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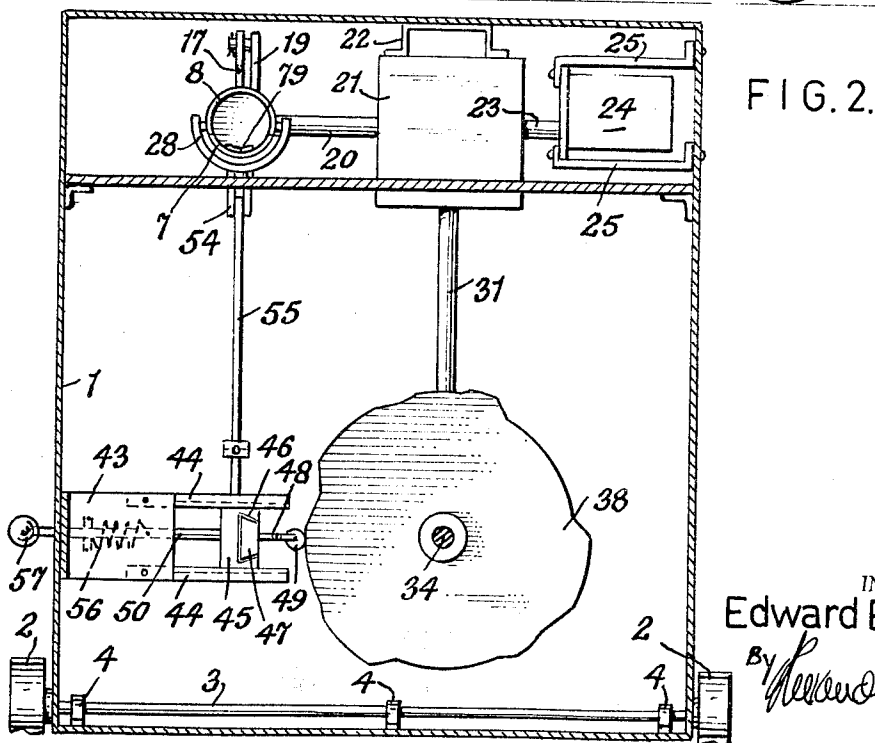
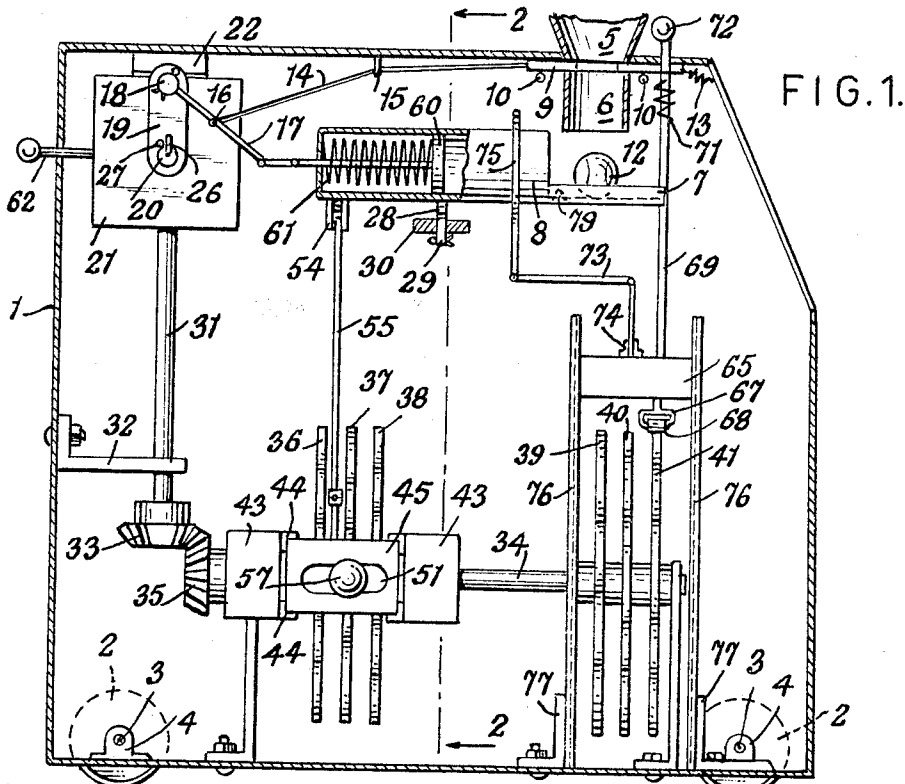
E. E. SAYETTE

