United States Patent

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[33] **Switzerland**
[31] **5587/67**

[54] **CENTRIFUGALLY OPERATED BALL PROJECTING DEVICE**
19 Claims, 10 Drawing Figs.

[52] **U.S. Cl.** **124/6,** 124/31, 124/41
[51] **Int. Cl.** **F41b 3/04**
[50] **Field of Search** 124/9, 8, 7, 6, 32, 31, 45, 41, 49, 50

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ABSTRACT: Apparatus for throwing tennis balls or the like comprises a barrel rotatable about a horizontal axis which intersects the barrel axis. The barrel has an inlet whose center is located on the horizontal axis. A blocking device in the barrel is actuated at variable intervals to permit a ball which enters the barrel by way of the inlet to issue from one end of the barrel by centrifugal force. The barrel is turnable about a vertical axis to change the planes of trajectories of balls and is rotated by a variable-speed drive so that the operator can change the trajectories independently of the angular position of the barrel during ejection of balls.

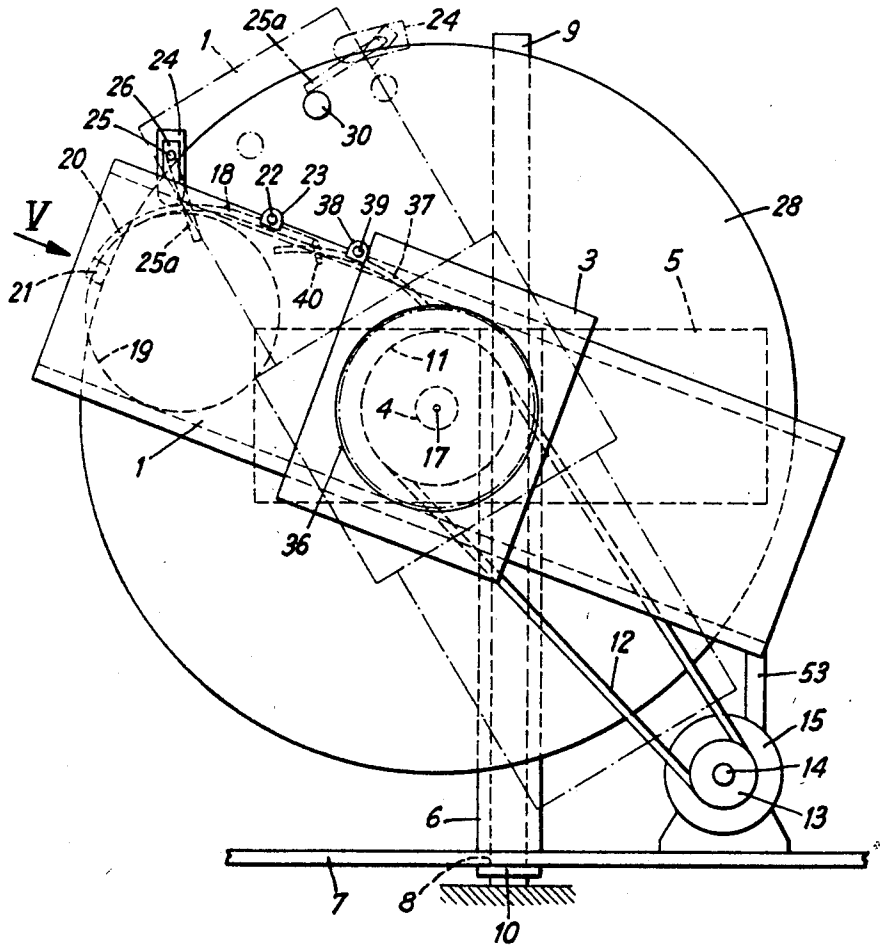


FIG. 1

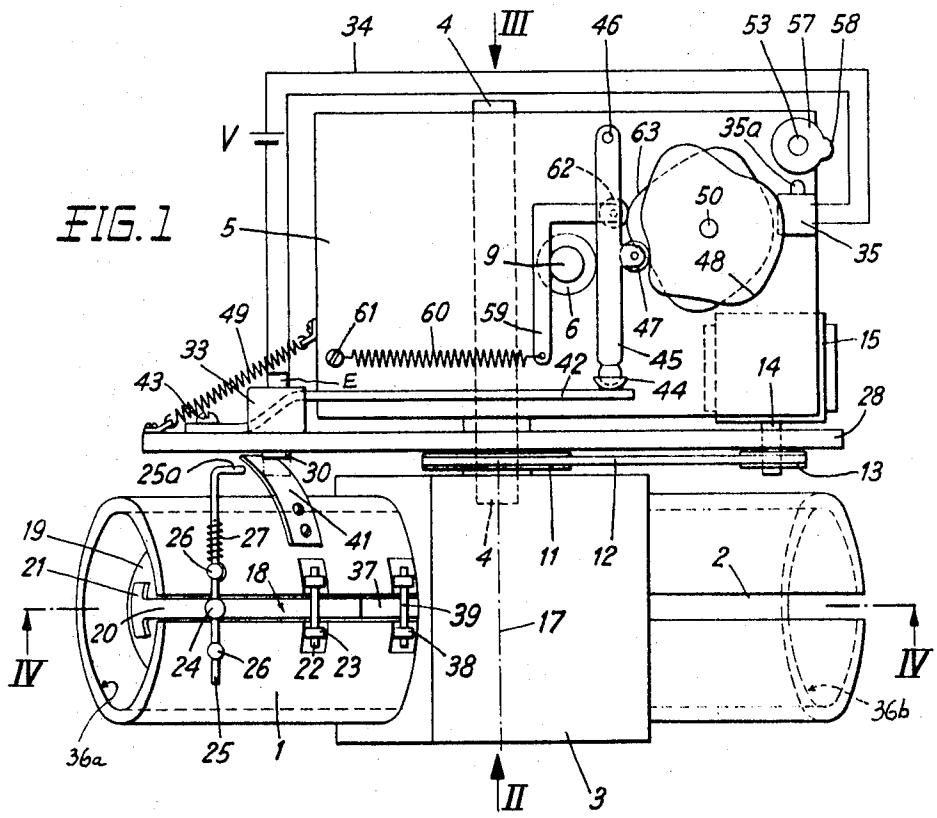
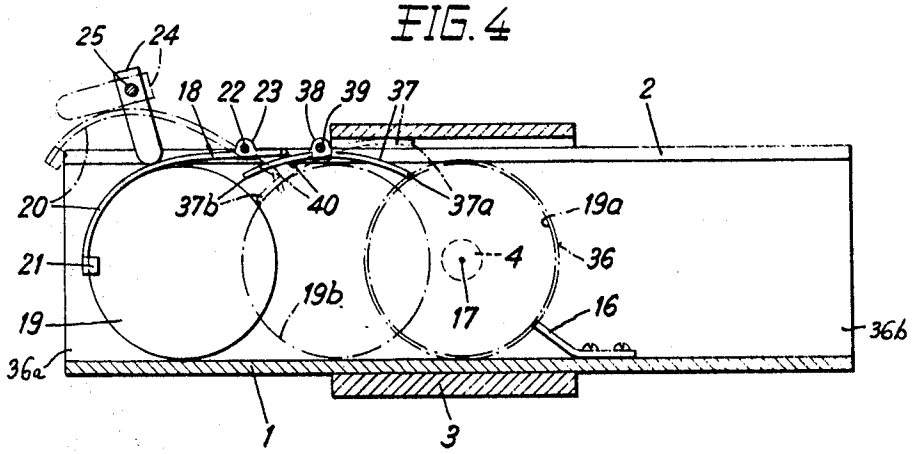


