

July 15, 1952

P. J. HEROLD

2,603,203

VARIABLE ANGLE TARGET THROWING APPARATUS

Filed March 31, 1947

4 Sheets-Sheet 1

FIG. 1

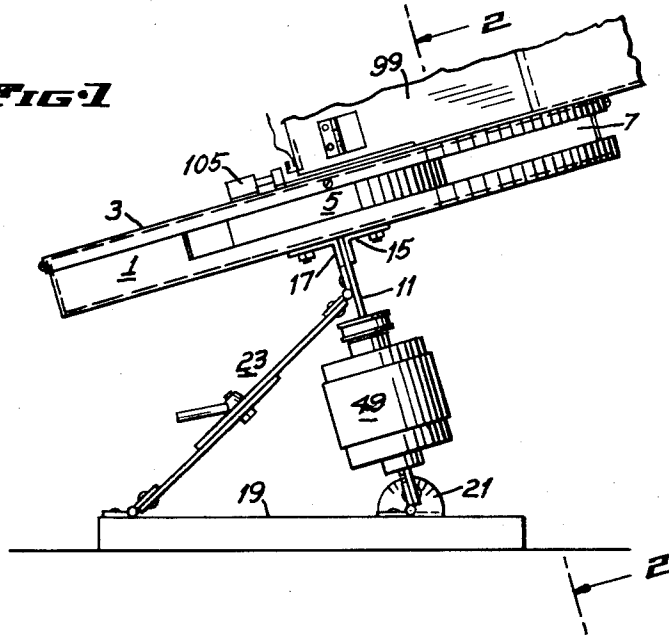
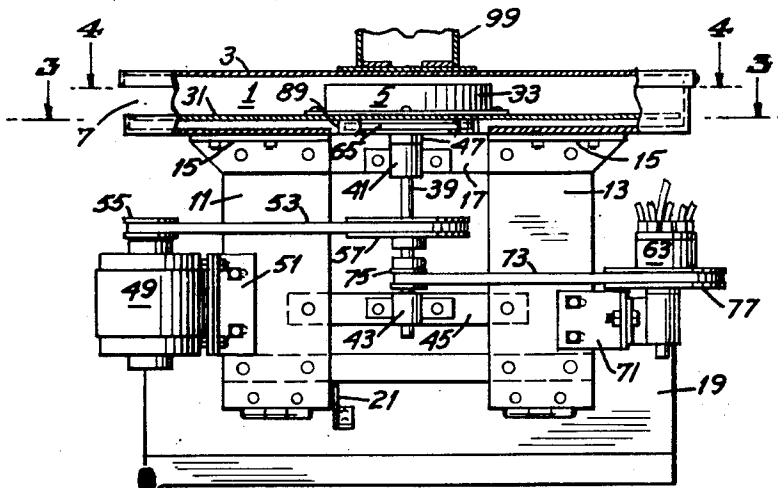