3,277,879

BALL-THROWING MACHINE (PRE-PROGRAMMED)

Filed April 30, 1964

2 Sheets-Sheet 1



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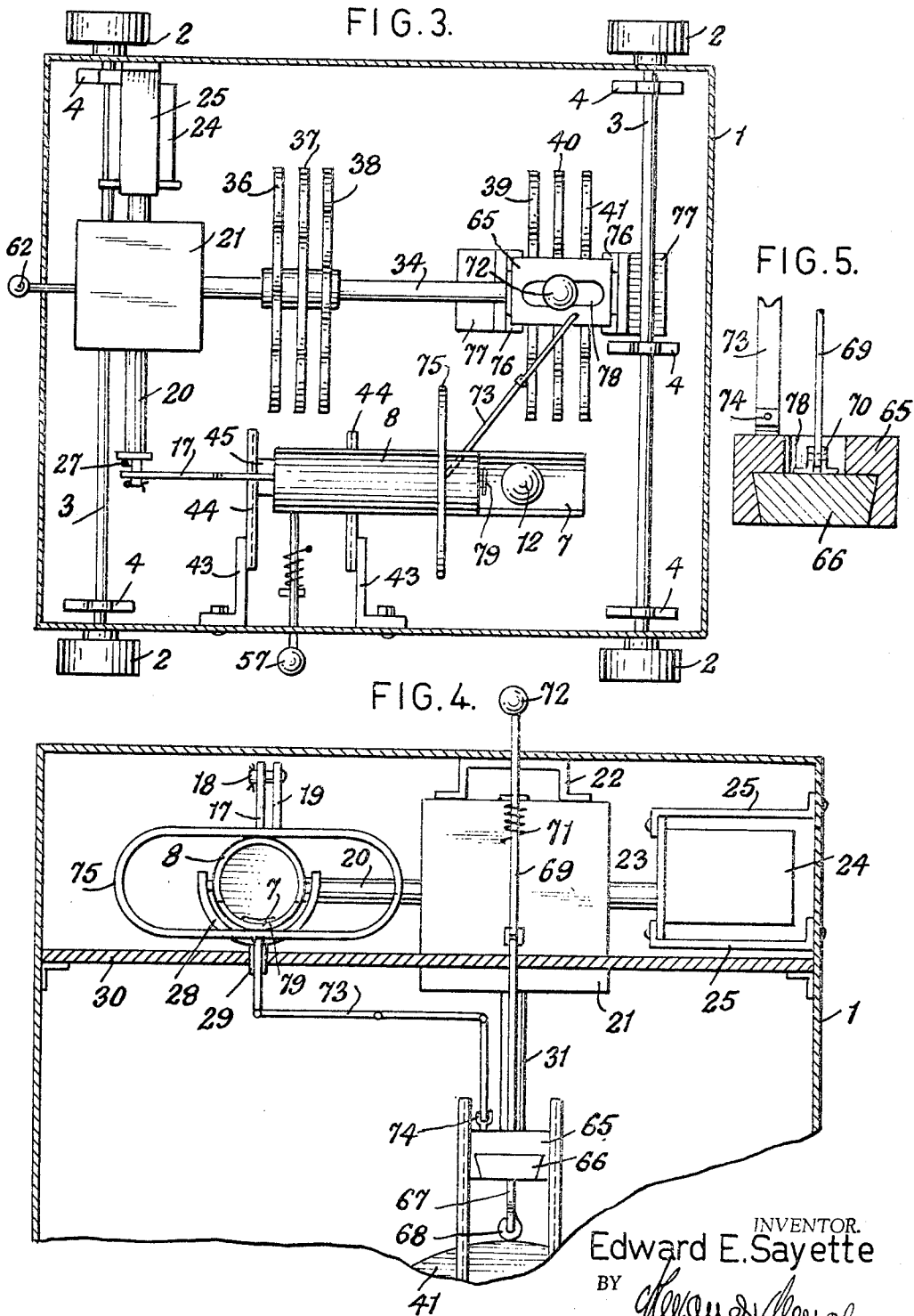
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BALL-THROWING MACHINE (PRE-PROGRAMMED)

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This invention relates to a ball-throwing machine such as can be used in playing or practicing the game of tennis, baseball or any other game in which a ball or other object is batted, caught, or otherwise used.

