

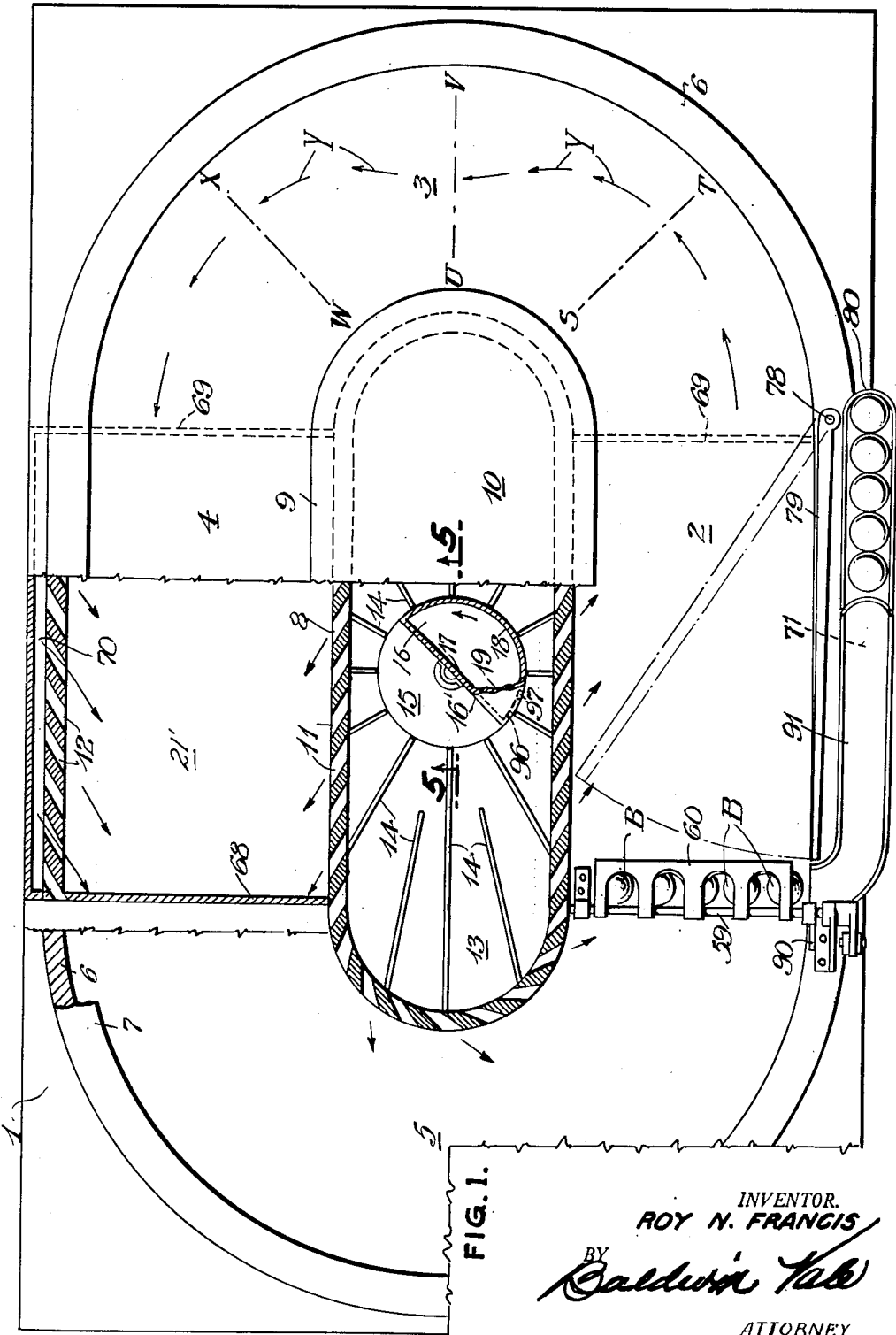
March 3, 1953

R. N. FRANCIS  
RACING GAME DEVICE

2,630,320

Filed Sept. 13, 1948

2 SHEETS—SHEET 1



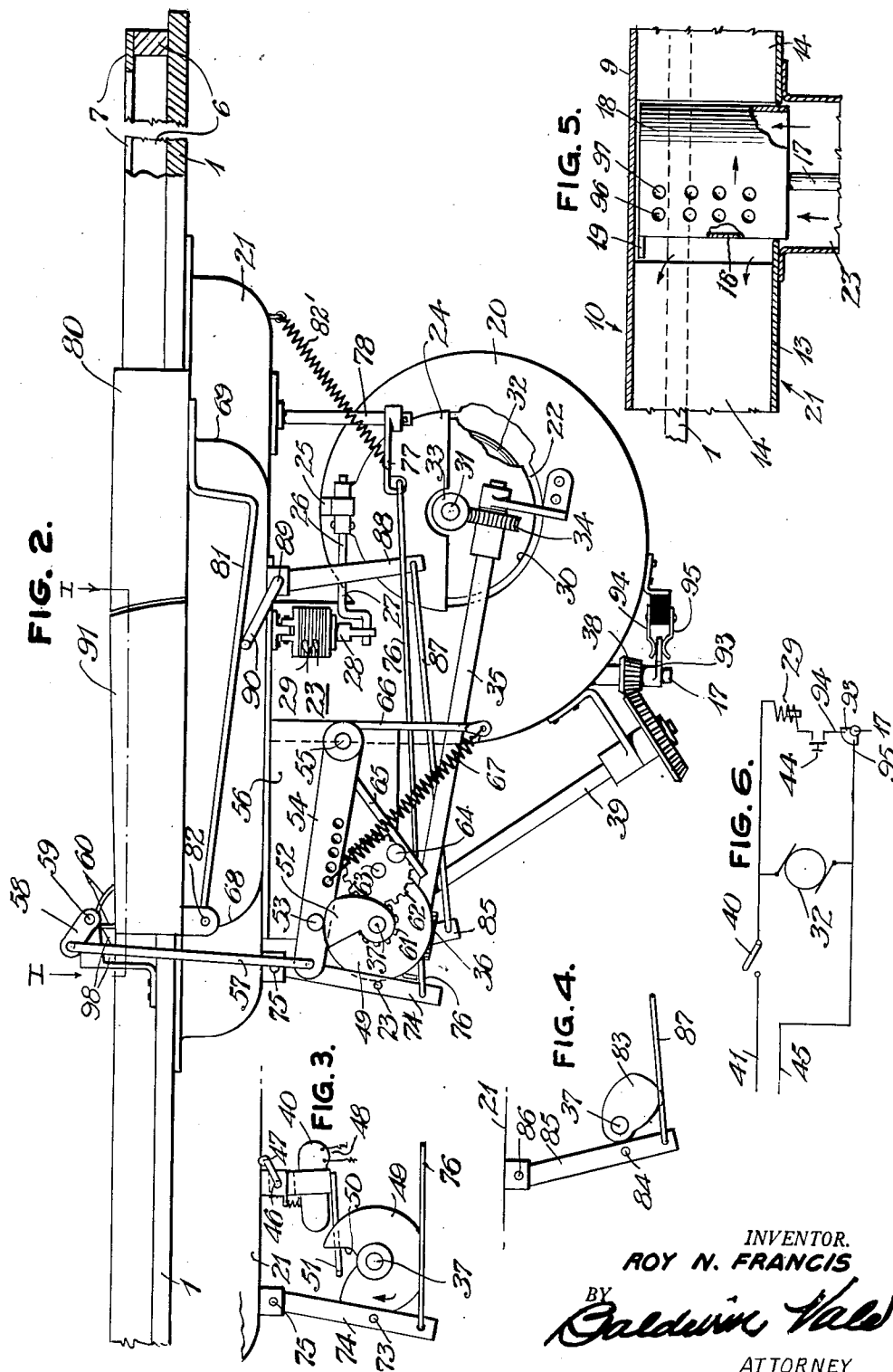
**March 3, 1953**

R. N. FRANCIS  
RACING GAME DEVICE

**2,630,320**

Filed Sept. 13, 1948

2 SHEETS—SHEET 2



## UNITED STATES PATENT OFFICE

2,630,320

## RACING GAME DEVICE

Roy N. Francis, San Francisco, Calif.