FIG. 2



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4 Sheets-Sheet 2

FIG. 3

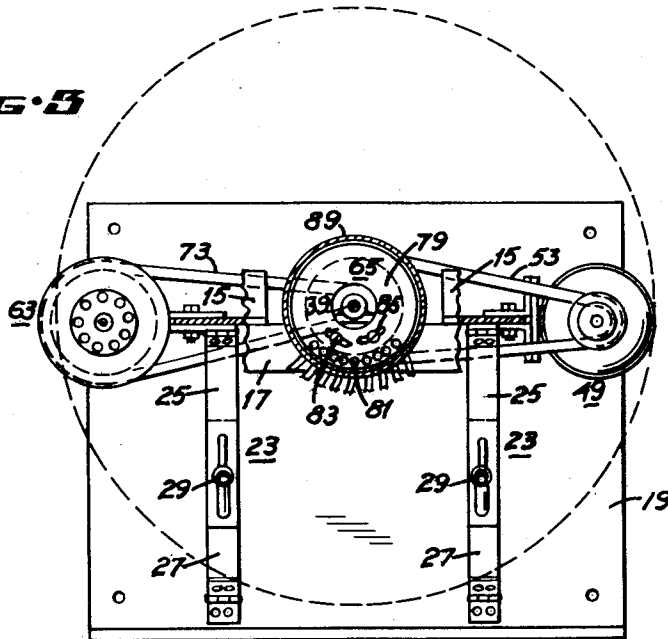
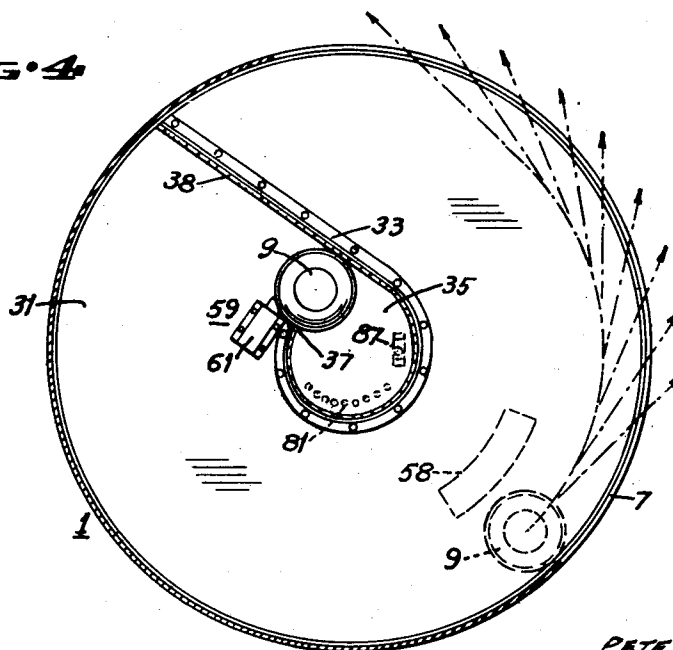


FIG. 4



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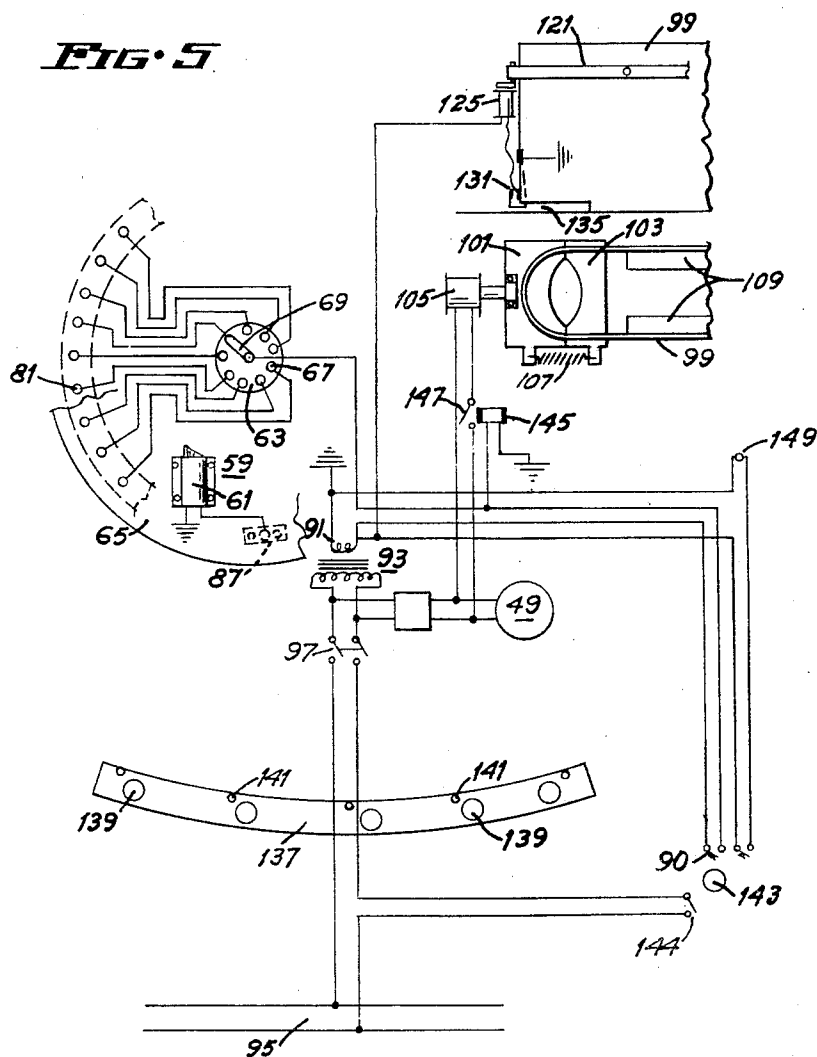
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VARIABLE ANGLE TARGET THROWING APPARATUS

