertures near the respective ends of the correlated bosses to engage threaded holes in the bosses 28 and 30 (Fig. 3) projecting from lower portion of the frame.

As is best shown in Figs. 5 and 6 the frame 22 comprises two vertical walls 32 and 34 joined by a bottom piece 36 and at their ends by the end pieces 38 and 40 which pieces are preferably cast integrally with the walls to form a gear box having a separate cover 35 (Fig. 1). As is shown in Fig. 3 the boss 30 laterally projects considerably further from the wall 34 than the opposing boss 28 projects from the opposite wall 32 so that the gear box is offset with respect to the center line of the base 20. The frame 22 is prevented from pivoting with respect to the base 20 by means of a threaded rod 42 (Figs. 1 and 2) the lower end of which engages a threaded aperture near one end of the base being locked therein by a nut 44. The rod 42 also carries two other nuts 46 which engage respectively the curvilinear top and bottom surfaces of a finger 48 which projects laterally from the wall 34 near the bottom of the gear box. As will appear later, movement of the nuts 46 along the rod 42 changes the angular relationship between the frame 22 and the base 20 and thereby the angle of elevation at which the targets are thrown by the trap.

Additional lateral stability is provided by two bosses 50 which are spaced at the same lateral distance as the bosses 26. Connection between the bosses 50 and the frame 22 is made by the bolts 52 which pass through the slotted apertures 54 in the bosses so that they do not interfere with the pivotal action of the frame. The threaded portions of the bolts 52 engage the respective ends of a shaft 56 (Figs. 3 and 6) which extends through the gear box. A hub 58 of a dual lever 60, whose function will be described hereinafter surround the portion of the shaft 56 extending beyond the gear box thereby to act as a spacer between the wall 34 and the corresponding boss 50, so that the shaft provides a fulcrum for the lever.

Power for operating the trap is supplied from a power source such as the electric motor M which is bolted to the end 40 of the gear box as is shown in Fig. 5. The output shaft of the motor M is provided with a V-pulley 62 which is coupled to a large sheave 64 by means of a V-belt 66. The sheave 64 is carried upon the projecting end of a shaft 68 which is journaled in the ball bearings 70 (Fig. 4) fitted in bosses in the gear box walls 32 and 34. The shaft 68 also carries a pinion 72 (see also Fig. 5) engaging a gear 74 upon a shaft 76. The ends of the shaft 76 are journaled in bearings secured in the walls 32 and 34 of the gear box. A second pinion 78 (Fig. 5) is also secured to the shaft 76 which pinion engages a large gear 80. The gear 80 is carried upon, but not secured to a shaft 82 one end of which is journaled in a ball bearing 84 (Fig. 6) secured in the gear box wall 32. The opposite end of the shaft 82 is journaled in a ball bearing 86 held in the end of a hollow boss 88 extending from the wall 34 so that the overhang of a cam 90, whose functions and details of construction will be described in detail hereinafter, carried upon the projecting end of the shaft is reduced to a minimum. The cam 90 is secured to the shaft 82 by means of a pin such as the bolt 91 which passes through aligned apertures in the shaft and the hub of the cam.

Also carried by the shaft 82 is a ratchet wheel 92 having a series of indentations upon its periphery. The wheel 92 and the gear 80 are tied together by a spacer 95 so that they are continuously rotated as a unit upon the shaft 82 by the motor M and the speed reducing drive described heretofore.

The ratchet wheel 92 is one element of a single revolution clutch. The remainder of the clutch comprises a curved pawl 94 (Fig. 5) pivoted at one end 96 to a restraining cover member 98 which surrounds the pawl so that its outward travel is limited. A tooth 100 for engaging the indentations of the ratchet wheel 92 projects from the inner surface of the pawl 94 substan-

tially midway between the ends thereof. The pawl 94 is urged inwardly so that the tooth 100 engages one of the indentations of the ratchet wheel 92 by means of a spring 102 which is compressed between the outer surface of the pawl 94 and the inner surface of the restraining member 98. The sidewall 104 of restraining member 98 is formed integrally with a hub 106 fastened to the shaft 82 by means of a bolt 108 so that when the tooth 100 engages the ratchet wheel 92, the shaft 82 is rotated by the motor M by means of the speed reducing drive described heretofore.

