

July 17, 1962

J. E. BECK ETAL

3,044,778

COIN-OPERATED GAME

Filed April 9, 1958

16 Sheets-Sheet 1

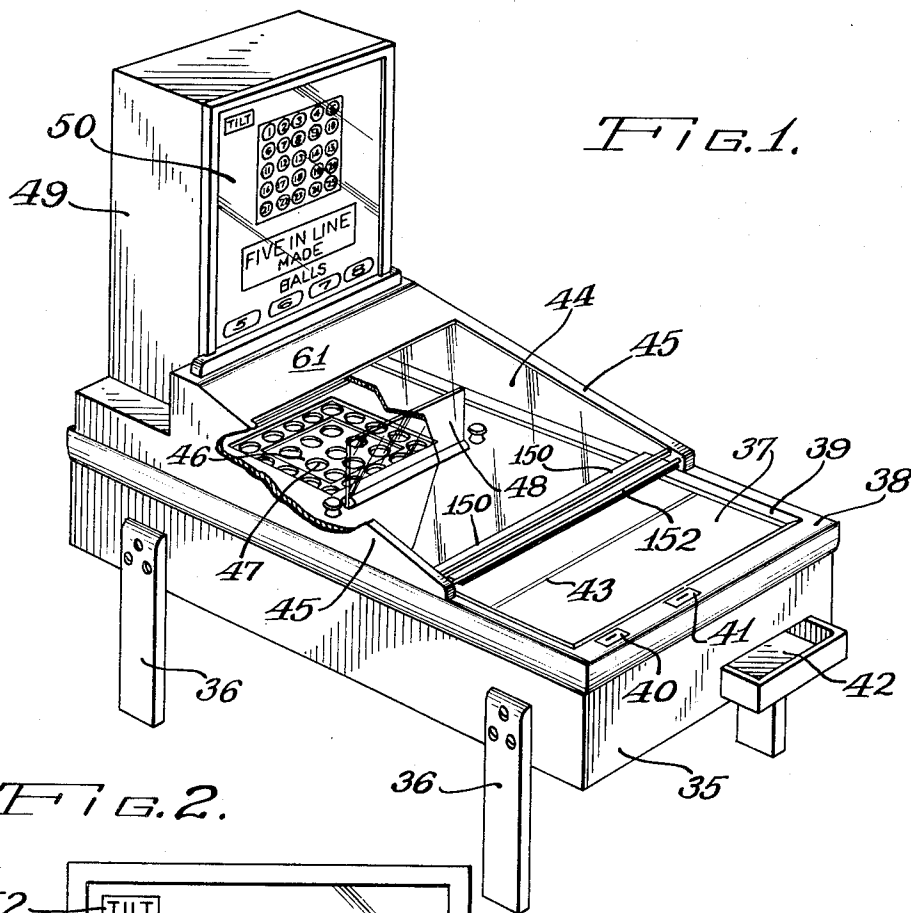
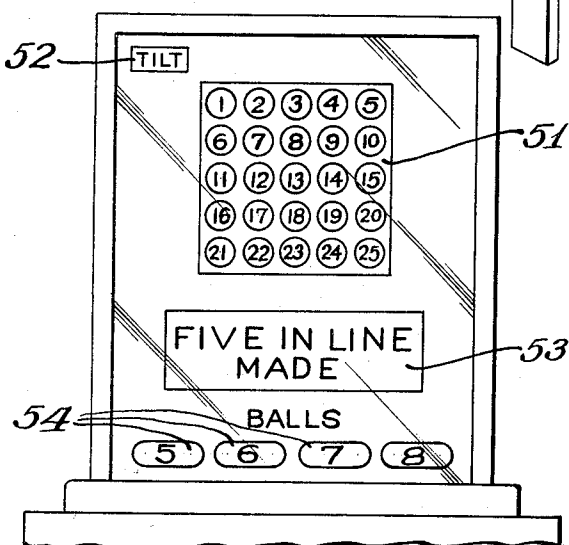


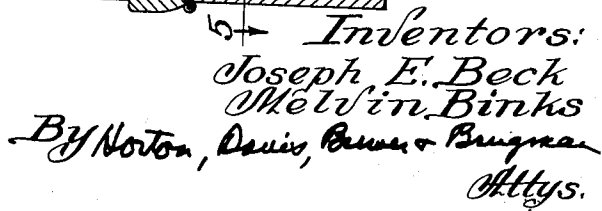
FIG. 2.