FIG. 4



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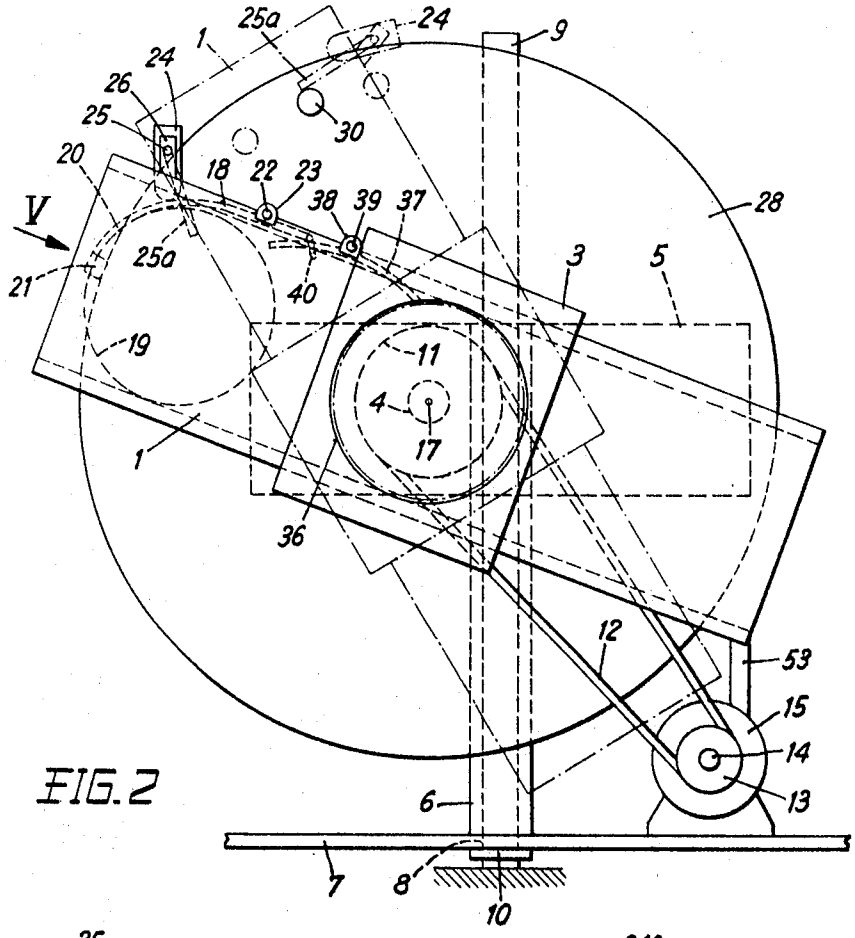