Application September 13, 1948, Serial No. 48,969

9 Claims. (Cl. 273-86)

1

This invention relates to mechanical games and more particularly to a machine simulating a miniature race track, in the class wherein balls are driven around a circular course by oblique air jets.

Among the objects of the invention is the provision of rotary air distributing means for causing a plurality of balls to roll around a defined course for several circuits and maintain a group formation. It is a disadvantage in games in this class, where the balls are propelled by a continuous air blast, that the balls tend to string out around the course, and finish in the general sequence initiated at the starting gate. Overcoming this tendency presented the major problem in the present invention.

Another object is the provision of an oblong race course with a starting gate, means for assembling the balls in finishing sequence, banked curves and other means for causing the balls to simulate the behavior of a group of race horses, by a novel means for applying the propulsive air-jets at automatically fixed intervals around the course with the result that the balls that over-run the jets tend to slow down, and the stragglers are advanced into the group, causing interferences and repositioning of the several balls in the group, so that the winner is unpredictable after the take off, and the race is eminently fair to the participants.

A further object is the provision of means for manually controlling the volume of the air jets within limited zones, so that a skilled player may skilfully "jockey" his "horse" into a favorable position relative to the group under limited circumstances, without disrupting the group formation.

Other objects and advantages will appear as the description progresses. In the specification and the accompanying drawings the invention is disclosed in its preferred form. But it is to be understood that it is not limited to this form; because it may be embodied in modifications within the spirit of the invention as defined in the claims following the description.

In the two sheets of drawings:

Fig. 1 is a plan view from above of a ball race course, in accordance with this invention, a portion of the course being in horizontal section on the line I—I, Fig. 2.

Fig. 2 is a side elevation of the same showing the underlying mechanism beneath the course.

Fig. 3 is a detail in front elevation of the cam assembly for actuating the starting switch and stop gate.

2

Fig. 4 is a similar view of the cam assembly for actuating the reloading shute.

Fig. 5 is a fragmentary detail in vertical section on the line 5-5 Fig. 1, of the distributor valve assembly.

Fig. 6 is a wiring diagram of the electric circuits.

In detail the structure shown in Fig. 1, shows the base table 1, supported upon legs or another suitable means adapted to conceal and protect the underhanging mechanism. The race course having the semicircular ends 3, 5, and the side stretches 2, 4, is superimposed above the plane of the table top 1. The ends 3, 5, are banked in a novel manner best adapted to maintain the group formation, as will be later more fully described.

The outer margin of the course is defined by the wall 6, having the inwardly projecting top flange 7. The center field is similarly defined by the wall 8, having outwardly extending top flange 9, of the cover plate 10.

The full circumference of the center wall 8 is provided with oblique air-jet passages 11. The outer wall 6, is provided with similar passages 12, directed at converging angles to the passages 11, across the course at 2, 4.

The space within the center wall 8, has the bottom 13, coacting with the top 10 and the wall 8 to form an air distributing chamber. This internal space is radially divided by the baffles such as 14, extending from the circular axial distributor opening 15, within which the distributor valve 16 is fixed upon and rotated by the shaft 17. This valve has the vertical diametrical vane 16', and the semicircular shield 18, and the top 19. This valve rotates contra-clockwise, and progressively distributes the airblast between the baffles 14, and through the jet passages 11 surrounding the chamber 13.

The height of the distributor valve 16, is defined by the depth of the air duct 21, Fig. 2, fixed to the under plane of the table top 1, and having the bottom 13, see Fig. 5.