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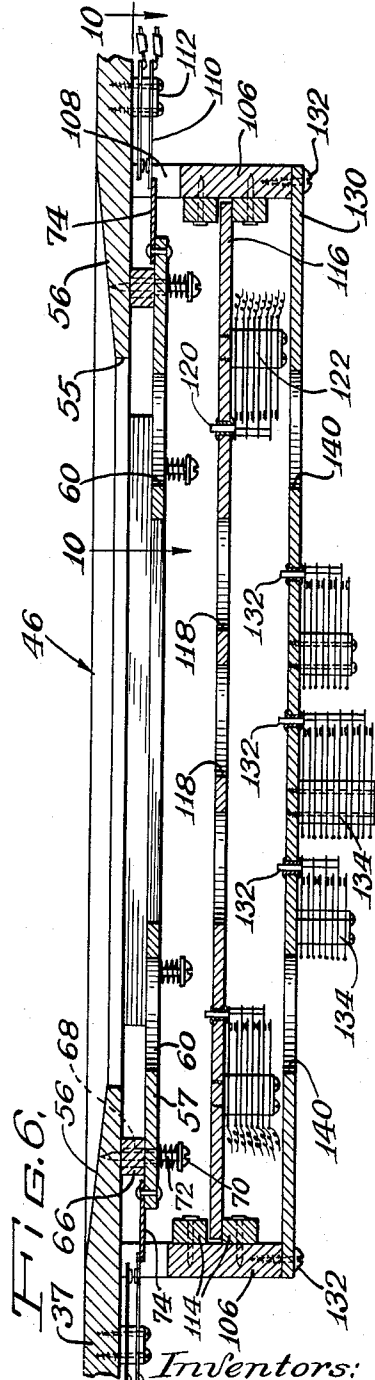
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16 Sheets-Sheet 3