It is one of the objects of the invention to provide a ball-throwing machine having sufficient flexibility of use to enable a player to vary the location to which a ball will be projected at predetermined intervals.

It is an object of the invention to provide a machine of this character in which variation in vertical and horizontal angularity of the ball-ejection tube will be automatically obtained at regulatable predetermined intervals, whereby variable projection of the ball will be secured to thereby increase the player's proficiency in batting or catching the thrown balls.

It is another object of the invention to provide a machine in which the balls are automatically fed to the ball-ejection tube; in which the plunger in said tube is moved to cocked position and then released and which action takes place at predetermined intervals to eject the balls or other objects, and in which the ball-ejection tube is automatically and intermittently tilted to thereby secure differences in the ball-throw angularity.

With these and other objects to be hereinafter set forth in view, I have devised the arrangement of parts to be described and more particularly pointed out in the claims appended hereto.

In the accompanying drawings, wherein an illustrative embodiment of the invention is disclosed,

FIG. 1 is a side elevational view, with parts in section, of a ball-throwing machine, constructed in accordance with the invention;

FIG. 2 is a sectional view, taken substantially on the line 2-2 of FIG. 1 looking in the direction of the arrows;

FIG. 3 is a top plan view of the machine, with the housing thereof being shown in section to disclose the interior parts, and with certain cam-follower parts omitted to disclose construction;

FIG. 4 is a sectional view of the upper portion of the machine as seen from the right of FIG. 3, and

FIG. 5 is a cross sectional view of one of the cam follower blocks and parts associated therewith.

The machine includes a substantially rectangular housing 1 within which the operational parts of the machine are contained, said housing being mounted upon a carriage consisting of the wheels 2, so that it may be moved from place to place as required for use. The wheels 2 are mounted on axles 3 which are rotative in the brackets 4. The wheels at the forward end of the machine, or those shown at the right in FIG. 1 may if desired, be of slightly larger diameter than those at the rear so that a slight inclination or angularity of the housing is attained.

Mounted at the top of the housing 1, is a hopper 5 in which the balls to be ejected by the machine are contained. The lower end of the hopper terminates in an outlet tube 6 located within the housing and from which successive balls descend to fall upon a trough-shaped forward extension 7, provided on the front of the ball-ejection tube 8.

The trough-shaped extension 7 on the outlet end of the tube 6 is provided by cutting away a part of said tube forward of the point of impact on the ball by the plunger shown at 60. When the ball is hit by said plunger it will react to the impact by being distorted to a flattened

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or elongated shape. Since the ball is not confined within a complete tube immediately after the impact, the distortion of the ball does not hamper its free forward flight.

Slidably mounted between the lower end of the hopper 5 and the upper end of the ball-outlet tube 6 is a slide or gate 9 supported by guides 10 and provided with an aperture of a diameter to permit the passage of a ball 12 through it when said aperture is aligned with the lower end of the hopper. The slide or gate 9 is normally retracted, or biased toward the right as viewed in FIG. 1, by means of a spring 13. At the end of the slide or gate remote from the spring 13, is attached a pull cable 14 that is guided through an eyelet 15 and is attached at 16 to part of a linkage 17 attached at 18 to one end of a dog 19 which is loosely fitted around an output shaft 20 driven from a transmission 21. Said transmission is supported on a bracket 22 from the top wall of the housing 1 and the transmission is driven by a shaft 23 extending from a motor 24 supported in the housing by brackets 25. A hand lever 62 is part of a known arrangement of gear-shifting means that is operative to regulate the rotative speed of shafts 31 and 20.