Air is supplied to the duct 21 by the cyclone-type blower 20, having the axial inlet opening 22, and the outlet neck 23, discharging into the duct 21, the distributor valve opening 15, and the jet passages 11, as described. The blower inlet opening 22 is partially closed by the flap damper 24, pivoted at 25 to the casing of the blower. The pivot arm 26 has a forwardly extended crank 27, operated by the core 28, of the solenoid 29. The suction of the blower and the

3

weight of the core 28, keep the damper 24, normally closed.

The rotor 30 of the blower is mounted upon the motor shaft 31, of the motor 32 behind the blower. The gear worm 33, fixed on the motor shaft, meshes with the gear 34, on the counter-shaft 35, having a gear worm 36 thereon meshing with a worm gear, not shown, on the cam shaft 37. This cam shaft synchronizes the various functions of the machine.

The distributor valve shaft 17, is driven from below by the bevel pinion 38 and the gear on the intermediate shaft 39, which is driven through a similar bevel gearing, not shown, by the cam shaft 37. The gear ratios between the motor 32, the cam shaft 37 and the various synchronized elements may be varied to meet special conditions such as the number of times the balls race around the course to constitute a run. These various ratios will vary according to motor speeds and other conditions in larger and smaller sizes of machines.

The motor circuit, Fig. 6, is controlled by the mercury switch 40; the current flows in over the wire 41, through the switch 40, through the motor 32, the solenoid 29, the damper switch 44, and out over the wire 45, see Fig. 6.

The mercury switch 40, Fig. 3, is pivoted to the under side of the air duct 21 on the rod 46, extending through the side of the supporting bracket and having the bent end 47, for manually tipping the mercury switch. This causes the mercury therein to flow back and close the circuit at 48, and energize the motor 32, and the cam shaft 37, having the starting cam 49 fixed thereon and having the gap 50 in its periphery, Fig. 3. To start the motor the mercury switch is manually held in the starting position until the trip 51 thereon rides up onto the periphery of the cam 49, which motor will run until the cam makes one revolution and the trip drops into the gap 50 and tips the mercury switch forward to open the motor circuit.

During the initial revolution of the camshaft 37 the cam 52 fixed thereon, Fig. 2, rides under the stud 53 on the lower lever 54 pivoted at 55 on the bracket 56 mounted beneath the air duct 21. This lifts the link 57 and the arm 58 fixed on the end of the cross shaft 59 of the starting gate 60, holding the gate in the down position. Simultaneously the pinion 61, Fig. 2, on the camshaft 37 rotates the gear 62 on the stud 63 mounted on the bracket 56. The trip 64 on the gear 62 depresses the arm 65 pivoted on the bracket at 55, and having the downwardly extended arm 66, to which the end of the tension spring 67 is anchored and extends upwardly and engages a hole in the lever 54. This arm has a series of holes along its length for adjusting the tension of the spring 67. When the stud 53 drops off of the cam 52, the spring 67 functions to snap down the lever 54 and swing open the gate 60 the rear plate of which strikes the balls and gives an initial thrust to the balls such as B, confined within the gate, see Fig. 1. The gear ratio at 61, 62 is such that the stud 64 never stops at the same radial position, except after relatively long intervals. This assures that the initial starting thrust against the balls in the gate 60, varies with each "race," due to the varying of the tension of the spring 67, as controlled by the position of the stud 64, so that no two successive startings of the balls are alike, thus giving variety to the several races in succession.

The timing of the distributor valve 16, Fig. 1, is

4

such that the air blast from the blower synchronized with the opening of the gate 60, is such that the vane 16' is about perpendicular to the plane of the wall 8, which releases the air jets behind the forwardly thrust balls from the gate 60. The rotation of the distributor valve 16 maintains a constant air jet thrust behind the group of balls traveling around the course from 2 to 5. The succeeding baffles, such as 14, successively concentrate and give direction to the air jets issuing from the passages 11, so that none of the rolling balls lag too far behind the initial grouping in the stretch 2 of the track.