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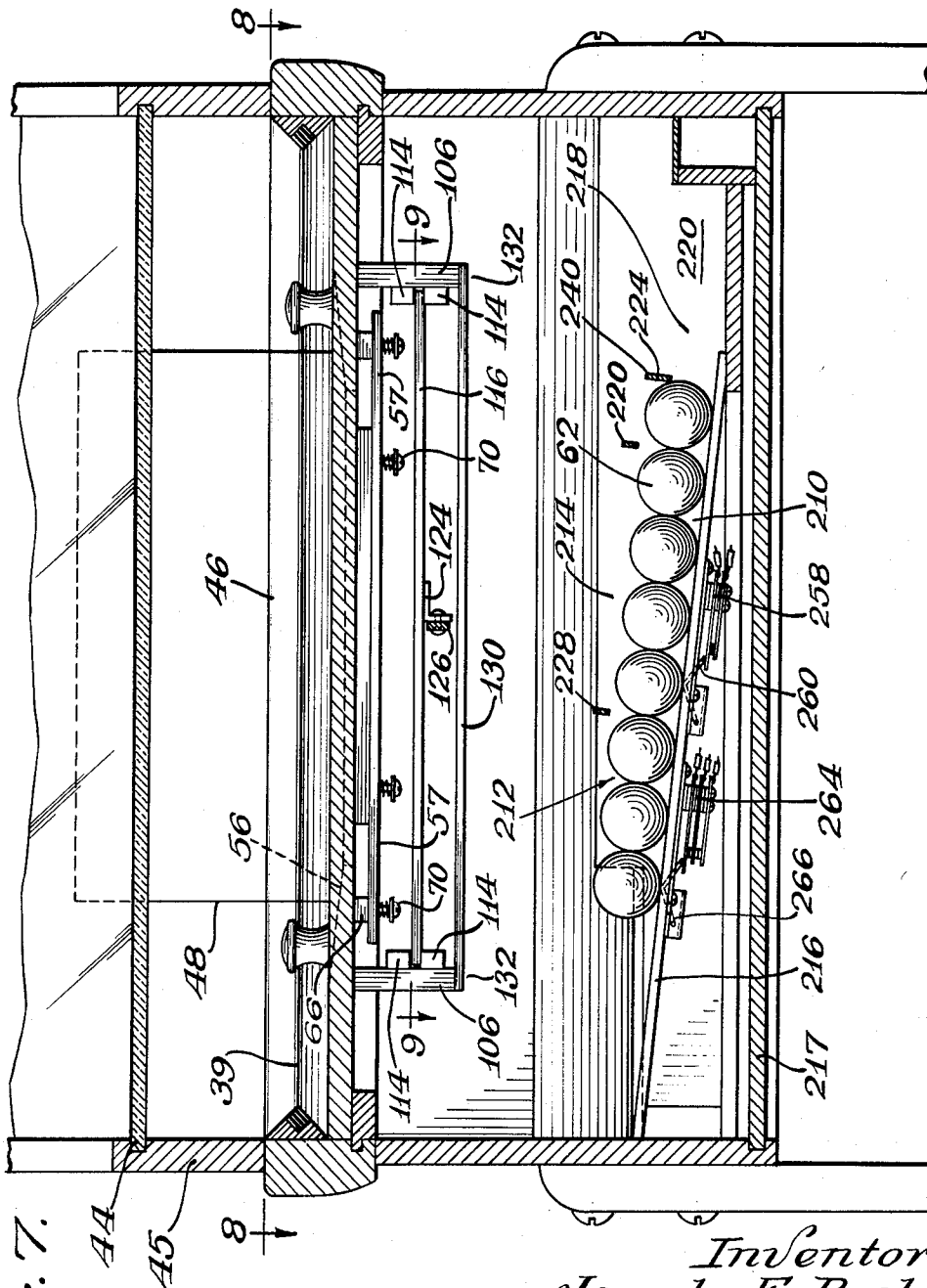