Normally such rotation of the shaft 82 is prevented by a latch or detent 110 (Fig. 5) which is pivotally carried by a shaft 112 projecting through the wall 32 of the gear box. A spacer 114 (Fig. 4) positions the detent 110 so that the end thereof is maintained in contact with the end 116 (Fig. 5) of the pawl 94 by a spring 118 which extends between the gear box and the end of one arm of a bell crank 120 fastened to the outer end of the lever. The pawl 94 is released by an electrical solenoid 122 whose armature is coupled to the end of the bell crank 120 by a link 124 so that energization of the solenoid rotates the shaft 112 to raise the detent 110. From the foregoing it will be apparent that if the solenoid 122 is momentarily energized the detent 110 is lifted permitting the spring 102 to force the tooth 100 into one of the indentations of the ratchet wheel 92 thereby rotating the attached pawl restraining member 98 and shaft 82. After the solenoid 122 is deenergized the detent 110 rides upon the outer surface of the pawl restraining member 98 until it again drops into the path of the pawl 94 so that the shaft 82 and attached cam 90 complete a single complete revolution thereby throwing one target as will be described in detail below. If the solenoid 122 is maintained energized the clutch remains in engagement so that the cam 90 continuously repeats the throwing cycle. It is also possible to fire the trap manually, the bell crank 120 having an arm 126 with an aperture in the end thereof for attaching a lanyard (not shown) whereby the detent 110 may be lifted.

The cam 90 has three cammed surfaces 128, 130 and 132 (Fig. 1) which are the timed means by which the sequence of operation of the various elements of the trap are controlled. The surface 128 controls the spring loading means, the surface 130 operates the target magazine, and the surface 132 the mechanism for returning a throwing arm 134 to a set or cocked position as will be described in detail below.

The throwing arm 134 comprises a platform 129 (Figs. 1 and 2) having a rail 137 raised along one side of the top thereof by spacers 139. The rail 137 is provided with a buffer strip 141 of yieldable material, such as rubber, which bears against the target being thrown so as to impart a spinning motion thereto as the arm 134 is rotated, as will be described below. One end of the arm 134 is bolted to a tongue 133 (see also Fig. 10) which is welded or otherwise attached to a hollow sleeve 136 (Fig. 1) arranged circumjacent a hollow shaft 138 so that the bottom end of the sleeve rests upon a split boss 142 which acts both as a clamp for securing the shaft 138 and as a thrust bearing for sustaining the weight of the complete arm assembly. As is best shown in Fig. 4 the boss 142 is carried at the outer end of a triangular web 143 extending laterally from the top of the frame 22. Upward movement of the sleeve 136 is prevented by a collar 135 which is secured to the shaft 138 immediately above the tongue 133 for example by a pin or set screw.

Until tripped or released, as described below, the arm 134 is restrained against the force exerted by three main power springs by latching means such as the detent best illustrated in Fig. 13, which detent comprises a finger 146 attached to the arm sleeve 136 and having a notch 148 for engaging a similar notch 150 in a latch member of a bell crank 152 which is pivotally connected to an extension 145 (Fig. 8) from the web 143 of the frame 22 as at 154. To prevent rapid wear of the notch surfaces, hardened pins 149 and 151 are incorporated in the finger 146 and the bell crank 152 respectively. The other arm 156 of the bell crank 152 has a finger 153 (Fig. 8) which is engaged by a projection 157 extending from the side of the central portion of the cam 90 which carries the cammed surface 128. This projection 157 is so oriented that it is adjacent the finger 153 at the end of the arm 156 when the clutch pawl 94 (Fig. 5) contacts the clutch detent 110 whereby engaging of the clutch immediately moves the bell crank 152 to unlatch the throwing arm detent thus permitting the arm 134 to be rotated to the target releasing position.