To further add impetus to the balls from the outer sides of the stretches 2 and 4, the outer wall 6 has the jet passages 12 in converging direction to the inner jets 11 but only on the straight-away passages 2 and 4, between the diameters of the end curves 3 and 5. This limitation is defined by the side walls 68, 69, of the lateral passage extensions 70, 71, of the air duct 21 which lead from the duct 21 below the bottom 13, wall 8 and the top 21' of the duct and then discharge behind and through the air jets 12 in the wall 6 laterally to the stretches 2 and 4 of the course. This gives added impetus to the group of balls to carry them around the first curve 3 and into the stretch 4, where they again receive the inner and outer thrusts from the jet openings 11 and 12, simultaneously. This carries the group of balls around the second curve 5, with only the inner jet thrust from 11, as on curve 3.

Continuous commercial use of this machine demonstrates, that this system of air distribution by the rotary valve 16, and the arrangement of the air jets 11, 12, will maintain the rolling balls in a group rarely longer than the width of the course between the walls 6, 8, so long as the gate 60 is raised and the motor runs. Occasionally one ball will shoot ahead of the group, but this takes it ahead of and out of range of the distributor valve 16 and the baffles 14, where it will lag because of the lack of air propulsion until the group catches up with it and it again receives the air blast from the distributor valve. If a ball lags behind the group it catches up when it reaches either of the stretches 2 or 4, because being alone it gets the full blast from the jets 11 and 12 without interference from the group.

On the curve areas 3 and 5 the balls change their relative positions in the group in an unpredictable manner, so that any ball may win or lose. The end areas are banked in a novel manner, there being a slight rise from a transverse line of the track or course about at the line 69, rising a few degrees to the point S, with a greater height at T so that the line S—T represents a fairly steep banked turn. The steepness of the bank of the turn declines at its mid point to substantially the line U—V with the incline from U to V lower than from S to T, although points S, U and W are all substantially on the same plane. The conditions relative to S—T are repeated at W—X where the curve again blends into the stretch 4 at 69, see Fig. 1. This condition is repeated at the end portion 5. This undulatory contour at the ends of the course gives an ideal path of a single ball which is diagrammatically indicated by the interrupted line of arrows Y, but it does not mark the actual path of the balls racing, some of which rebound from the flange 7; others collide on the stretches 2 and 4 and take various paths around and up and down the curves at the ends of the course. This concavo-convex

5

undulation of the curved banking of the end portions interferes with the normal centrifugal action on the balls and tends to rearrange the group and cause the outer balls to race down the bank from T to U, and V to W so that a leading ball may lose its lead in rejoining the group, and a laggard may roll in ahead of the group on the second bank at 5. Only by these various means described has it been possible to make the balls stay in a free group where any ball may roll without lagging too far behind, or gaining too much lead. It is important that no ball lag too far behind while the gate 60 is closing.

The present synchronous elements are plotted so that the group of balls makes four complete circuits of the course. On the fourth circuit the cam 49, Fig. 3, on the cam shaft 37 engages and pushes the lug 73 on the lever 74 outwardly on the pivot 75. This pulls the link wire 76 and the lever 77 on the pivot staff 78 having the stop gate 79 fixed thereon. This swings the stop gate across the stretch 2, and guides the racing balls in finishing sequence into the elevator 80, mounted on the arm 81 that is pivoted at 82 beneath the base 1. The balls are thus aligned in the elevator 80 with the winner in the lead and the other balls in sequence within the elevator. The lug 73 then drops into the gap 50 in the cam 49 and the tension of the spring 82' then restores the stop gate 79 to the closed position, as in Fig. 1.

The cam 52 then lifts the lever 54, restoring the starting gate 60 to the closed position upon the gate being raised to open position the cam 83 on the camshaft 37, see Fig. 4, pushes outwardly the lug 34 on the arm 85 that is pivoted at 86 beneath the air duct 21. This causes the arm 85 to pull the wire link 87 and the lever 88 having the pivot 89 mounted beneath the air duct 21, and with the crank extension 90 beneath the arm 81. The crank extension 90 lifts the elevator 80, so that the balls therein roll into the inclined chute 91, and against the stop 98 fixed on the pivot shaft 59 of the starting gate 60. This stop swings across the path of the balls in the chute 91, when the starting gate swings into the elevated position during the ball racing cycle.