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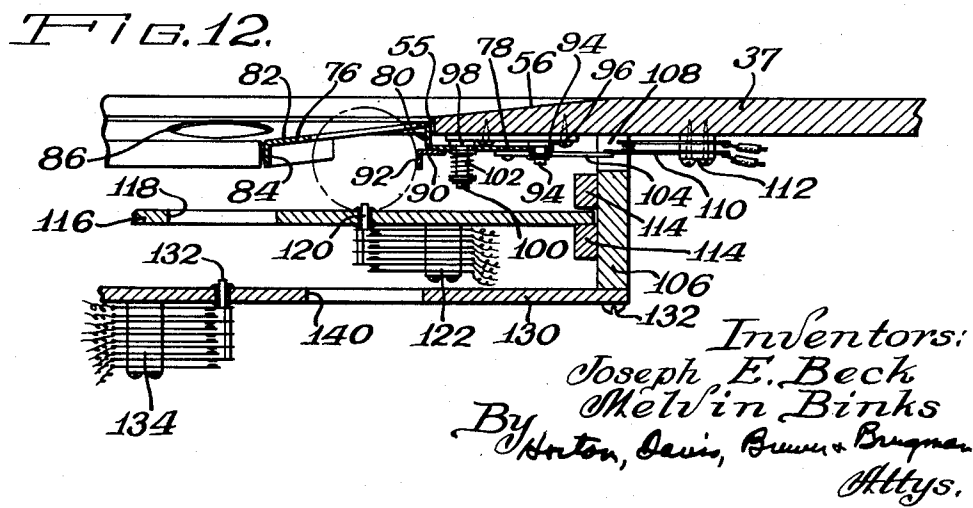
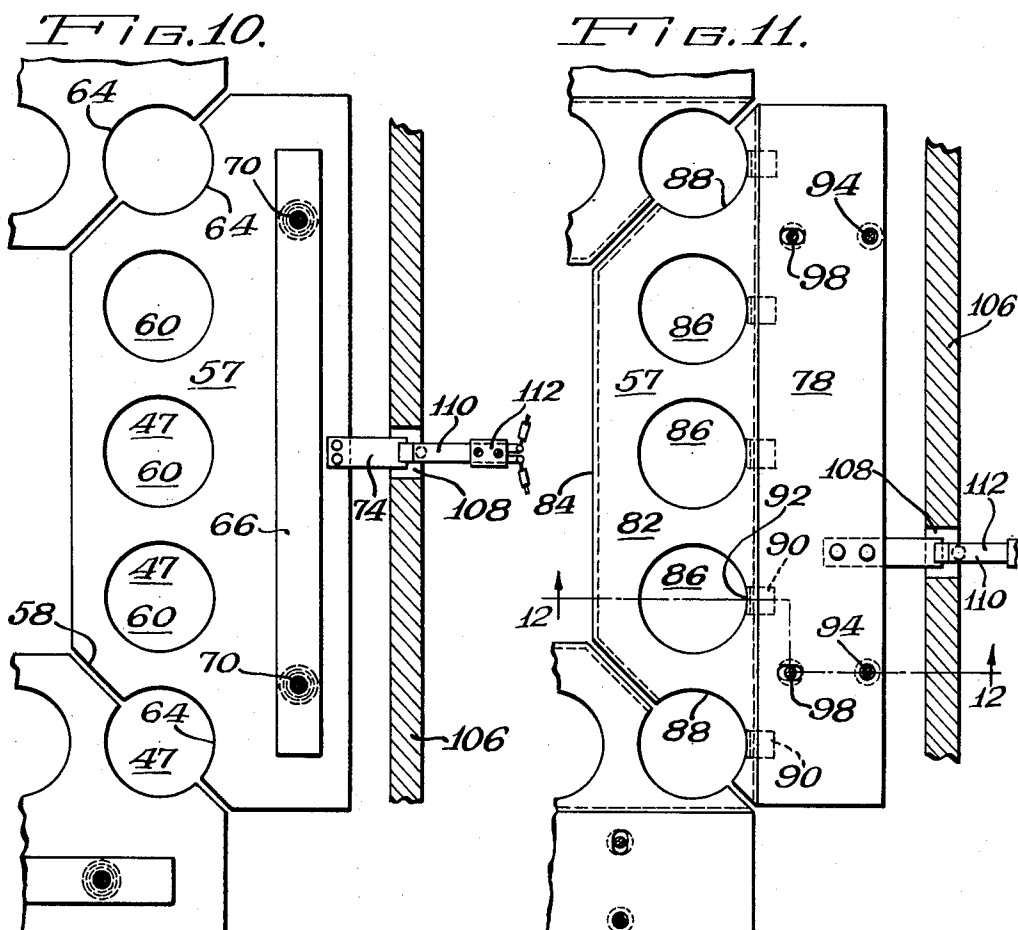