Power for rotating the throwing arm 134 is provided by the three helically wound main springs 154 and 155 as mentioned above. As is best shown in Figs. 1 and 7, the springs 154 and 155 are compressed between two spring seats 158 and 159. The spring seat 158 is connected to a crosshead 160 by means of rods 162 which pass through the springs 155 respectively. One end of each rod 162 is pinned to a correlated end of the crosshead 160. The opposite end of each rod 162 passes through an aperture in the seat 158 and is threaded to engage the nuts 164. The midpoint of the crosshead 160 is connected to one end of a chain 161 the other end of which passes around the sleeve 136 of the arm 134 to connect with a finger 163 extending radially from the sleeve. The seat 159 is coupled to one end of a rod 166 which passes through the central spring 154 so that its opposite end projects through an aligned aperture in the seat 158. The projecting end of the rod 166 also passes through an aperture in the end of the dual spring loading lever 60 (Fig. 1) which rod end is threaded to accommodate an adjustable hand nut 168 against which bears the end of the spring loading lever 60. The nut 168 is locked in adjusted position by means of a check nut 171.

A roller 170 (Fig. 1) is rotatably carried between the dual arms of the spring loading lever 60 approximately midway between the arm ends so that the roller bears against the cammed surface 128 of the timing cam 90. From the foregoing it will be evident that with the arm 134 restrained in the set or cocked position by the finger 146, as described heretofore, the movement of the upper end of the lever 60 to the right (as seen in Fig. 1) by the rotation of the cammed surface 128 compresses the main power springs 154 and 155 between the seat 158 held stationary by the restrained throwing arm 134 and the seat 159 moved by the arm 60. The cammed surface 128 is indented as at 172 wherein the roller 170 drops when the main springs are fully loaded at which set position is correlated with position in which the clutch pawl 94 (Fig. 5) is restrained by the detent 110. The indentation 172 positively locates the set position and prevents the large force exerted by the compressed main springs from rotating the timing cam 90 in a reverse direction.

The cammed surface 132 which returns the throwing arm 134 from the target releasing position to the set position, bears against a projection upon a cam following lever arm 174 (Fig. 1) which is pivotally connected to the wall 34 of the gear box as at 176. The lever arm 174 is maintained in contact with the cammed surface 132 by a spring 178 which extends between an aperture in the upper end of the arm and a pin 180 projecting outwardly from the gear box wall 34. It will be noted that the end of the pin 180 also acts as a stop for the arm 156 (Fig. 4) of the bell crank 152. The end of the lever arm 174 is provided with a laterally projecting finger 182 (Fig. 2) for engaging a circumferential groove in a block 184 slidingly mounted upon a rod 186. A spring 188 is also mounted circumjacently the rod 180 so that one end thereof bears against the sliding block 184 and the opposite end is restrained by a circular nut 190 which threadingly engages the extending end of the rod. The opposite end of the rod 186 is connected to one end of a chain 192 whose opposite end is connected to a finger 194 (Fig. 7) extending from the sleeve 136 of the throwing arm 134 so that movement of the lever arm 174 compresses the spring 188 thereby moving the rod 186 and chain 192 to rotate the throwing arm 134 back to the set position.

The third cammed surface 130 operates the target feeding magazine through a linkage including an offset lever 196 (Fig. 1) which is pivotally connected as at 198 to the wall 34 of the gear box. One end of the lever 196 carries a roller 200 which bears against the cammed surface 130. The other end of the lever 196 is pivotally secured to a tubular piece 202 having internal threads which engage the threaded end of a push rod 204. A check nut 206 prevents relative movement between the rod 204 and the tubular piece 202. The push rod 204 extends upwardly through the hollow shaft 138 (Fig. 1) which acts as a pivot for the throwing arm as described heretofore.

The bottom end of the shaft 138 is pinched in the aperture in the split boss 142 by the cap screws 207. The upper end of the shaft 138 has secured thereto a support member 208 (Figs. 1 and 3) the extending end of which is bifurcated having two laterally extending circular arms 210 at the end of each of which is bolted respectively a vertical guide strip 211. A similar guide strip 212 is bolted to the junction of the two circular arms 210 which have such a radius that the strips 211 and 212 provide three equally spaced guides for a stack of targets similar to the target T shown in Fig. 14. Additional support for the guides 211 and 212 is provided by the similarly shaped arms 214 (Fig. 1) of an upper support member.