FIG. 2

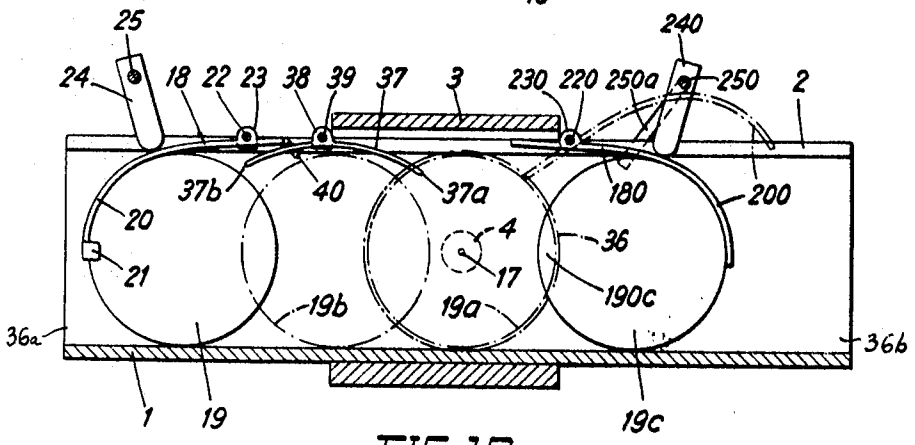


FIG. 10

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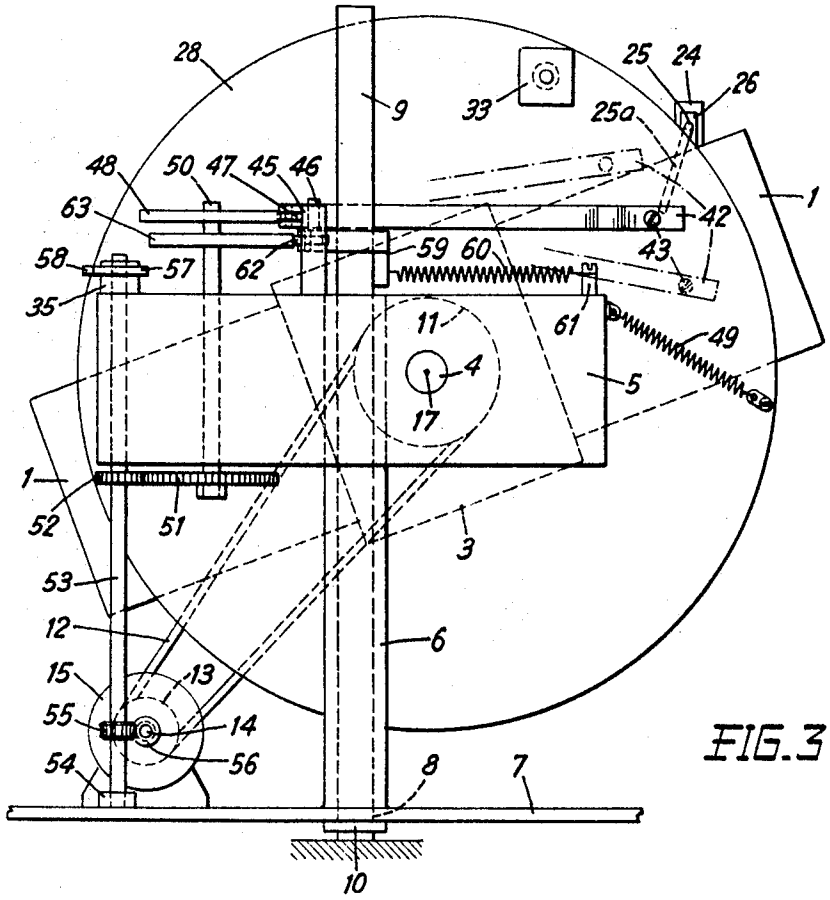


FIG. 3

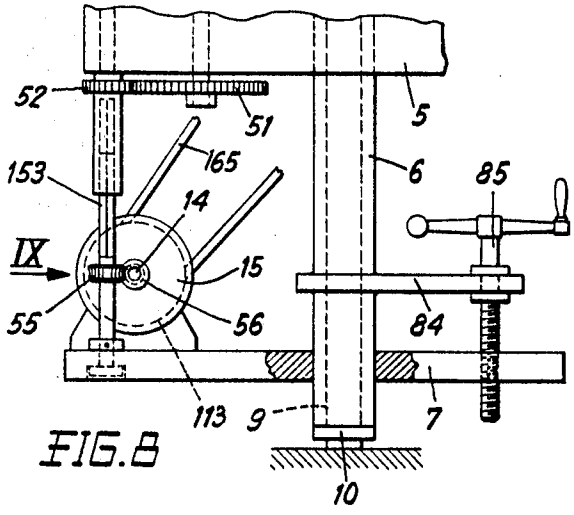


FIG. 8

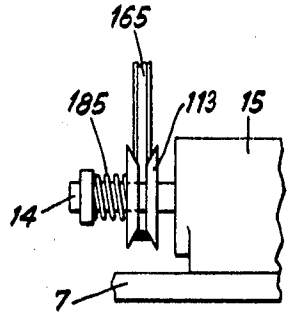


FIG. 9

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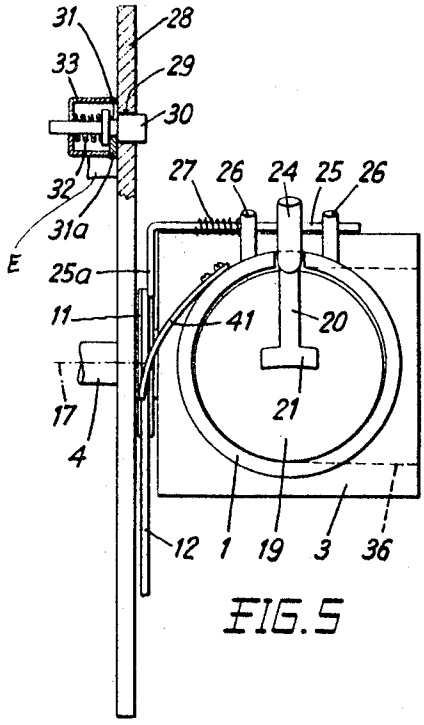


FIG. 5

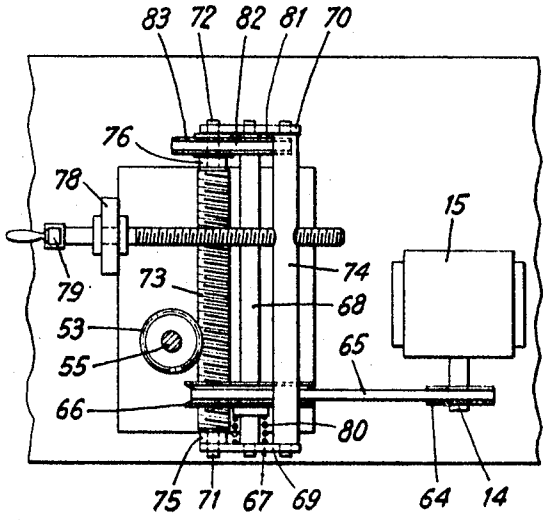


FIG. 6

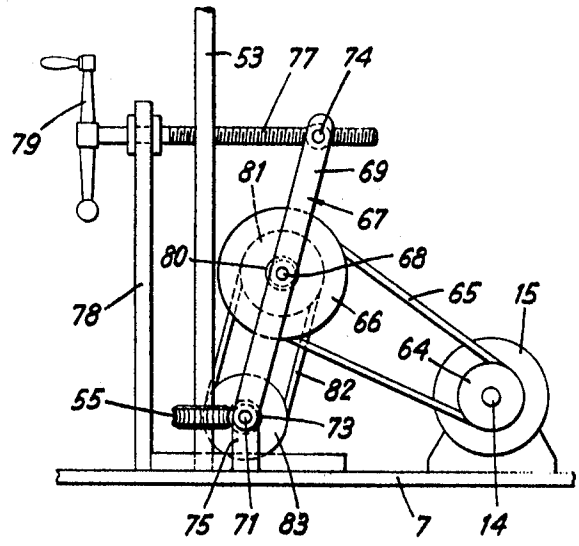


FIG. 7

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CENTRIFUGALLY OPERATED BALL PROJECTING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for throwing projectiles. More particularly, the invention relates to apparatus which can be utilized for throwing or casting of spherical, disc-shaped or other types of objects, especially for throwing objects which are utilized in various types of games, e.g., tennis balls, baseballs, soft balls, clay pigeons or the like.

SUMMARY OF THE INVENTION

It is an object of my invention to provide an apparatus which can throw balls or other types of projectiles in different planes, at different speeds and/or in different trajectories.