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J. E. BECK ETAL
COIN-OPERATED GAME

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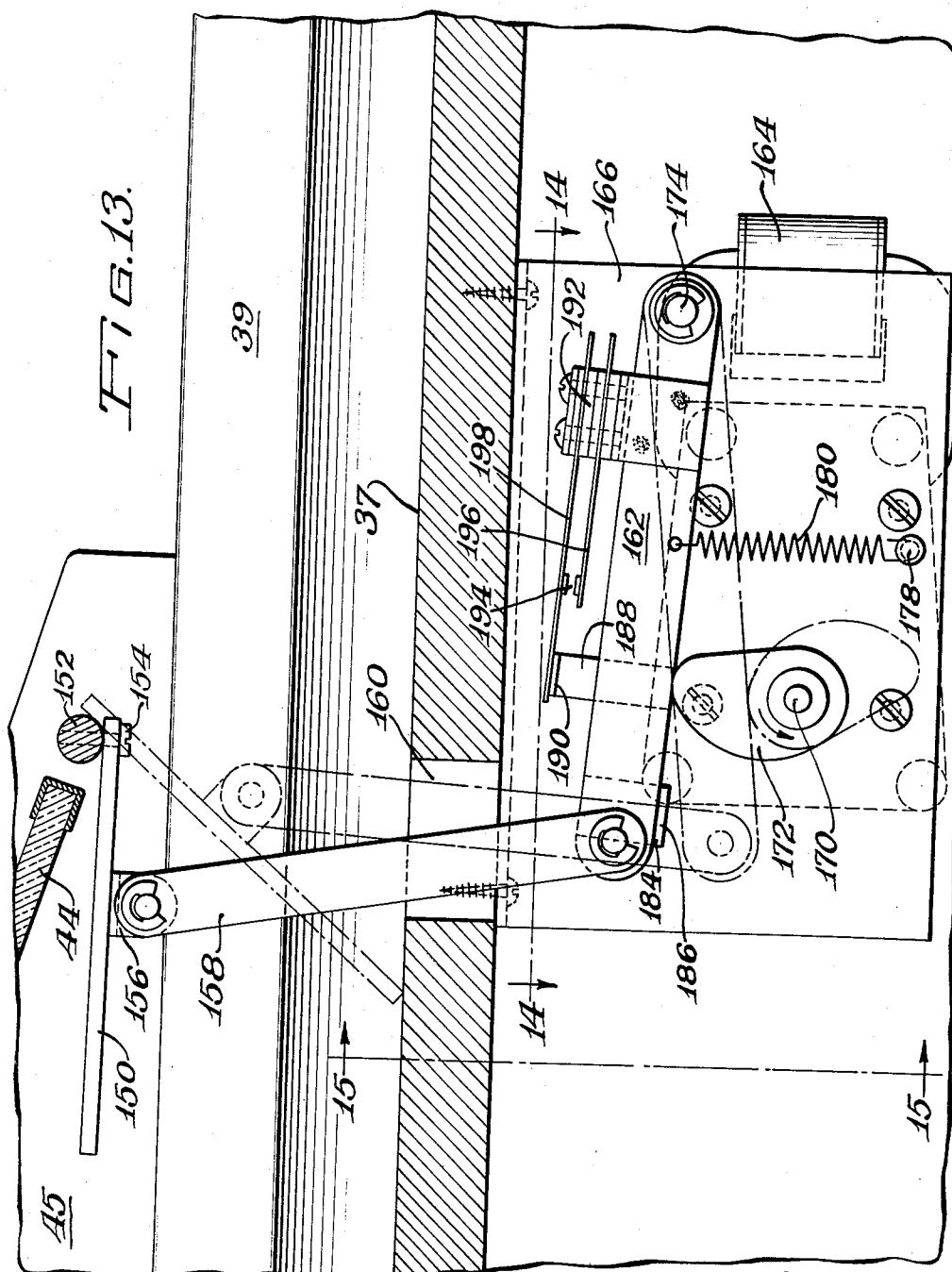
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COIN-OPERATED GAME