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4 Sheets-Sheet 3



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VARIABLE ANGLE TARGET THROWING APPARATUS

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4 Sheets-Sheet 4

FIG. 6

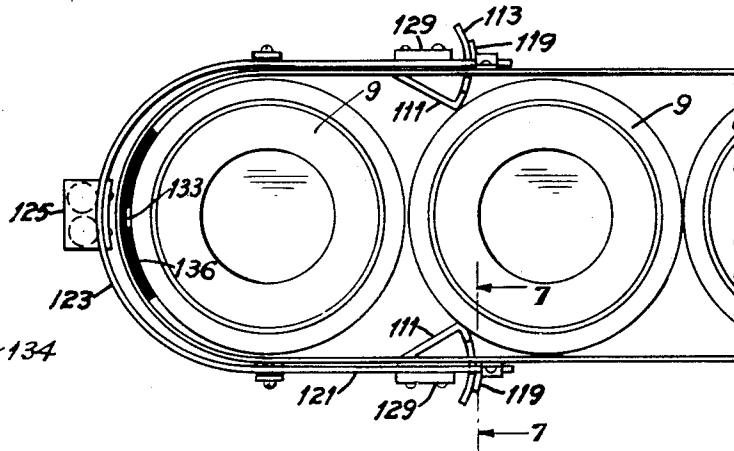


FIG. 7

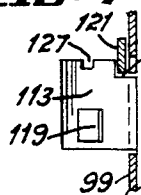


FIG. 8

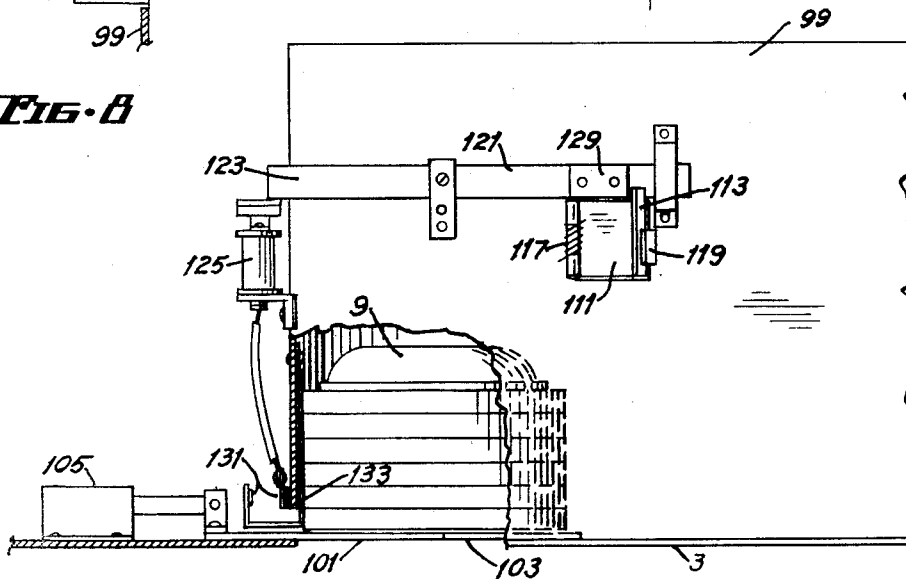
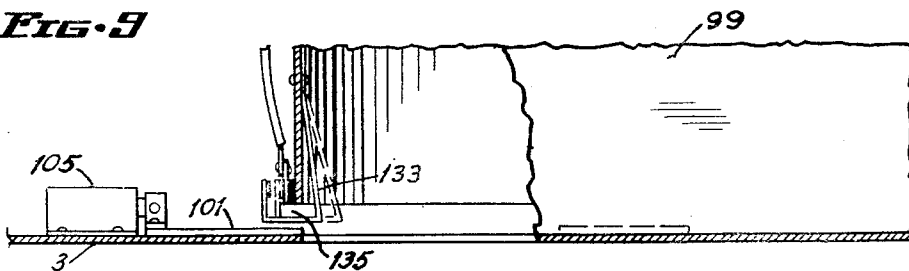