Another object of the invention is to provide an apparatus which is particularly suited for use as a practicing machine by tennis, baseball or softball players or in other games wherein a ball must be caught, thrown and/or batted in a number of ways and under different circumstances.

A further object of the invention is to provide an apparatus wherein the speed, rate and/or sequence in which the projectiles are thrown or catapulted can be varied at will so as to select the operation of the apparatus in accordance with the ability or progress of the person using it and to render it possible to throw projectiles in a manner closely resembling various situations which arise in a game.

An additional object of the invention is to provide an apparatus whose operation can be regulated automatically in accordance with a predetermined program and/or by hand.

Still another object of the invention is to provide an apparatus which can propel spherical or otherwise configurated projectiles with or without spin.

An ancillary object of the invention is to provide the apparatus with means for preventing simultaneous ejection of two or more projectiles.

The apparatus comprises basically a tubular barrel which has an outlet or muzzle at least at one of its ends and an inlet intermediate its ends, drive means for rotating the barrel about a preferably horizontal axis of rotation which is inclined with reference to the axis of the barrel and preferably intersects the latter axis at right angles midway between the ends of the barrel, and blocking means provided on the barrel and having a portion movable into the barrel to a blocking position to thus hold a projectile against ejection by centrifugal force and to a retracted position in which it allows a projectile to issue from the barrel by way of the outlet.

The apparatus preferably comprises adjustable control means for operating the blocking means in a desired sequence and at desired intervals so as to determine the exact moment of discharge of a projectile as a function of the inclination of the barrel axis with reference to a horizontal plane and to thus select the trajectories of projectiles. The apparatus is preferably further provided with second adjustable control means for swiveling the barrel about a substantially vertical axis and for thus selecting the planes of trajectories. The drive means for the barrel preferably comprises a variable-speed motor or a variable-speed transmission enabling the operator to change the speed at which the barrel rotates and to thus determine the distances which the projectiles can cover in air on ejection by way of the outlet in a predetermined position of inclination of the barrel with reference to a horizontal plane.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved apparatus itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of certain specific embodiments with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top plan view of an apparatus which embodies one form of the invention;

FIG. 2 is a front elevational view of the apparatus as seen in the direction of arrow II in FIG. 1;

FIG. 3 is a rear elevational view of the apparatus as seen in the direction of arrow III in FIG. 1;

FIG. 4 is a vertical sectional view of the barrel as seen in the direction of arrows from the line IV–IV of FIG. 1;

FIG. 5 is a fragmentary end elevational view as seen in the direction of arrow V in FIG. 2;

FIG. 6 is a fragmentary top plan view of a second apparatus;

FIG. 7 is a fragmentary front elevational view of the second apparatus;

FIG. 8 is a fragmentary rear elevational view of a third apparatus;

FIG. 9 is a view of a detail as seen in the direction of arrow IX in FIG. 8; and

FIG. 10 is an axial sectional view of a modified barrel which can be utilized in the apparatus of FIGS. 1—5, 6—7 or 8—9.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 1 to 4, there is shown an apparatus which can be used by tennis players to practice their game. The function of the apparatus is to dispense tennis balls in different directions, at different frequencies, at different angles and within an area of desired size. The apparatus comprises an elongated tubular barrel 1 which resembles a hollow cylinder of constant circular cross section and is provided with an axially parallel slot 2. The median portion of the barrel 1 is fixedly mounted in a cylindrical bore machined into a block-shaped holder or socket 3 which is secured to one end of a horizontal drive shaft 4. The axis 17 of the drive shaft 4 intersects and makes an angle of 90° with the axis of the barrel 1. The shaft 4 is rotatably mounted in an adjustable support 5 which is traversed by a vertical sleeve 6 of circular cylindrical outline. The lower end portion of this sleeve is rigid with a platform or base 7 which has a bore 8 for an upright column or post 9. The latter extends through and upwardly beyond the sleeve 6 and its lower end portion is fixedly mounted in the ground or in another stationary structure and has a collar 10 serving as an abutment for the platform 7. The parts 5, 6 and 7 form a rigid unit which can turn or swivel about the column 9 and rests on the collar 10.

The drive shaft 4 carries a pulley 11 which is adjacent to the socket 3 and is coplanar with a smaller pulley 13 on the output shaft 14 of an electric motor 15 mounted on the platform 7. An endless V-belt 12 is trained around the pulleys 11, 13 to drive the shaft 4 and the barrel 1 when the circuit of the motor 15 is completed. The transmission including the pulleys 11, 13 and belt 12 can be replaced by a sprocket and chain transmission. The parts 4 and 11—15 together constitute a drive means which can rotate the barrel 1 in a vertical plane.

The median portion of the barrel 1 is provided with a circular inlet 36 which can admit a succession of projectiles, here shown as tennis balls 19. Both ends of the barrel 1 are open; however, only the left-hand end (as viewed in FIG. 4) constitutes a muzzle or outlet 36*a* for balls 19 because the barrel 1 accommodates a removable stop in the form of a bracket 16 which is fixed to its internal surface and whose tip prevents the balls which enter by way of the inlet 36 from moving in a direction to the right, as viewed in FIG. 4.

The barrel 1 carries an intermittently operated blocking device 18 serving to normally prevent the ejection of balls 19 by way of the outlet 36*a*. This blocking device 18 has a portion or arm 20 which normally extends into the interior of the barrel 1 in the region between the outlet 36*a* and inlet 36 to hold the foremost ball 19 against ejection by centrifugal force when the barrel 1 rotates about the axis 17, i.e., when the circuit of the motor 15 is completed. The arm 20 is of arcuate shape and its curvature conforms substantially to that of a ball 19. As shown, the arm 20 is fulcrumed on a horizontal pin 22 which is parallel to the axis 17 and is mounted in two bearing eyes 23 affixed to the external surface of the barrel 1. The arrangement is such that the arm 20 can pivot in a plane which includes the axially parallel slot 2 and the axis of the barrel 1.