When the gate 60 descends at the close of the race interval the stop 98 opens the passage from the chute 91 and the balls roll out of the chute and into the gate 60, ready for the next racing cycle. Two sets of balls are thus used, one set reserved in the chute 91, while the other set is running or in the elevator 80, as described. These balls are preferably solid plastic in contrasting colors of the same diameter and weight, and sufficiently heavy to avoid too high speed and too sudden acceleration under the double air jets in the stretches 2, 4.

Normally the blower works under about one-half volume capacity because of the damper 24. To selectively control this volume, the push-buttons such as 44 for remote control are installed at intervals around the table 1. These buttons control the solenoid 29 for opening the damper 24, as previously described. The conductive interrupter 93, consisting of a segment of a circle is fixed on the lower end of the distributor shaft 17, and revolves between the insulated spring contact brushes 94, 95, (see Fig. 2), that are interposed in the selectively controlled solenoid circuit which functions when the balls B are in the stretch 4. This opens this circuit in synchronism with the distributor valve 16, so that the solenoid circuit can only be closed

6

by the pushbutton 44, when the valve is distributing air in the straight-away stretch 4. The pushbutton operator, having chosen a particular ball in the race, may give it an added impetus by opening the damper 24 within this selected area, should the chosen ball be in the lead or lagging behind the group.

The vertical series of lead holes 96, 97, in the semi-circular shield 18 of the distributor, in advance of the vane 16, see Fig. 5, gives an initial blast of air at reduced velocity ahead of the concentrated jets through the air passages 11. This prevents a too violent response of the balls to the approaching jets, which may cause them to veer across the course, defeating the objective of making the balls simulate the behavior of horses on a race course.

In the wiring diagram, Fig. 6, the current flows in over the wire 41, the mercury switch 40, the motor 32 and back to the source over the wire 45. In the remote control means the current flows in over the wire 41, the solenoid 29, the pushbutton 44, the contacts 94, 95, and the interrupter 93, and back over the wire 45.

The invention operates substantially as follows: The operator lifts the bent end 47; this tilts the mercury switch 40 and closes the motor circuit. The initial rotation of the motor causes the rotation of the cam shaft 37 and the trip 51 of the mercury switch rides upon the cam 49 for a full revolution of the cam. The cam 52 releases the lever 54, which under the tension of the spring 67 snaps the starting gate 60 open and thrusts the row of balls forward on the stretch 2. The distributor valve vane 16' has synchronously advanced to direct the air jet from the passages 11 and 12, which gives momentum to the group of balls sufficient to carry them around the end curve 3. The undulation at S-T vertically modifies the path of the balls and prevents them from rushing around the outer curve of the wall 6 in single sequence. The continued air jets from the end passages 11 keep the weaving balls from bunching up, or lagging on the end curve 3.

The group of balls then enter the stretch 4 in different relative arrangement, where they again receive the added air jet impulse from the side passages 12. During this interval the pushbuttons 44 may be selectively operated to open the damper 24 to increase the volume of air, as described.

From the stretch 4 the balls repeat on the end curve 5, the conditions described relative to the end curve 3. The gate 60 remains elevated until the balls have made four laps, more or less as plotted. On the fourth lap the stop gate 79 synchronously swings angularly across the width of the stretch 2 and directs the balls into the elevator 80 which has been lowered by the crank extension 90. Both the starting gate 60 and the stop gate 79 synchronously return to their race starting positions, previously described.

As the starting gate 60 opens, the elevator 80 rises and the balls roll into the chute 91 against the stop 98. When the gate 60 closes at the end of the race, the stop 98, swings out of the path of the balls in the chute, which then roll into the closed starting gate, ready for the succeeding race.

During the interval that the stop gate is open across the stretch 2 the air jets from the passages 11 are diverted by the open stop gate and the balls roll into the elevator 80 without this lateral air thrust.