The shaft 138 also slidably supports the gripping means for the target stack which means comprises a movable jaw 216 and a relativley stationary jaw 218. The stationary jaw 218 includes two bosses 220 and 222 having axially aligned apertures which slidably engage the outer surface of the hollow shaft 138. The bosses 220 and 222 are connected by a U-shaped member 224 whose lower corner carries two yieldable gripper rolls 226 made for example of rubber. The movable jaw 216 is also U-shaped and supports similar gripper rolls 228 upon the cross piece thereof as is best shown in Fig. 2. The ends of the legs of the movable jaw are pivotally supported from curvilinear arms 230 which extend

from the opposite sides respectively of the U-shaped member 224 of the stationary jaw 218. The movable jaw 216 is rotated with respect to the stationary jaw 218 by means of an arm 232 one end of which is integrally attached to one leg of the movable jaw. The arm 232 is curvilinear and provided with an offset, as is shown in Figs. 1 and 3, so that the opposite end thereof is adjacent the portion of the shaft 138 situated between the bosses 220 and 222 of the stationary jaw 218. The jaws 216 and 218 are biased to open the gripper rolls 226 and 228 by a spring 234 the ends of which are connected respectively to the arm 230 and the member 224.

A pin 236 projects laterally from the end of the arm 232 through a slotted aperture 238 in the wall of the hollow shaft 138 so that the end of the push rod 204 contacts such pin. The stationary jaw 218 is biased downwardly by a spring 240 arranged about the shaft 138 between the bottom of the support member 208 and the top of the boss 220. The downward movement of the stationary jaw is limited by a threaded pin 242 engaging a threaded aperture in the boss 220 so that its lower end contacts the upper surface of the end of the arm 232.

From the foregoing it will be evident that the raised portion of the cammed surface 130 will elevate the push rod 204 to hold the gripper jaws 216 and 218 normally closed in an elevated position so that they grasp the bottom target thus holding the stack out of the path of the throwing arm 134. After the arm 134 has been returned to the set position by the cammed surface 132 as has been described in detail heretofore, the cammed surface 130 moves the lever 196 to gradually lower the push rod 204 thus lowering the entire gripping means until the bottom target T1 (Fig. 11) of the stack is adjacent the top of the throwing arm. In this position the boss 222 of the stationary jaw 218 rests upon the collar 135. Further downward movement of the push rod 204 permits the spring 234 to rotate the movable jaw 216 about the pivotal connection with the arms 230 so that the gripper rolls 226 and 228 drop the stack upon the arm 134 as is shown in Fig. 11. The cammed surface 130 then raises the push rod 204 thereby closing the gripper rolls 226 and 228 upon the next to the bottom target T2. Further upward movement of the push rod 204 causes the arm 232 to contact the pin 242 thereby raising the gripping means and stack of targets out of the path of the arm 134 as is shown in Fig. 12.

The lower stationary jaw boss 222 is provided with a vertically arranged pin 244. As the gripping means descend to deposit a target upon the arm 134 as described above, the lower end of the pin 244 contacts a bent tab 246 (Fig. 10) carried upon a finger 248. The finger is pivotally fastened to the arm tongue 133 by means of a bolt 250 and biased inwardly by a spring 252 the ends of which are connected to a pin projecting upward from the throwing arm platform 129 and the finger 248 respectively so that contacting of the bent tab 246 by the pin 244, as the target stack descends, moves the finger out of the path thereof. The outward movement of the finger 248 is limited by a tail portion 254 which bears against the side of the collar 135. After the target T1 has been deposited upon the throwing arm as described heretofore, the finger 248 is released by the pin 244 upon the elevating of the target stack whereupon the force of the spring 252 moves the finger 248 inwardly so that the hooked

end 256 thereof forces the target T1 into engagement with the throwing arm rail 137. The hooked end 256 also restrains the target until the arm 134 has been accelerated sufficiently so that centrifugal force holds the target against the rail 137 whereupon the finger 248 is moved outwardly to release the target. Such movement is accomplished by a roller 258 attached to the finger 148 so as to be adjacent a cutaway sector 259 of the collar when the arm 134 is in the set position and which rides up onto the outer circumference of the collar as the arm is moved towards the target releasing position.