The front end of the arm 20 carries a pair of laterally extending vanes or extensions 21 which can enter the barrel 1 by way of the outlet 36*a* when the arm 20 is pivoted in a counterclockwise direction, as viewed in FIG. 4, to move from the phantom-line retracted to the solid-line blocking position. The arm 20 of the blocking device 18 is normally held in the solid-line blocking position by a swingable locking lever 24 which is pivotable about the axis of a horizontal shaft 25. When in locking position, the lever 24 extends substantially at right angles to the adjoining portion of the arm 20. The locking lever 24 is rigid with the shaft 25 and the latter is oscillatable in bearing eyes 26 mounted externally on the barrel 1 between the bearing eyes 23 and the outlet 36*a*. The inoperative position of the locking lever 24 is shown in FIG. 4 by phantom lines; the lever 24 then permits the foremost ball 19 to pivot the arm 20 to the phantom-line retracted position and to issue from the barrel by way of the outlet 36*a* under the action of centrifugal force to be propelled a distance which depends on the angular position of the barrel at the time the extensions 21 expose the outlet 36*a* as well as on the rotational speed of the drive shaft 4. The locking lever 24 is biased to locking position by a helical torsion spring 27 one end of which is anchored in the shaft 25 and the other end of which is anchored in the adjoining bearing eye 26. One end portion 25*a* of the shaft 25 is bent, as best shown in FIG. 1, and can be engaged by a motion transmitting projection or trip 30 to move the locking lever 24 to inoperative position while the barrel 1 rotates about the axis 17 of the drive shaft 4.

The aforementioned projection or trip 30 forms part of an adjustable control unit and is mounted on an angularly adjustable disc-shaped carrier 28 of the control unit. As shown in FIG. 5, the carrier 28 has a bore or hole 29 through which the projection 30 extends. This projection 30 has a circumferential groove 31 which can receive the pallet of a pawl 31*a* so that the pawl then holds the projection in idle or inoperative position shown in FIGS. 1 and 5 by solid lines. When the projection 30 assumes such idle position, it can be bypassed by the bent over end portion 25*a* of the shaft 25 so that the spring 27 is then free to maintain the lever 24 in locking position in which this lever prevents the arm 20 of the blocking device 18 from leaving the interior of the barrel 1. A helical spring 32 operates between a collar on the projection 30 (FIG. 5) and the rear wall of a small housing or retainer 33 which is affixed to the carrier 28. The purpose of the spring 32 is to bias the projection 30 to operative or extended position which is shown in FIG. 1 by phantom lines. The projection 30 then engages the end portion 25*a* of the shaft 25 during each revolution of the barrel 1 about the axis 17. The pawl 31*a* constitutes the armature of an electromagnet E which is energizable to withdraw the pallet of the pawl from the groove 31 and to thus permit the spring 32 to move the projection 30 to extended position. The pawl 31*a* is biased to the position of FIG. 5 by a suitable spring (not shown) which becomes effective as soon as the electromagnet E is deenergized. The pallet of the pawl 31*a* is then free to snap into the groove 31 and to hold the projection 30 in retracted position as soon as the projection is depressed against the opposition of the spring 32. Such depression of the projection 30 is carried out in a fully automatic way in response to rotation of the barrel 1. As shown in FIG. 1, the barrel 1 carries an arcuate resetting ramp or cam 41 which strikes against and depresses the projection 30 against the opposition of the spring 32 shortly after the end portion 25*a* moves beyond this projection. The resetting cam 41 is necessary in order to insure that the barrel 1 does not discharge a ball 19 during each of its revolutions, particularly when the shaft 4 rotates at a high speed.

The electromagnet E is connected in an electric circuit 34 which further includes a source V of electrical energy and a master switch 35.

The position of the projection 30 along the path of the end portion 25*a* of the shaft 25 determines the inclination of the barrel 1 at the time the barrel discharges a ball 19, i.e., the angle which the longitudinal axis of the barrel 1 makes with a horizontal plane. Such position of the projection 30 also determines the maximum distance which the balls 19 cover in flight. If the angular position of the carrier 28 remains unchanged, i.e., if the position of the projection 30 remains unchanged, each successive ball 19 defines the same trajectory and lands at the same distance from the outlet 36*a* provided, of course, that the rotational speed of the barrel 1 remains unchanged.

The inlet 36 of the barrel 1 has a diameter which exceeds slightly the diameter of a ball 19. The center of this inlet is located on the axis 17 and the apparatus can be furnished with a magazine (e.g., with a chute, not shown) which supplies to the inlet 36 balls 19 by gravity feed. In order to prevent simultaneous ejection of two balls 19, the barrel 1 is further provided with an intercepting device which comprises a two-armed lever 37 best shown in FIGS. 1, 2 and 4. The lever 37 is mounted on a horizontal shaft 39 which is journaled in bearing eyes 38 carried by the external surface of the barrel 1. One arm 37*b* of the lever 37 extends through a loop 40 at the rear end of the arm 20. If the arm 20 assumes the blocking position which is shown in FIG. 4 by solid lines, its loop 40 maintains the intercepting lever 37 in a position in which the second arm 37*a* of the lever 37 prevents a freshly admitted ball 19*a* from moving toward the extensions 21 of the blocking lever 20. Thus, the ball 19*a* is then located between the stop 16 and the arm 37*a*. If the arm 20 is then moved to the phantom-line retracted position of FIG. 4, the loop 40 pivots the intercepting lever 37 to the phantom-line second position of FIG. 4 so that the ball 19*a* can move to the position 19*b* in which it dwells by abutting against the arm 37*b*. Thus, the barrel 1 can discharge only one ball at a time. When the arm 20 thereupon returns to the solid-line blocking position of FIG. 4, its loop 40 returns the intercepting lever 37 to the solid-line first position and the arm 37*b* releases the ball 19*a* (in the position 19*b*) for movement toward the extensions 21 so that such ball 19*a* takes the position previously occupied by the ejected ball 19. At the same time, the second arm 37*a* returns to the solid-line position of FIG. 4 and prevents the next-following ball from leaving the position previously occupied by the ball 19*a*.

When the motor 15 drives the shaft 4 and the barrel 1 at a constant speed, the frequency at which the barrel discharges balls 19 depends on the frequency at which the master switch 35 completes the electric circuit 34 for the electromagnet E. All balls travel the same distance (i.e., they define identical trajectories) as long as the angular position of the projection 30 remains unchanged. Furthermore, all balls travel in the same vertical plane as long as the angular position of the support 5 with reference to the vertical axis of the column 9 remains unchanged.