The transmission shaft shown at 20 is provided with a radial projection 26 adapted to engage against a projecting pin 27 on the dog 19 so that when the shaft 20 is rotated, said projection 26, engaging the pin 27, will cause the dog 19 to be swung in a manner to cause it to be employed to impart at pull on the cable 14, whereby the slide or gate 9 will be moved to align its aperture with the outlet of the hopper 5 and permit a ball 12 to drop down into the trough 7 substantially as shown in FIG. 1.

The angularity of the machine or the inclination of the ball-ejection tube will cause the ball to roll to the entrance of the tube where a slight projection 79, on the trough-shaped forward extension 7, will stop the motion of the ball and position the ball at the entrance to the tube preparatory to the ejection of the ball upon impact with the plunger or piston 60.

The ball-ejection tube 8 is mounted for universal movement in a yoke 28 having its stem 29 rotatively mounted in the cross-piece 30. The mounting of the ball-ejection tube in this manner permits it to be inclined vertically as well as swung horizontally or from side-to-side to thereby vary the direction of throw of the ball, by means to be described. The ball-ejecting tube 8 contains the plunger or piston 60 biased by the spring 61 and during the operation of the machine the plunger strikes the ball and propels it forwardly and out of the housing.

Extending downwardly from the transmission 21 is a drive shaft 31 which is rotated by said transmission at the selected speed, and said shaft 31 is guided by a bracket 32 and is provided at its lower end with a bevel gear 33, said bevel gear having its teeth interrupted consecutively. Disposed at right angles to the shaft 31 is a cam shaft 34 provided at one end with a bevel gear 35 in mesh with the consecutively interrupted bevel gear 33. Shaft 34 is thus intermittently rotated, with pauses at predetermined intervals, by its drive from the gear 33.

The cam shaft 34 carries two sets of cams, one of said sets being composed of the three cams indicated at 36, 37 and 38, and the second set consisting of the three cams shown at 39, 40 and 41. The cams in the first-mentioned set, or those indicated at 36, 37 and 38 serve to swing the ball-ejection tube horizontally or from side-to-side, to thereby cause the balls ejected from the tube to travel as required. Either of the three cams 36, 37 and 38 can be used for this purpose and by their respective contours they will vary the horizontal positions of the ball-ejection tube.

Mounted on one of the side walls of the housing 1 by means of brackets 43, are guides 44 in which a block 45

is slidably mounted. Said block is formed with a dovetail groove 46 (FIG. 2) in which a complementarily-shaped member 47 is slidably accommodated. Projecting from the member 47 is a clevis 48 carrying a cam roller 49 held against one or the other of the cams 36, 37 or 38 as selected. A stem 50 projects from the member 47 and passes through an elongated slot 51 in the block 45, such slot permitting movement of the stem 50 within it as required to enable the member 47 to be moved to position the cam roller 49 against one or the other of the three cams 36, 37 or 38. The stem 50 terminates in a knob 57, located externally of the housing 1 to permit manual shift of the cam roller 49 to one or the other of the cams. The ball-ejection tube is universally connected near its rear end, as at 54, to articulated linkage 55 which attaches to the slidable block 45, and by the movements imparted to the block by one or the other of the cams 36, 37 or 38, the block will cause horizontal swing of the ball-ejection tube from side to side for the angular projection of the balls. In FIG. 3 of the drawings the cam follower block assembly consisting primarily of the parts 45 to 51 inclusive, has been omitted to more clearly disclose the arrangement of the cams 36, 37 and 38.

The stem 50 is spring-biased by the spring 56 to hold the roller 49 in constant contact with any one of the cams, and said roller can be moved as required to contact the desired cam by manual engagement with the knob 57.

The set of cams composed of those shown at 39, 40 and 41, is employed for vertically tilting the ball-ejection tube 8, and the means which accomplishes this tilting movement includes a vertically-slidable block 65, similar to the block 45, and which is provided with a dovetail member 66. The block 65 is vertically guided in guide members 76 mounted by the brackets 77. Attached to the dovetail member 66 is a yoke or clevis 67 carrying a cam roller 68 adapted for operation against the edge of one or the other of the cams 39, 40 and 41. A rod 69 is attached at 70 to the slidable member and said rod passes upwardly through slot 78, said rod being provided with a biasing spring 71, and it extends out of the top of the housing and terminates in the knob 72. Linkage 73 is coupled at one end, as indicated at 74, to the block 65, and the upper end of the linkage terminates in an elongated loop 75 which encircles the ball-ejection tube 8. Thus, as the block 65 is raised or lowered by the action of one or the other of the cams 39, 40 and 41, the linkage 73 will cause the loop 75 to raise or lower the ball-ejection tube to various degrees of angularity so that the balls ejected out of the tube and out of the housing will be directed accordingly.