FIG. 9



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2,603,203

VARIABLE ANGLE TARGET THROWING APPARATUS

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Application March 31, 1947, Serial No. 738,264

4 Claims. (Cl. 124—6)

1

My invention relates to target-throwing apparatus and more particularly of the type adapted for the sport of trap or skeet shooting.

Among the objects of my invention are:

(1) To provide a novel and improved apparatus for throwing targets and designed for use in trap or skeet shooting;

(2) To provide a novel and improved target-throwing apparatus adapted for the throwing of targets at random angles within a predetermined horizontal angular range;

(3) To provide a novel and improved target-throwing apparatus capable of being selectively utilized for either trap or skeet shooting;

(4) To provide a novel and improved target-throwing apparatus capable of throwing targets in rapid succession;

(5) To provide a novel and improved target-throwing apparatus of relatively light weight capable of being readily assembled and disassembled for use at different locations.

Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same taken in conjunction with the accompanying drawings wherein—

Figure 1 is a side elevational view of a target-throwing apparatus embodying the features of my present invention;

Figure 2 is a front elevational view of the machine or apparatus of Figure 1;

Figure 3 is a view taken in the plane 3—3 of Figure 2;

Figure 4 is a view taken in the plane 4—4 of Figure 2;

Figure 5 is a diagram showing the electric wiring of the cooperating electric components involved in the apparatus of the present invention;

Figures 6, 7, 8 and 9 are fragmentary views illustrating details of a magazine-loading feature embodied in the apparatus of the previous figures.

The present invention is a continuation-in-part of my pending application for Target Throwing Machine, Serial No. 498,992, filed August 17, 1943, now Patent No. 2,432,155.

Referring to the drawings for a detailed description of my invention in a preferred form, it comprises a shallow circular housing 1 including a cover 3 and enclosing an impeller 5. This housing is provided with an edge slot 7 through which targets 9 may be thrown at fixed or random angles.

The housing is supported along the upper edges of a pair of plates 11 and 13 spaced in a common plane, by providing an angle beam 15

2

at the upper end of each of such supporting plates on the same side thereof, and a cross-beam 17 of the same type connecting the two supporting plates on the other side thereof. The supporting plates are hinged at their lower ends to a base 19 to permit tilting of the housing and impeller to any position within a wide range of vertical angular positions. Such angular adjustments may be indicated on a protractor 21 disposed on the base adjacent an edge of one of said supporting plates such as plate 11.

Maintenance of the housing in an adjusted position is provided for by a pair of adjustable brackets 23, each involving a pair of overlapping plate sections 25 and 27, one of which is hinged to the upper portion of one of the housing supporting plates with the other hingedly secured to the base. A manually operable clamp 29 serves in its clamping position, to hold the bracket sections against relative movement and thus rigidify the bracket following adjustment of the housing and impeller to a desired vertical angle.

The impeller 5 includes a disc 31 having an upstanding spiral-arranged flange 33 of a single convolution having its center of generation at the center of the disc and terminating in a substantially straight portion as it approaches the edge of the disc, though a slight reverse curve as it approaches the edge is preferred. The flange as thus arranged, defines a central target-loading area 35 bounded in part by an exit gateway 37.

The flange 33 is preferably lined with suitable shock absorbing material 38 such as rubber, felt, etc., to protect the fragile targets against breakage.