The aforementioned control unit comprises means for changing the angular position of the barrel 1 during discharge of balls 19. Such means includes a device which can change the angular position of the carrier 28. In this way, the apparatus can change the angle between a horizontal plane and the axis of the barrel 1 from 0 to 90°. As stated before, the carrier 28 is turnable on the drive shaft 4. An arm 42 on the carrier 28 is turnable about the axis of a pivot pin 43 and its free end is coupled to a one-armed lever 45 by a ball-and-socket joint 44 (see FIG. 1). The lever 45 is pivotally secured to the support 5 by a pin 46 and carries a roller follower 47 which tracks the face of a disc-shaped cam 48. A helical spring 49 which operates between the carrier 28 and support 5 serves to bias the follower 47 against the face of the cam 48. This cam is affixed to a shaft 50 which is rotatable in the support 5. The lower end of the shaft 50 extends beyond the underside of the support 5 and carries a gear 51 meshing with a gear 52 on a vertical shaft 53 which is rotatable in the support 5 and in a bearing 54 provided on the platform 7 (see particularly FIG. 3). The shaft 53 is rigid with a worm wheel 55 which meshes with a worm 56 on the output shaft 14 of the motor 15. Thus, when the circuit of the motor 15 is completed, the output shaft 14 drives the shafts 53, 50 by way of the worm 56, worm wheel 55 and gears 52, 51 whereby the shaft 50 rotates the cam 48

and causes the roller follower **47** to periodically change the angular position of the carrier **28** and projection **30**. Depending on the configuration of the face on the cam **48**, the follower **47** can move the carrier **28** and the projection **30** between two spaced end positions, for example, between the two end positions which are shown in FIG. **2** by phantom lines. The apparatus is preferably furnished with two or more cams **48** each of which can be rapidly attached to and detached from the shaft **50** so that the player or another person operating the apparatus can select the extent of angular displacement of the projection **30** about the axis **17** of the shaft **4**. The configuration of faces on the individual cams **48** of a set is selected in such a way that each thereof establishes a training program which presents a different series of problems to the player. Thus, the trainer can select the cams **48** in accordance with the ability and progress of a particular player.

The shaft **53** extends upwardly beyond the support **5** and carries an actuating cam **57** having a lobe **58** which can engage a movable contact **35***a* of the master switch **35** to complete the circuit **34** and to energize the electromagnet E once during each revolution of the shaft **53**. Thus, the frequency at which the barrel **1** discharges balls **19** depends on the rotational speed of the shaft **53**, i.e., on the ratio of the transmission **55**, **56** between the output shaft **14** and the shaft **53**. Such frequency can be changed by replacing the cam **57** with a cam having two or more lobes **58**.

The heretofore described parts of the apparatus render it possible to select the frequency at which the barrel **1** discharges tennis balls, the configuration of the trajectories defined by balls subsequent to discharge from the barrel, and hence the distance which the balls cover during travel in air, it being assumed that the drive shaft **4** rotates the barrel at a constant speed.

The apparatus further comprises a second control unit for changing the vertical plane in which the balls travel from the outlet **36***a*. This second control unit comprises a device which can change the angular position of the support **5** with reference to the axis of the column **9**. Such device comprises a two-armed lever **59** which is rigidly secured to the column **9** (see FIG. **1**) and one arm of which carries a roller follower **62** tracking the face of a disc-shaped cam **63** on the shaft **50**. The other arm of the lever **59** is connected to a helical spring **60** which is coupled to a retainer **61** on the support **5**. The spring **60** maintains the follower **62** in engagement with the face of the cam **63** and, as the shaft **50** drives the cam **63**, the support **5** swivels back and forth about the axis of the column **9** in dependency on the configuration of the cam face. The cam **63** is replaceable in the same way as the cam **48** so that the player can select a cam of desired configuration in order to determine the sequence and the extent to which the support **5** swivels on the column **9**. The cam **63** determines the limits of swiveling movement of the support **5** (and hence of the barrel **1**) as well as a number of desired intermediate positions within such limits. The selection of an appropriate cam **63** depends on the ability and on the experience of the player.

FIGS. **6** and **7** illustrate a portion of a slightly modified apparatus having a regulating device for the two control units. This regulating device comprises a variable-speed transmission serving to change the speed at which the barrel **1** can swivel about the column **9** and the rate at which the inclination of the barrel with reference to a horizontal plane can be changed during ejection of successive balls while the motor **15** is on. The variable-speed transmission can also lengthen or shorten the intervals at which the barrel **1** discharges successive balls. The worm **56** of FIG. **3** is replaced by a pulley **64** which is fixed to the output shaft **14** of the motor **15**. An adjustable second pulley **66** is mounted on a shaft **68** and an endless belt **65** is trained around the pulleys **64**, **66**. The pulley **66** has two flanges one of which is rigid with the shaft **68** and the other of which is movable axially of the shaft **68** toward and away from the fixed flange. The shaft **68** is mounted in a frame **67** which comprises two sidewalls **69**, **70** pivotable on trunnions **71**, **72** provided at the axial ends of an elongated worm **73** which meshes with the worm wheel **55**, the latter being mounted on the vertical shaft **53**. The upper ends of the sidewalls **69**, **70** are connected with stubs at the axial ends of a rod **74** which is rotatable with reference to the side arms. The trunnions **71**, **72** of the worm **73** are rotatable in bearing brackets **75**, **76** which are rigid with the platform **7**. The angular position of the frame **67** can be adjusted by a feed screw **77** which is rotatable in a frame member **78** secured to the platform **7** and is provided with a hand wheel **79**. The feed screw **77** meshes with the rod **74**, i.e., the latter performs the function of a spindle nut and is moved toward or away from the frame member **78**, depending on the direction of rotation of the hand wheel **79**. The aforementioned axially movable flange of the pulley **66** is biased against the fixed flange by a helical spring **80** which surrounds the shaft **68** and bears against the sidewall **69** of the frame **67**. When the hand wheel **79** is rotated in a sense to move the rod **74** toward the frame member **78**, the belt **65** causes the movable flange of the pulley **66** to move away from the fixed flange against the opposition of the helical spring **80** so that the belt **65** then drives the shaft **68** at a higher speed. The shaft **68** carries a further pulley **81** for a belt **82** which drives a pulley **83** on the trunnion **72** of the worm **73**. Thus, by rotating the hand wheel **79**, the operator can change the transmission ratio between the output shaft **14** and worm **73**. It is clear that the regulating device shown in FIG. **7** comprises means for permitting some swiveling of the feed screw **77** with reference to the frame member **78** so as to compensate for changes in the level of the rod **74** when the hand wheel **79** is rotated in a sense to move the rod toward or away from the frame member.