From the foregoing, the operation of the improved ball-throwing machine will be readily understood.

Prior to setting the machine in operation, the player will set the transmission at the fast or slow speed by manipulation of the speed-control lever 62. By manipulation of the levers 57 and 72, the respective cam rollers 49 and 68 will be positioned against the respective cams to secure the level of machine variability desired by a player or coach. An example of the contour of one of the cams is shown in FIG. 2 and the various cams may be generally somewhat similar or varied therefrom to secure different inclinations or side-wise movements of the ball-ejection tube.

As the radial projection of the output shaft 26 begins to rotate in a counter-clockwise direction, it acts against the pin 27, attached to the dog 19, and causes the dog to be rotated in the same direction. This imparts a pull on the cable 14 which moves the slide or gate 9 to a position to align its aperture with the outlet of the hopper 5 so that a ball will drop down and be received on the trough 7 as shown in FIG. 1. As the tube 8 is at a slight angle, the ball will roll back until it is positioned by the projection 79. The spring 61 is compressed by the pull exerted on the linkage 17 and as the slide continues its movement it will prevent other balls from descending, by interposing

an imperforate part of it between the bottom of the hopper and the tube 6.

When the dog 19 has rotated over 180 degrees it reaches a position to react to the force of the compressed spring 61. It will then snap back to its original position and remain there until such time as the radial projection of the transmission shaft 26 will again act on the pin 27 and cause the dog 19 to again be rotated as above described. As the dog 19 is released, the spring 13 will return the slide or gate 9 to its original hopper-closing position with sufficient speed to prevent any further balls from falling from the hopper.

The piston 60, when urged by the compressed spring 61, will strike the ball which has been positioned at the entrance to the tube 8, and will project it through a trajectory determined by the cam rollers 49 and 68 on their respective cams.

Concurrent with the above actions, the transmission shaft 31 is rotating the timing gear 33. Sufficient consecutive teeth are removed from the gear 33 to provide for one-twentieth of a rotation of gear 35 for every full rotation of the gear 33.

A feature of the present apparatus resides in the fact that it allows the player or coach to select the speed at which he wishes to play; to select any one of three or more cams to automatically provide for a sequence of twenty or more different settings of the vertical and/or horizontal positions of the ball-ejection tube. The ability of the machine to theoretically allow for unlimited combinations of vertical and horizontal positions of the ball-ejection tube, injects an unknown factor when practicing or playing with the machine and which will tend to simulate the playing against of an actual opponent.

It will be apparent that the machine disclosed may be varied in numerous ways without departing from the spirit of the invention. For example, the number and arrangement of the cams may be varied. A coin-vending device provided with an automatic timer may be applied to the machine for use in public areas. The compression spring utilized to provide an energy source to the piston may be replaced by tension, torsion, conical or other type springs and/or compressed air or oil or other methods of generating or imparting energy to the ball, whether mechanical or electrical or otherwise.

Having thus described an embodiment of the invention, it is obvious that the same is not to be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. A ball-throwing apparatus comprising, a housing, a motor-operated transmission therein for speed variation, a universally-mounted ball-ejection tube having a compression spring and plunger located within it, a pivoted dog connected to the plunger and adapted to cause compression of the spring and retraction of the plunger and then permit the expansion of the spring and cause ball-ejection by the plunger, means driven from the transmission to cause rotative movement of the dog, a plurality of cams rotated from the transmission, a cam follower means contacting at least one of the cams, a coupling between said cam follower means and the ball-ejection tube by which vertical inclination of the tube occurs at predetermined intervals, a second cam follower means contacting at least another one of the cams, and a coupling between the second cam follower means and the ball-ejection tube by which horizontal pivotal movement of the ball-ejection tube will occur at predetermined intervals.