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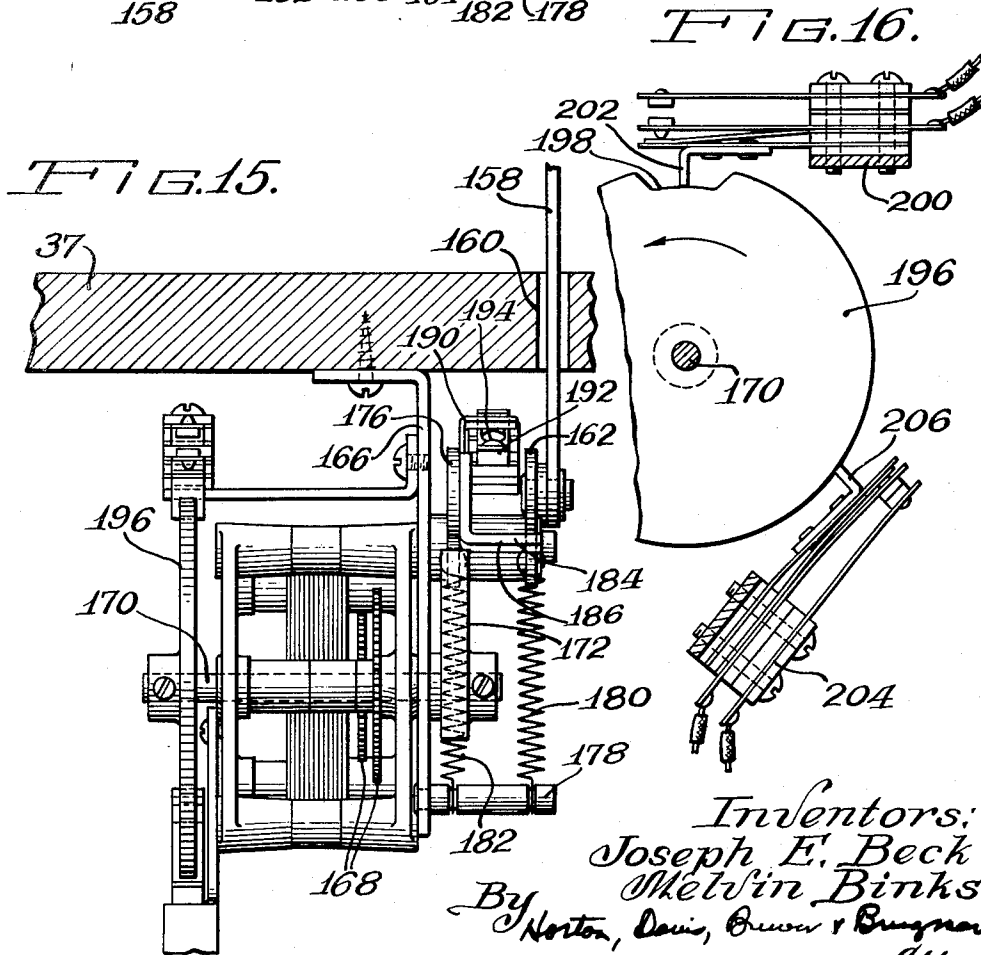
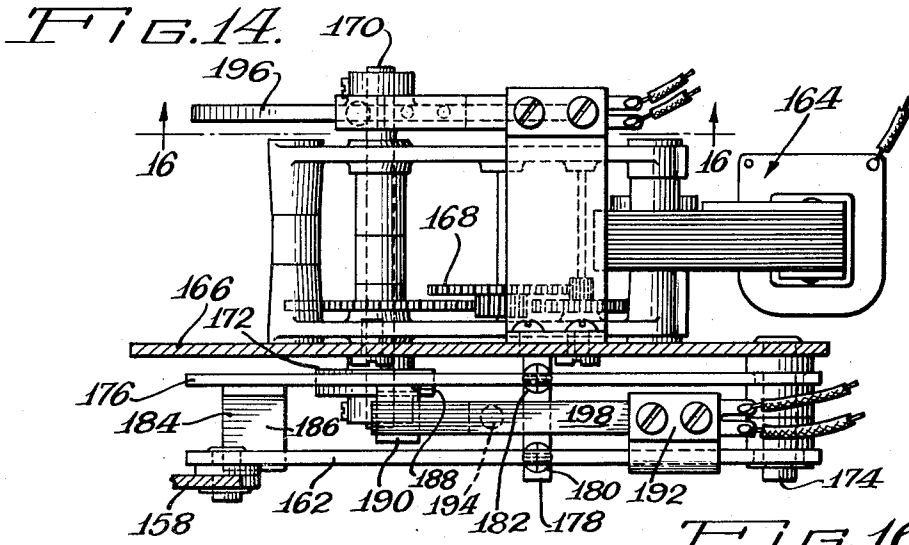
J. E. BECK ETAL