Having fully described this invention and its

mode of operation what I claim and desire to secure by Letters Patent is:

1. In a game having a closed undulating banked course, and balls of equal diameter and weight rolling thereon, air blast means for propelling said balls along said course, rotary valve means associated with said air blast means for consecutively directing the air blast, cutting off the air blast to the lead balls and delivering the full blast to the trailing balls to assist in constantly changing the relative position of the balls in transit.

2. In a game having a closed undulating banked course, and balls of equal diameter and weight rolling thereon, mechanical means for delivering the initial impetus to a group of balls along said course, air blast means for propelling said balls along said course, rotary valve means associated with said air blast means for consecutively directing the air blast, cutting off the air blast to the lead balls, supplying a small amount of air blast to the central group of balls, and delivering the full blast to the trailing balls to assist in constantly changing the relative position of the balls in transit.

3. A game machine in the class described, comprising a base having a substantially circular race course thereon defined by an outer wall, and by an inner wall with oblique air-jet passages therethrough; a central air duct chamber having radial baffles and communicating at its periphery with said air-jet passages; a rotary distributor valve centrally located within said chamber for successively and consecutively delivering an air blast through the compartments of said chamber to said air-jets in the corresponding portions of said inner wall; a blower connected with and discharging through apertures in said valve, through said compartments and air-jet passages and across said course; a starting gate extending across the width of said course having a rear bar adapted to project a series of balls onto said course; means for diverting said balls from said course and into said starting gate; and mechanical means for synchronizing the action of said starting gate and said ball diverting means with the rotation of said distributor valve.

4. A game machine in the class described, comprising a base table having a substantially circular race course thereon defined by an outer wall, and by an inner wall with oblique air-jet passages therethrough; an air duct chamber connecting with each of said walls discharging through said passages along said outer and inner walls; a rotary distributor valve centrally located within said chamber; a plurality of deflecting baffles within said chamber and radiating from said valves toward said inner wall and dividing said chamber into a series of radial compartments; a blower connected with and discharging through said valve, compartments and air-jet passages and across said course; a starting gate extending across the width of said course and adapted to retain a series of balls; means for opening said gate and projecting said balls onto said course to start them in transit in synchronism with the rotation of said distributor valve; a stop gate pivotally mounted on said base table adapted to swing across the width of said course and deflect said balls therefrom in sequence of arrival; and means for swinging said stop gate in timed sequence with the opening and closing of said starting gate.

5. A game machine in the class described, comprising a base table having a substantially cir-

cular race course thereon defined by an outer wall and by an inner wall with oblique air-jet passages therethrough; a central air duct chamber under and connecting with said walls and discharging through said air-jet passages, said air duct chamber having radial baffles dividing it into radial compartments; a substantially semi-circular rotatably mounted distributor valve centrally located within said chamber and having a transverse diametrical vane extending across the open side of a semicircular shield having a series of holes therethrough adjacent one end of said vane; a blower connected to and discharging through the series of holes in said valve, said compartments and air-jet passages and across the course; a starting gate extending the width of said course and adapted to retain a series of balls; means for opening said gate and imparting the initial impetus to said balls along said course, said opening being in timed sequence with the rotation of said distributor valve; a normally closed stop gate pivotally mounted on said table and adapted at the conclusion of the race to deflect said balls from said course in the order of their arrival and means for restoring the balls to said starting gate.

6. A game machine in the class described, comprising a base table having a substantially oval race course thereon defined by an outer wall, and by an inner wall, with oblique air-jet passages therethrough; an air duct chamber under and connecting with said walls; a plurality of deflecting baffles within said chamber and radiating from the central portion thereof toward said inner wall dividing said chamber into radial compartments; a rotary distributor valve axially located within said chamber; a motive means; a blower driven by said motive means connected with and discharging through said valve, said compartments and said air-jet passages; a starting gate extending across the width of said course and adapted to retain a series of balls; mechanical means for opening said starting gate and starting said balls in transit along said course in timed sequence with the rotation of said distributor valve; a stop gate pivotally mounted on said table and adapted to swing across the width of said course and back; a ball elevator mounted on said base adjacent said stop gate adapted to be raised and lowered synchronously with the swing of said stop gate and also adapted to receive the balls directed therein by said stop gate and return them to the starting gate; and synchronizing means actuated by said motive means for obtaining the timed sequence of said starting gate, stop gate and elevator with the rotation of said distributor valve.