The impeller disc is carried on the upper end of a drive shaft 39 which extends downward between the supporting plates 11, 13 and is mounted in a pair of spaced bearings 41 and 43, one of which is affixed to the aforementioned cross beam 17, while the other is affixed to a cross arm 45 extending between and affixed to the supporting plates at a lower position.

Adjacent the upper of the two shaft bearings, is a thrust bearing 47 which could be made integral with its adjacent shaft bearing.

Continuous rotation of the impeller is imparted thereto by a motor 49 which is carried on a bracket 51 affixed to the supporting plate 11 and drive-connected to the impeller shaft by any suitable drive means such as a belt 53 interconnecting a drive pulley 55 on the shaft of the motor with a driven pulley 57 on the impeller shaft.

A counterbalancing weight 58 affixed to the

underside of the impeller disc opposite the spiral flange, serves to counterbalance the weight of the flange and thus minimize vibration which might otherwise develop.

Targets placed on the impeller under the conditions thus far described, will be promptly thrown off at random angles depending on the position of the spiral flange at the instant the target lands on the loading area of the impeller. To place some element of control in the hands of an operator, as to the time at which a target may be discharged, while retaining the advantage of having the target emerge from the impeller housing at random angles, I provide a target brake 59, preferably one operated by a solenoid 61, and located on the impeller disc at the exit gateway of the spiral-arranged flange, whereby a target placed at loading position within the spiral, will be precluded from moving out through the gateway under the centrifugal action of the whirling impeller disc.

The brake solenoid is connected in an electrical circuit under the control of an operator who will stand at some strategic position with respect to the contestants so that he might time target releases in accordance with the desires of contestants.

Such circuit will include a pair of commutators 63 and 65 having similar numbers of contacts.

Structurally speaking, the one commutator 63 may be of the automobile ignition type involving a plurality of circularly arranged contacts 67 and a centrally disposed rotatable contactor 69.

This commutator is supported on a bracket 71 affixed to the supporting plate 13, and is driven from the impeller shaft by any suitable drive means such as a belt 73 connecting a pulley 75 on the impeller shaft with a pulley 77 on the commutator shaft on which the contactor 69 is mounted.

The second commutator 65 is preferably in the form of a disc 79 of insulation such as "Bakelite," such disc having the required number of contacts 81 preferably imbedded therein. The disc is mounted on the shelf provided by the cross beam 17 as by a pair of machine screws 83 extending through adjustment slots 85, and has a central opening for passage of the impeller shaft 39 with suitable clearance. The floor of the impeller chamber is provided with a large central opening to permit of the mounting of the disc of insulation as described.

The contacts of this commutator are adapted to be sequentially contacted by a contactor 87 carried on the under side of the impeller disc.

A ring or circular wall 89 depending from the impeller disc and encircling the commutator disc 79 cooperates with the impeller disc to form a housing to protect the contacts 81 and associated contactor 87 from damage or excessive dust accumulation.

In connecting the commutators in circuit, the corresponding contacts of both commutators are connected together. The contactor 69 of the bracket mounted ignition type commutator is connected to one side of a power source through a manually closable switch 90, while the contactor 87 of the impeller associated commutator is connected through the brake solenoid 61 to the other or grounded side of the power source. Such source of power is preferably the secondary winding 91 of a step-down transformer 93 connected to an available power circuit 95 of 110 volts or the like through a main switch 97. The

lower operating voltage thus derived is to be preferred in connection with the commutator circuits, to avoid excessive sparking which might occur at the higher voltage existing at the primary side of the step-down transformer.

In the commutator circuits thus described, it becomes apparent that energization of the target brake solenoid cannot take place except only when the contactors of both commutators simultaneously contact corresponding contacts, and at such times as the manually operable switch 90 is closed, and these are the only conditions under which a target can be released from the impeller.