By changing the speed of the worm **73**, the operator changes the speed of the shaft **53** and hence the speed of the shaft **50** (FIG. **3**) and cams **48**, **63** and **57**. Thus, the operator can change the angular position of the support **5** on the column **9**, the intervals between successive ejections of balls and the length of paths along which the balls travel (i.e., the inclination of the barrel **1** at the moment of ball discharge). However, and as long as the speed of the motor **15** remains constant, the operator cannot change the distance which the ball covers in air in a predetermined angular position of the barrel **1** with reference to the horizontal plane. In other words, the operator cannot change the speed at which the balls issue from the outlet **36***a* if the speed of the motor **15** is constant. FIGS. **8** and **9** illustrate a variable-speed drive which can change the rotational speed of the barrel **1** about the axis **17** of the drive shaft **4**. In this embodiment of the invention, the sleeve **6** is not rigid with the platform **7**, i.e., the latter is movable axially of the sleeve **6** and column **9**. The sleeve has a radial arm **84** for a vertical feed screw **85** which is provided with a hand wheel and meshes with the platform **7**. Thus, by rotating the screw **85**, the operator can raise and lower the platform **7** with reference to the collar **10** which supports the sleeve **6**. The pulley **13** of FIG. **3** is replaced by an adjustable pulley or sheave **113** one flange of which is rigid with the output shaft **14** and the other flange of which is biased toward the one flange by a helical spring **185** bearing against a collar on the output shaft **14**. The support **5** is rigid with the sleeve **6**; therefore, when the feed screw **85** is rotated in a sense to move the platform **7** downwardly, the belt **165** (which replaces the belt **12** or the belt **65**) penetrates deeper between the flanges of the pulley **113** and the rotational speed of the shaft **4** is reduced accordingly. The rotational speed of the shaft **4** is increased when the platform **7** is caused to move upwardly. In this embodiment of the invention, the shaft **153** which replaces the shaft **53** comprises two sections which are telescoped into each other so that the effective length of the shaft between the gear **52** and worm wheel **55** increases or decreases in response to displacement of the platform **7** along the sleeve **6**. As shown in FIG. **8**, the shaft **153** comprises two sections of polygonal cross-sectional outline so that the lower section can transmit torque to the upper section. It is clear that the arrangement shown in FIGS. **8** and **9** can be dispensed with if the motor **15** is replaced by a variable-speed motor or if

the shaft 14 is driven by a variable-speed transmission which receives motion from the motor 15. By adjusting the axial position of the feed screw 85, the operator can change the distance which the balls 19 cover on ejection from the barrel 1 while the inclination of the barrel with reference to the horizontal plane of the platform 7 remains unchanged.

Referring finally to FIG. 10, there is shown a portion of an apparatus which can impart to the balls a spinning motion or "English". This is achieved by causing the balls to roll in the barrel 1 prior to discharge from the respective outlet or muzzle. In other words, the distance between the blocking device for the foremost ball in the barrel 1 and the outlet of the barrel must be selected in such a way that the ball rolls in the barrel prior to issuing from the outlet. The resulting spin does not disappear while the ball travels in air so that the player can practice return strokes by hitting the balls while the balls spin. It is further desirable to construct the apparatus in such a way that the balls may be caused to spin at the will of the operator or player, i.e., that the barrel 1 can discharge balls with or without "English". It is to be understood, however, that the apparatus can be furnished with two barrels one of which discharges balls with and the other of which discharges balls without spin and that the two barrels can be used interchangeably.

The barrel 1 of FIG. 10 comprises all of the parts which are shown in the left-hand portion of FIG. 4 but the stop 16 is removed so that the balls can also be discharged from the right-hand outlet or muzzle 36*b* of the barrel. The stop 16 is replaced by a second arcuate blocking arm 200 which forms part of a second blocking device 180 and is pivotable on a shaft 220 mounted in bearing eyes 230. A locking lever 240 for the arm 200 is fixed to a shaft 250 which has a bent over end portion 250*a* corresponding to the end portion 25*a* of shaft 25. The distance between the blocking arm 200 and the second outlet 36*b* exceeds the distance between the arm 20 and outlet 36*a*. Thus, when the arm 200 releases a ball 19*c*, such ball must roll in the barrel 1 on its way toward the outlet 36*b* and receives a spin which remains during flight of the ball.

The manner in which the end portion 250*a* of the shaft 250 for the locking lever 240 is controlled is the same as described for the lever 24 and shaft 25. Thus, the carrier 28 is provided with a second projection 30 (not shown) which can be moved into or away from the path of the end portion 250*a* in order to effect movement of the blocking arm 200 to the retracted position which is shown in FIG. 10 by phantom lines. The arm 200 can but need not be moved to retracted position when the left-hand portion of the barrel 1 is empty and when the intercepting lever 37 assumes the operative position shown in FIG. 10. The arm 37*a* of the lever 37 then performs the same function as the stop 16 of FIG. 4 with the exception that it prevents successively admitted balls from travelling toward the arm 20. The shaft 53 of the apparatus which embodies the structure of FIG. 10 is provided with a second cam 57 which controls a second master switch in a second electric circuit to intermittently energize a second electromagnet which can release the projection for the end portion 250*a* of the shaft 250 at desired intervals and in desired angular positions of the barrel. The paths of the end portions 25*a*, 250*a* are preferably concentric so that the two projections (namely, the projection 30 for the end portion 25*a* and the nonillustrated second projection for the end portion 250*a*) can be mounted at different radial distances from the axis of the carrier 28. The projection 30 is invariably retracted when the projection for the end portion 250*a* is in extended position, and vice versa.

The operation of the apparatus including the structure of FIG. 10 is as follows:

At the start, the barrel 1 is empty. When the first ball 19*a* enters the barrel by way of the inlet 36, it engages the arm 37*a* of the intercepting lever 37 which is held in operative position. Centrifugal force which acts upon the ball 19*a* while the barrel 1 rotates about the axis 17 causes it to move against the arm 200 of the blocking device 180 which is held in operative or blocking position as shown by solid lines. The leftmost portion 190*c* of the thus displaced ball 19*a* in the position 19*c* then performs the function of the stop 16 and cooperates with the arm 37*a* of the intercepting lever 37. If the lobe 58 of the cam 57 then closes the master switch 35 to energize the electromagnet E for the pawl 31*a*, the projection 30 causes the arm 20 to move to the retracted position which is shown by phantom lines and the ball whose entry was blocked by the portion 190*c* of the ball 19*a* in the position 19*c* and by the arm 37*a* of the intercepting lever 37 is free to move to the position 19*b* and to the position 19 upon repeated closing of the switch 35. On third closing of the switch 35, the arm 20 allows the ball to issue from the outlet 36*a*. The ball 19*c* simply remains in abutment with the blocking arm 200 as long as the corresponding second circuit remains open. In this way, the barrel 1 of FIG. 10 can discharge a succession of balls 19 without spin.