7. A game machine in the class described, comprising a base table having a substantially oval race course thereon defined by an outer wall, and an inner wall with oblique air-jet passages therethrough; an air duct chamber under and connecting with said walls discharging through said passages in said inner and outer walls; radial baffles in said air duct chamber dividing the same into radial compartments; a rotary distributor valve centrally located within said chamber having air passages for registering with the entrance of successive compartments; a blower connected with and discharging through said valve, said radial compartments and said air jet passages; a starting gate extending across the width of said course and adapted to retain a series of balls; a normally retracted stop gate pivotally mounted on said base and adapted to swing across the width of said

course; a motive means driving said blower; a camshaft driven by a countershaft gearing by said motive means and having a cam and spring actuated lever assembly for raising said starting gate and starting said balls on said course; a starting cam on said camshaft and having a peripheral gap therein; a starting switch having a trip riding on said starting cam and closing the circuit of said motive means, until said trip drops into said gap in the starting cam; a swing lever having a cam follower lug actuated by said starting cam and linked to the pivot mounting of said stop gate for deflecting said balls from said course in synchronism with the closing of the said starting gate; a ball elevator in the path of said deflected balls; a cam on said camshaft actuating a lever assembly for elevating said ball elevator and delivering said balls to said starting gate; and an intermediate shaft assembly driven by said camshaft for driving said distributor valve by said motive means, while said starting switch is closed.

8. A game machine in the class described, comprising a base having a substantially oval race course thereon defined by an outer wall having oblique air-jet passages therethrough intermediate the end portion of said course and by an inner wall with oblique air passages therethrough; an air duct chamber under and communicating with said air-jets; a plurality of deflecting baffles within said chamber and radiating from the central portion thereof toward the inner wall dividing said chamber into radial compartments; a rotatably mounted distributor valve centrally located within said chamber and adapted to release a blast of air successively into each of said compartments; a blower connected with and discharging through said valve and air-jet passages and across said course; a starting gate extending across the width of said course and adapted to retain a series of balls; means for opening said starting gate and starting said balls in transit on said course in timed relation with the rotation of said distributor valve; a stop gate pivotally mounted on and adapted to swing across the width of said course and deflect said balls there-

from; means for swinging said stop gate in synchronism with the opening and closing of said starting gate; a damper associated with said blower for controlling the volume of air admitted to said blower; and a remote control for opening and closing said damper for modifying the volume of air discharged through the said air-jet passages.

9. A game machine in the class described comprising a base having a closed substantially oval race course thereon, with semicircular end portions and straightaway side stretches, defined by inner and outer walls having oblique air-jet passages therethrough, the semicircular end portions having undulating areas inclining and declining relative to the plane of said straightaway stretches; an air duct chamber beneath and connecting said air-jet passages; a rotatably mounted distributor valve within said chamber; a blower connected with and discharging through said rotary valve and said inner and outer air-jet passages and across said course; a starting gate extending across the width of said course and adapted to retain a series of balls; means for opening said gate and starting said balls on said course in timed relation with the rotation of said distributor valve; a receptacle adjacent the outer wall of the course to deliver the balls to the starting gate and receive them at the end of the run; a stop gate assembly mounted on said base and adapted to deflect balls from said course at the end of the run into said receptacle, in synchronism with the rotation of said distributor valve.

ROY N. FRANCIS.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number    | Name      | Date           |
|-----------|-----------|----------------|
| 290,474   | Riblet    | Dec. 18, 1883  |
| 770,494   | Cady      | Sept. 20, 1904 |
| 1,411,962 | Dupell    | Apr. 4, 1922   |
| 1,899,706 | McClellan | Feb. 28, 1933  |
| 2,129,489 | Brown     | Sept. 6, 1938  |