Such energization of the target brake solenoid can be arranged to occur within a single revolution of the impeller following a closing of the manually operated switch, by setting the relative rotational speeds of the commutator contactors so that the impeller-mounted contactor completes a revolution at least once during the passage of the other contactor over each one of its contacts. The rotational speed of the impeller-mounted contactor being a function of the impeller rotation, its speed will necessarily be determined by the rotational speed of the impeller which is necessary to cast targets a predetermined distance and at desired angular elevations. Consequently, as a matter of convenience, the rotational speed of the other contactor will be adjusted to arrive at the desired speed ratio of the contactors of both commutators.

Such ratio is not critical, for minor departures therefrom will still bring about simultaneous contacting of corresponding contacts within a momentary period of time.

It is noted at this time and considered a feature of this invention, that the contacts of the impeller commutator are bunched to occupy a minor portion of the commutator disc circumference and are so disposed as a group, that discharge of targets will occur within a predetermined angle, such as 90 degrees, and within the arc bounded by the slot in the impeller housing. Within these limits, a target can emerge from the housing at any one of a number of angles, depending upon the particular contact through which the target brake solenoid happens to be energized.

The commutator 63 thus selects the angle upon momentary closing of the manually controlled switch 90, while the impeller associated commutator 65 times the release of the target brake to assure discharge at such selected angle.

Inasmuch as the energizing contacts will be determined at the moment the manually operated switch is closed, the angle selected will be a random angle within the prescribed limits. Thus, the operator has the power to time the throw but not its specific direction.

The manually operable switch is preferably of the push-button or toggle type whereby an operator by a momentary closing of the switch, may limit the operation of the apparatus to the throwing of a single target. In view of the fact that the commutators are always in operation, the throwing of such a target will occur almost immediately upon the closing of such switch. Thus, the machine may be made to throw targets as often and as fast as the operator can produce momentary closing of the switch.

In this connection, I have illustrated in Figures 5, 6, 7, 8 and 9 details of an automatic target-loading means such as has been illustrated and described in my earlier filed application, Serial No. 498,992, now Patent Number 2,432,155, but

with slight but important improvements embodied therein.

The automatic loading means referred to involves a magazine 99 for holding a plurality of stacks of targets, such magazine being mounted on the upper surface of the impeller housing with one end located over but preferably slightly offset with respect to the target-loading area of the impeller.

This end of the magazine has a trap door in the floor thereof formed of a pair of slidable panels 101 and 103 adapted through interconnecting linkage (not shown), to separate in response to movement of one of the panels. Such movement may be initiated through energization of a solenoid 105 against the restoring action of a spring 107 tending to hold the trap door panels in closed position.

The stacks of targets are placed upon a pair of runways 109 disposed in the magazine and are normally held out of pressure contact with the stack which is being dispensed, by a pair of stops 111 each including an arcuate arm 113. These stops are hingedly mounted in opposite walls of the magazine, with the arcuate arms substantially tangential to the first reserve stack of targets. A light spring 117 on each stop hinge tends to bias its associated stop inwardly to stop position, as determined by a limiter element 119 on such stop, but, such springs are purposely made too light to restrain movement of reserve stacks toward the dispensing end of the magazine, particularly when the impeller is in tilted position as it usually will be when in use. If desired, a rolling weight (not shown) may be placed in the magazine behind the last stack to aid in such feeding operation.

Coacting with springs 117 to restrain movement of reserve stacks is a U-shaped operating lever 121 extending around the end of the magazine and pivoted to the sides thereof with its trough end 123 supported over a solenoid 125 and its free ends adapted to drop into corresponding notches 127 in the upper edges of the arcuate arms 113 to hold the stops against outward movement. These free ends are preferably weighted with weights 129 to assure positive action in this regard.

The solenoid 125 is connectable in circuit through a normally open switch 131. One contact of such switch is mounted on a leaf spring 133 affixed to the inner end wall of the magazine and extending under the lower edge of the magazine through a notch 135 provided therein for the purpose. Upon exhausting all targets from a stack being dispensed, the switch, normally held wide open by such targets, is permitted to restore itself to its normal open condition with its contacts closer to each other. In so doing, however, the inertia initially imparted to the leaf spring, causes it to swing beyond its normal position and momentarily close the switch and for a brief fraction of a second thus energize the solenoid. The free ends of the lever are thereby lifted to free the stops and permit them to swing out as a reserve stack of targets passes through, the lever 121 in the meantime riding on the upper edges of the arcuate arms 113.