After the arm 134 has passed the target releasing position it is decelerated gradually to avoid shock and vibration thus reducing the wear and tear upon the trap and eliminating the necessity of securing the trap to a permanent base. Such deceleration is accomplished by a brake comprising a brake band 260 (Fig. 1) arranged circumjacent the brake surface of a brake drum 140 which is fastened to the end of the throwing arm sleeve 138 immediately above the boss 142. As is best shown in Fig. 8, one end of the brake band 260 is riveted to a fastener 261 which engages a pin 262 extending vertically upward from the extension 145 of the frame web 143 which carries the pivot pin 154 as described above. The opposite end of the band 260 is riveted to two metal straps 264 having aligned apertures in the extending ends thereof through which passes a bolt 265 securing an eyebolt 266. The threaded end of the eyebolt 266 engages an aperture in a vertical finger at the end of one of the arms 268 of a bell crank 270 being secured therein by nuts 272. The bell crank 270 is pivotally mounted upon the pin 154 which also carries the bell crank 152 for releasing the throwing arm detent, as described in detail heretofore.

As is shown in Fig. 9, the bell crank 270 has an arm 274 which contacts a cammed surface 276 which is an integral part of the drum 140 being located immediately below the brake surface thereof. The end of the arm 274 is maintained in contact with the surface 276 by a spring 278 located circumjacent a threaded pin 280 extending from the side wall 34 of the frame 22 immediately below the stop 180 (Fig. 1). One end of the spring 278 bears against a knurled nut 282. The other end of the spring 278 contacts the bifurcated arm 284 of the crank 270 so that the crank is urged in a counterclockwise direction as viewed from the top. The cammed surface 276 is arranged so that the contacting arm 274 is forced outwardly against the force exerted by the spring 278 thereby releasing the brake band 260 during the travel of the throwing arm from the set position to the target releasing position. As the target releasing position is reached the end of the arm 274 is in contact with the declivous portion 286 (Fig. 9) of the cammed surface 276 so that the spring is permitted to rotate the bell crank 270 thus gradually tightening the brake band 260 to bring the throwing arm 124 to rest without shock or vibration.

The above described automatic trap is very simple in operation. The target magazine is loaded with a stack of targets with the bottom target held by the gripper rolls 226 and 228. The motor M is connected to a conventional power source (not shown) thereby continuously rotating the clutch ratchet wheel 92 (Fig. 5) by means of the speed reducing gear and belt drive described above. The trap is cocked by momentarily energizing the solenoid 122 from the power source by means of a switch (not shown) preferably of the conventional push button type. Energization of the solenoid 122 lifts the detent 110 thus permitting the shaft 82 and the attached timing cam 90 to make one complete revolution. During approximately the first 180 degrees of revolution the spring loading lever 60 is moved by the cammed surface 128 first to release and then gradually to load the main power springs 154 and 155 so that the throwing arm 134 is cocked. As the spring loading operation is being completed the cammed surface 130 moves the push rod 204 thereby lowering the gripping means to deposit the lowermost target of the stack upon the throwing arm 134, the target being restrained by the finger 248 as described heretofore. This operation is completed and the stack raised out of the path of the throwing arm 134 before the rotation of the cam 90 is stopped after one complete revolution by the detent 110.

Upon completion of the above operations, the trap is loaded and cocked so that it is prepared to throw the target upon the throwing arm 134. The trap is fired by momentarily energizing the solenoid 122 a second time so that the timed cam 90 makes a second complete revolution. As the cam 90 starts to rotate, the projection 157 on the side of the cam contacts the finger 153 at the end of the arm 156 to release the detent 148 so that the throwing arm 134 is moved from the set position to the target releasing position by the main springs 154 and 155. During such movement the target is released by the finger 248, the target being subsequently held against the rail 137 by centrifugal force until it is thrown off the end of the arm with a spinning motion which is imparted thereto by the rail so that the target flies true.