If the player thereupon decides to practice hitting balls which arrive with a spinning motion, the cam 57 is removed or the circuit 34 is opened by an auxiliary switch, not shown, and the operator attaches a different cam 57 (or the same cam) in a position in which the lobe or lobes of such different cam can complete the circuit for the projection which acts upon the end portion 250*a*. The intercepting lever 37 remains in the position which is shown in FIG. 10 so that it does not allow balls entering via inlet 36 to move to the position 19*b* and from such position into abutment with the arm 20. Thus, a ball which enters by way of the inlet 36 is free to move to the position 19*c* as soon as the arm 200 moves to blocking position which is shown by solid lines. The arm 200 performs the function of the arm 20 and that of the lever 37 because it can prevent movement of balls from the position 19*a* to the position 19*c* when it is held in retracted position and permits movement of balls 19*a* to the position 19*c* when in the solid-line blocking position. The locking lever 240 is permanently biased to locking position by a torsion spring which is similar to the spring 27 so that it normally tends to assume the solid-line position of FIG. 10. The ejection of balls with a spinning motion is repeated as often as necessary, i.e., as long as the second projection continues to strike against the end portion 250*a* of the shaft 250 for the locking lever 240. The arrangement may be such that the operator of the apparatus can rapidly shift from ejection of balls without spin to ejection of balls with spin and vice versa so that the player can practice under circumstances closely resembling situations which arise during a game.

As stated before, the improved apparatus can be used with equal advantage for throwing of other types of projectile, for example, for throwing of baseballs, soft balls or clay pigeons. When used by baseball players, the apparatus can throw balls to be caught by outfielders or it can serve as a pitching machine.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. Apparatus for throwing balls or other types of projectiles, comprising a tubular barrel having an outlet at least at one end thereof and a projectile admitting inlet intermediate its ends; drive means for rotating said barrel about an axis of rotation which is inclined with reference to the axis of the barrel; blocking means having a portion movable into the barrel to a blocking position between said outlet and said axis of rotation to thus hold a projectile against ejection by centrifugal force and to a retracted position in which it allows a projectile to issue from the barrel by way of said outlet; and intercepting means arranged in said barrel between said inlet and said

blocking means and movable with said blocking means between an operative and inoperative position to respectively intercept movement of the projectile toward said outlet when said blocking means is in the retracted position and to permit passage of said intercepted projectile toward said outlet and engagement thereof with said portion of said blocking means when the latter is in said blocking position so that said projectile may then be ejected from said outlet upon said movement of said blocking means to said retracted position.

2. Apparatus as defined in claim 1, wherein said drive means comprises means for changing the rotational speed of said barrel.

3. Apparatus as defined in claim 1, further comprising control means for moving said portion of said blocking means between said blocking and retracted positions.

4. Apparatus as defined in claim 3, wherein said axis of rotation is substantially horizontal and wherein said control means comprises means for effecting movement of said portion of said blocking means to retracted position in different positions of inclination of said barrel with reference to a horizontal plane to thereby change the trajectories of projectiles issuing by way of said outlet.

5. Apparatus as defined in claim 1, wherein said axis of rotation is a substantially horizontal axis; and further comprising means for moving the barrel about a substantially vertical axis to thereby change the planes of trajectories of projectiles issuing by way of said outlet.

6. Apparatus as defined in claim 1, further comprising control means including means for effecting movement of said portion of said blocking means to retracted position at predetermined intervals and means for immediately returning said portion of said blocking means to blocking position.

7. Apparatus as defined in claim 1, wherein said axis of rotation is a substantially horizontal axis and wherein said barrel is turnable about a substantially vertical axis to change the planes of trajectories of projectiles issuing by way of said outlet, and further comprising first adjustable control means for effecting movement of said portion of said blocking means to retracted position at variable intervals, second adjustable control means for turning said barrel about said vertical axis, and regulating means for adjusting said first and second control means.

8. Apparatus as defined in claim 1, wherein said barrel is an elongated cylinder and wherein said axis of rotation is normal to and intersects the axis of said cylinder.

9. Apparatus as defined in claim 8, wherein said axis of rotation intersects the axis of said cylinder midway between the ends of said barrel.

10. Apparatus as defined in claim 8, further comprising stop means provided in said barrel to block the travel of projectiles toward the other end of the barrel, said stop means being disposed between said other end and said inlet.

11. Apparatus as defined in claim 1, wherein said inlet has a center located on said axis of rotation.

12. Apparatus as defined in claim 1, wherein said portion of said blocking means is movable to blocking position by way of said outlet.

13. Apparatus as defined in claim 1, wherein said axis of rotation is a substantially horizontal axis and wherein said barrel has two outlets, one at each end thereof, and further comprising second blocking means having a portion movable into the barrel to a blocking position in which it holds a projectile intermediate said inlet and said other end and to a retracted position in which the projectile is free to issue from the barrel by centrifugal force by way of said other end.

14. Apparatus as defined in claim 13, further comprising a pair of control means for respectively moving said portions of said blocking means between blocking and retracted positions.

15. Apparatus as defined in claim 1, wherein said portion of said blocking means is remote from said outlet in the blocking position thereof and wherein said projectiles are spheres which are caused by the barrel to spin during travel toward said outlet on movement of said portion of blocking means to retracted position.

16. Apparatus as defined in claim 1, wherein said intercepting means is coupled to said blocking means to intercept a projectile in the blocking position of said portion.

17. Apparatus as defined in claim 1, wherein said intercepting means comprises a two-armed lever one arm of which can hold a projectile on entry into the barrel by way of said inlet in the inoperative position of said intercepting means and the other arm of which can hold said projectile immediately upstream of said portion of said blocking means in the operative position of said intercepting means.

18. Apparatus as defined in claim 17, wherein said one arm in said operative position of said intercepting means intercepts movement of one projectile toward said inlet while said blocking means at the same time prevents movement of said one projectile out of said outlet of the barrel.

19. Apparatus as defined in claim 1, further comprising an upright column supporting said barrel and said drive means for angular movement about a vertical axis.