Each arcuate arm is provided with a notch 134 at its upper inside corner to receive the lever 121 when the stops 111 are manually swung outwardly slightly beyond the outward position reached during the automatic feeding of stacks to dispensing position. This permits loading of the magazine without interference from these elements.

A pad 136 of rubber, felt or the like at the discharge end of the magazine serves to minimize breakage of targets at this point.

In feeding the bottom target of a stack to the impeller, any suitable means such as that disclosed in my aforementioned application may be relied on to hold the remaining targets of the stack until the trap door closes.

The manner in which the various components of the apparatus are interconnected to provide the proper cooperation among them, is depicted in Figure 5 in conjunction with a field layout for trap shooting.

The shooter's stand is indicated as an arcuate platform 137 with several shooting positions indicated by the circles 139, and adjacent each such position there is provided a cartridge supply stand 141.

To one side of the shooter's stand, is the operator and score-keeper position 143 which when employing my invention, may be handled by one person. The operator in addition to his timing switch 90, is also provided with a manually operable switch 144 in the main line to the transformer whereby he may disconnect the apparatus, including the motor, during such periods when shooting is not taking place.

The solenoid 125 which operates the stop control lever is connected across the low-voltage side of the transformer 93 through the normally open leaf spring switch 131 whereby the moving of a fresh stack of targets into loading position will occur automatically and without requiring the attention of the operator.

The trap door solenoid 105, however, is preferably connected across the high voltage side of the transformer in order to achieve a more powerful and more rapid opening of the trap door than could be expected if operated upon a lower voltage. To place the energization of the trap door operating solenoid within the control of the operator, I provide a control relay 145 in parallel with the series connected commutators and connect the armature 147 of such relay in the trap door solenoid circuit.

Thus, every time the operator momentarily closes his timing switch 90 to bring about the discharge of a target from the apparatus, the trap doors will open and promptly deposit a fresh target upon the impeller in preparation for the next closing of the timing switch.

As an added feature of the present invention, I provide an announcement light 149 under the control of the operator whereby he might indicate by the flash of such light, that a shooter has scored a hit. It has been the practice in the past that when a shooter failed to hit the target, the scorer would call out, "Lost," and if the shooter hit the target the scorer announced, "Dead." Due to the noise of others shooting at traps located nearby, or due to the fact that the scorer did not announce plainly or loud enough, or the shooter was hard of hearing, the shooter often did not know exactly how the target was scored.

In utilizing a flash lamp for the purpose, the lamp could be located within range of vision of the contestants, and thereafter no difficulty would be experienced in informing the various contestants as to the success of their endeavors.

Furthermore, in special and important matches, a referee is often employed in addition to the usual score-keeper. With the use of a flash lamp circuit, this will allow the referee to stand apart from the one that records the scores and in a position where he can best observe the flight of the targets. The results realized by the various con-

testants can then be flashed not only to the contestants but also to the score-keeper who would just have to watch the flash lamp instead of trying to follow the targets in flight.

In the apparatus as described, targets are thrown at random angles within a substantial arc, which may be of the order of 90 degrees. For a beginner, it might often be desirable to reduce such arc and this can readily be accomplished in the machine or apparatus constituting the present invention, by merely disconnecting one or more of the end contacts on one of the commutators.

While for trap shooting, the targets are thrown at random angles, in skeet shooting, the targets are thrown at one known angle only. To convert the apparatus of the present invention from use as in trap shooting to apparatus adapted for skeet shooting, becomes a very simple matter, for all that is necessary is to shunt out the bracket-mounted commutator by a connection from the operator's control switch 90 to one of the contacts on the impeller-associated commutator. With this simple change, the apparatus will throw targets at one angle only, that is, as viewed in a horizontal plane. The angle of elevation at which the target may be thrown may still be adjusted by altering the angle at which the apparatus is tilted.