After the target is released the throwing arm 134 is gradually decelerated to a stop by the brake drum 140 whereupon the cammed surface 132 moves the reset lever 174 to return the throwing arm 134 to the set position. The cammed surfaces 128 and 130 then load the main springs 154 and 155 and deposit another target on the throwing arm 134, as described above, so that the trap is again loaded and cocked. Succeeding targets are thrown by successively momentarily energizing the solenoid 122 to repeat the above operating cycle. If the solenoid 122 is continuously energized, the detent 110 is lifted out of the path of the pawl 94 so that the cam 90 rotates continuously thereby throwing succeeding targets as rapidly as the trap can complete its operating cycle.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. A target trap comprising a main frame having a target carrier rotatably held thereon, spring means for causing said carrier to perform a target throwing movement from a cocked position to a fired position; said spring means comprising a plurality of spring guide rods, a crosshead joining end portions of said guide rods, a connection from said crosshead to said carrier, a plate forming a spring power transmitting seat and joining said guide rods adjacent the ends thereof remote from said crosshead, a spring abutment movably held on said guide rods, and a plurality of power springs held on said guide

rods respectively between said abutment and said plate.

2. Apparatus according to claim 1, comprising means for retaining said spring abutment in fixed position during the throwing movement of said carrier.

3. Apparatus according to claim 2, comprising means for restoring said carrier to cocked position and means for releasing said abutment from said retaining means as the carrier completes its target throwing movement, thus enabling displacement of said abutment by thrust transmitted thereto by said springs during the return of said carrier to cocked position.

4. Apparatus according to claim 3, comprising means for moving said abutment relative to said plate to stress said springs after said carrier has been restored to cocked position.

5. Apparatus according to claim 4, in which said abutment moving means comprises a rod joined to said abutment, said rod passing through an aperture in said plate and being provided with a head engaged by a power driven operator.

6. The combination with a target throwing trap comprising a main frame, a target carrier pivoted in said main frame, a power spring assembly for causing said carrier to move from a cocked position to a fired position; of means for stopping the throwing movement of said carrier adjacent fired position without substantial resistance to the return movement of said carrier, said means comprising a brake drum and a cam mounted for rotational movement with said carrier, a brake band adapted to engage said brake drum, a pivoted member joined to said brake band and comprising a follower for said cam, and a spring acting on said pivoted member to hold said cam follower in contact with said cam and when permitted by the contour of said cam to engage said brake band with said brake drum.

7. In a target throwing trap comprising a main frame, a target carrier pivoted in said main frame, a power spring assembly comprising a movable spring abutment and a plurality of power springs engaging said abutment and causing said carrier to perform a target throwing movement from a cocked position to a fired position, a latch device for retaining said carrier in cocked position, means for actuating said latch device to free said carrier, a friction brake for stopping said carrier in fired position without substantial resistance to return movement of said carrier, a target holding magazine, and means for delivering targets one at a time from said magazine to said carrier: the combination comprising a source of power; a power transmitting assembly; clutch devices for coupling said power transmitting assembly to said source of power; means for actuating said latch to release said carrier for target throwing movement, means for actuating said brake to stop the throwing movement of said carrier, means for effecting the displacement of said abutment to enable return of said carrier without stressing said power springs, means for returning said carrier to cocked position, means for returning said abutment to stress said power springs, and means for actuating said target delivery means to effect delivery of a target from said magazine to said carrier; said power transmitting assembly comprising elements for actuating each of said means in the recited sequence.

8. Apparatus according to claim 7, comprising a finger adapted to complete the movement of a target into throwing position on said carrier, means urging said finger into engagement with a target as delivered from said magazine, and means associated with said magazine for restraining said finger from such movement during the delivery of a target and freeing said finger as target delivery is completed.

9. Apparatus according to claim 7, in which said carrier pivot comprises a hollow boss and said target delivery means comprises a thrust rod extending upwardly through said hollow boss.

10. Apparatus according to claim 9, in which said target delivery means comprises an assembly of target stack gripping jaws adapted for vertical reciprocating movement, said jaw assembly comprising a jaw fixed for rectilinear movement and a second jaw mounted on and for movement relative to said first jaw, and means whereby said relatively movable jaw is engaged by said thrust rod.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,663,780	Spangler	Mar. 27, 1928
2,135,603	Roth	Nov. 8, 1938
2,245,258	Darrell	June 10, 1941
2,310,746	Parker	Feb. 9, 1943
2,531,613	Darrell	Nov. 28, 1950