2. A ball-throwing apparatus as provided for in claim 1, wherein means is provided by which the cams are divided into a plurality of groups, and each of said follower means is shiftable to place it in operative position in respect to any one of the cams in its group.

3. A ball-throwing apparatus comprising, a universally-pivotal ball-ejection tube containing a spring-biased

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plunger, means for supplying successive balls to the tube, means for compressing the spring in the tube and then allowing it to expand to cause the plunger to eject a ball out of the housing, and motor-operated means which can be initially pre-set by the operator to a desired adjusted position for automatically causing tilting of the tube to a plurality of predetermined positions and at predetermined intervals to thereby vary the angularity of ball ejection from the tube.

4. A ball-throwing apparatus comprising, a universally-pivotal ball ejection tube containing a plunger, means for supplying successive balls to the tube, means for forcibly moving the plunger in one direction to cause it to eject balls from the tube, and motor-operated means which can be initially pre-set by the operator to a desired adjusted position for automatically causing tilting of the tube to a plurality of predetermined positions and at predetermined intervals to thereby vary the angularity of the ball ejection by the plunger.

5. A ball-throwing machine as provided for in claim 4, wherein there is provided means for automatically swinging the ball-ejection tube on a horizontal plane at predetermined times, the ejection tube having an effective larger diameter at a portion located adjacent to the point of impact on the ball by the plunger.

6. A ball-throwing apparatus comprising, a housing, a motor-operated transmission therein for speed variation, a universally-mounted ball-ejection tube having a plunger-urging spring and a plunger located within it, a pivoted dog connected to the plunger and actuated by the transmission and adapted to cause regulation of force of the spring and the retraction of the plunger and then permit the reaction of the spring to cause ball-ejection by the plunger, a cam rotated from the transmission, a cam follower for the cam, and linkage means between the follower and the ball-ejection tube by which automatic vertical inclination of the tube will be caused to take place at predetermined intervals.

7. A ball-throwing apparatus comprising, a universally-pivoted ball-ejection tube containing a spring-biased plunger, means for supplying successive balls to the tube, means for regulation of force of the spring in the tube and then allowing it to react to cause the plunger to eject a ball away from the tube, and motor-operated means which can be initially pre-set by the operator to a desired adjusted position for periodically and automatically causing tilting of the tube in both a vertical plane and in a horizontal plane to predetermined positions at predetermined periods to thereby vary both the vertical and horizontal angularity of the ball-ejection from the tube.

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8. In a ball-throwing machine, a universally-pivoted ball-ejection tube containing a spring-biased ball propelling plunger, motor-driven means for cocking the plunger and then causing the spring to propel a ball out of the ball-ejection tube, and cam and follower arm linkage means which can be initially pre-set by the operator to a desired adjusted position for periodically and automatically moving the ball-ejection tube to a plurality of locations of vertical and horizontal inclination.

9. In a ball-throwing machine, a universally-pivoted ball-ejection tube containing a ball-propelling plunger, means for moving the plunger through a ball-propelling movement, motor-driven means for cocking the plunger and then permitting the plunger-moving means to cause the plunger to propel a ball out of the ball-ejection tube, and cam and follower arm linkage means which can be initially pre-set by the operator to a desired adjusted position for periodically and automatically moving the ball-ejection tube to a plurality of locations of vertical and horizontal inclination.

10. A ball-throwing machine comprising, a housing, a rotated shaft therein, means for rotating the shaft, a dog caused to rotate by movement of the shaft, a hopper for balls, a slidable gate for permitting successive balls to be delivered from the hopper, a ball-ejection tube to which the balls are delivered, said tube being movably mounted in said housing, a plunger and a spring located with the ball-ejection tube, a connection means between the dog and the gate by which movement of the dog will cause the slide to permit the delivery of a ball from the hopper to the ejection tube, a coupling means between the dog and the plunger whereby movement of the dog will retract the plunger and tension the spring and then relieve the tension of the spring, a plurality of rotated cams, a cam follower operative against one of the cams, a linkage means between said follower and the ball-ejection tube whereby the tube will be periodically inclined in a vertical direction during rotative movements of the cam, a second cam follower operative against another one of the cams, and a coupling means between the last-mentioned cam follower by which the tube will be horizontally swung during rotative movements of the last-mentioned cam.

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