From the above description of my invention in its preferred form, it will be apparent that it fulfills all the objects of my invention as previously set forth. The apparatus is light and portable, requires no more than one operator to control its entire operation, is substantially uniform in its results for each position to which it may be adjusted, will function rapidly and without delay and with a minimum of broken targets, and any chips or broken targets will be readily swept from the impeller chamber without delay or injury to the apparatus.

Accordingly, while I have described such preferred embodiment in considerable detail, I do not desire to be limited in my protection to such detail except as may be necessitated by the appended claims.

I claim:

1. In a target-throwing apparatus having impeller means, means for continuously rotating said impeller means, and releasable means for holding a target on said impeller means against discharge therefrom; means for releasing the target from said impeller means at some random angle within a predetermined angular range, said releasing means including a manually operable control comprising a switch; an angle selector operative as such in response to a momentary closing of such switch, said angle selector comprising a commutator and contactor relatively and continuously rotatable, said commutator connected in circuit with said switch and releasing means and having angle determining contacts contactable by said contactor during the closing of such switch and said relative rotation being at an angular velocity such that each contact is contacted during substantially a complete revolution of said impeller means; and means for timing said release in accordance with the contact of said angle selector engaged during momentary closure of said switch to effect discharge of said target at the angle selected, said last means comprising a commutator having a like number of contacts as said angle selector commutator and an angular velocity the same as said impeller, said contacts being connected in series with cor-

responding contacts of said angle selector commutator and grouped to effect release of such target at particular assigned angles when a particular contacted angle selector contact and its corresponding contact on said second commutator are simultaneously contacted during such momentary closing of said switch.

2. A target-throwing apparatus having an impeller means for throwing targets, means for continuously rotating said impeller means, and means for holding a target on said impeller means against discharge therefrom; electrical means for releasing said target from said holding means, said electrical releasing means including a pair of commutators having like numbers of operating contacts with the corresponding contacts electrically connected together in series, means for engaging each contact of one commutator in sequence for a period of time approximating the period of one revolution of said impeller means, means driven by said impeller means for electrically successively engaging all the contacts of the second of said commutators in the same time period, and a manually operable control adapted to complete a series circuit through said releasing means and said commutators when corresponding contacts of said commutators are simultaneously contacted, said circuit including a switch actuated by said manual control.

3. A target-throwing apparatus having a shallow circular housing with a slot opening in the edge thereof through which targets are to be thrown, impeller means within said housing for throwing such targets, means for continuously rotating said impeller means in said housing, and means for holding a target on said impeller means against discharge therefrom; electrical means for retracting said holding means to release a target from said impeller means, said electrical means including a pair of commutators having like numbers of operating contacts with the corresponding contacts electrically connected together in series, means for electrically engaging each contact of one commutator in sequence for a period of time approximating the period of one revolution of said impeller means, means driven by said impeller means for electrically engaging all the contacts of the second of said commutators in the same time period, and a manually operable control adapted to complete a series circuit through said retracting means and said commutators when corresponding contacts of said commutators are simultaneously contacted, said circuit including a switch actuated by said manual control.

4. A target-throwing apparatus having a shallow circular housing with a slot opening in the edge thereof through which targets are to be thrown, impeller means within said housing for throwing such targets, means for continuously rotating said impeller means in said housing, and means for holding a target on said impeller means against discharge therefrom, and electrical means for retracting said holding means to release a target from said impeller means at some random angle within the angle bounded by said slot opening only, said electrical means including a pair of commutators having like numbers of operating contacts with the corresponding contacts electrically connected together in series, means for electrically engaging each contact of one commutator in sequence for a period of time approximating the period of one revolution of said impeller means, means driven by said impeller means for electrically engaging all the contacts of the second of said commutators successively in the same

time period, and a manually operable control adapted to complete a series circuit including a switch actuated by said manual control through said electrical releasing means and said commutators when corresponding contacts of said commutators are simultaneously contacted, said second commutator having its contacts grouped to assure discharge within the angle bounded by said slot.

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