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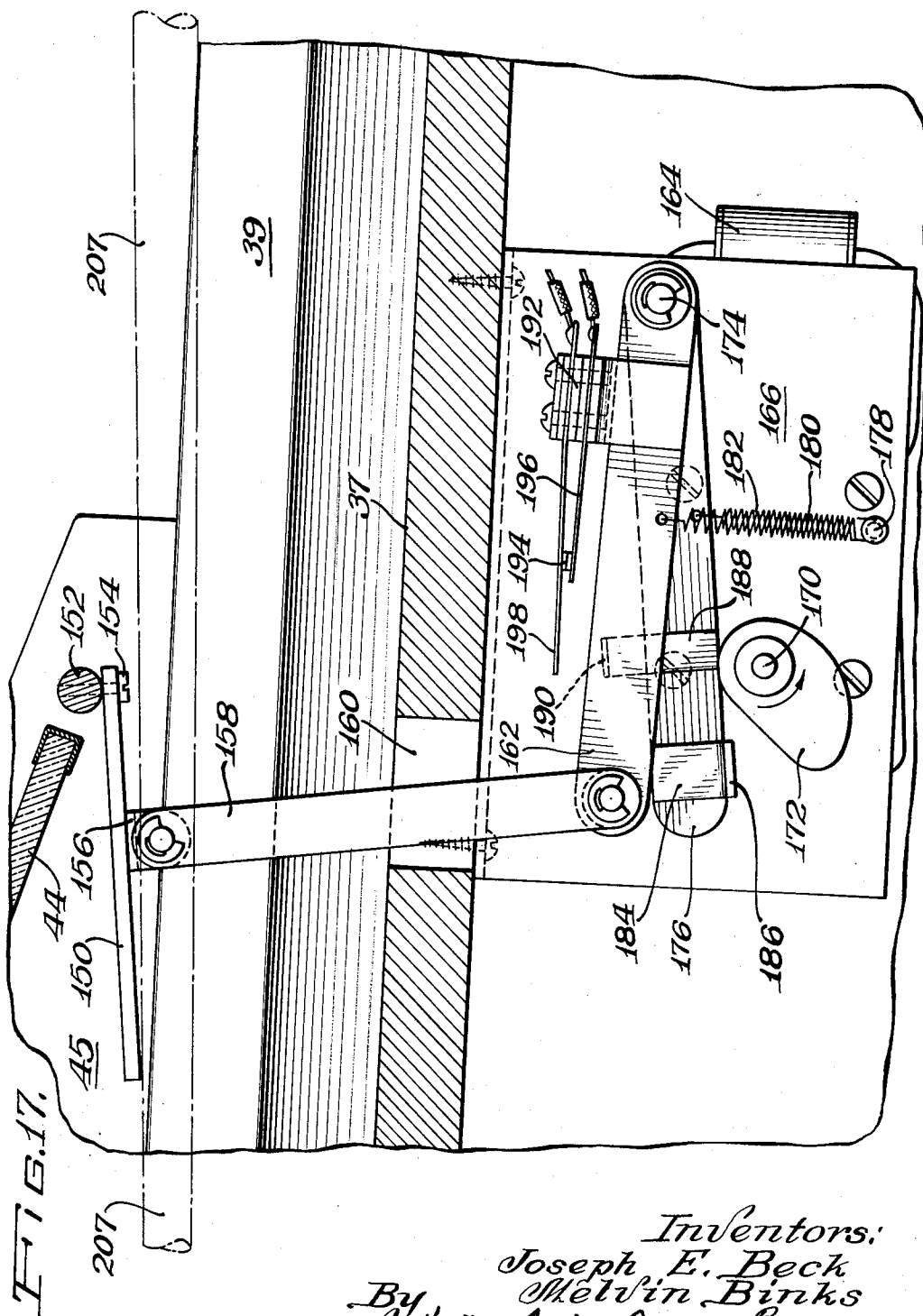


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COIN-OPERATED GAME

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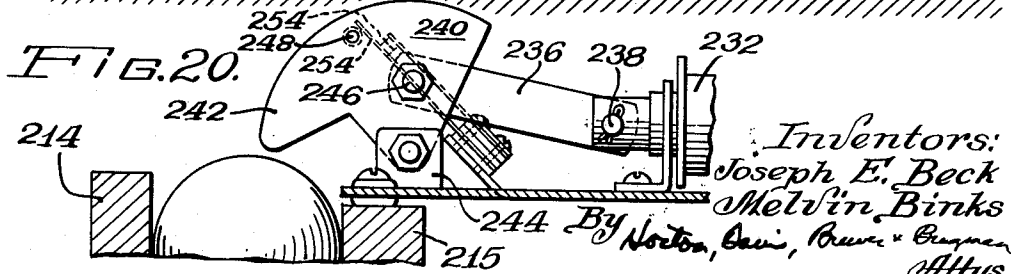
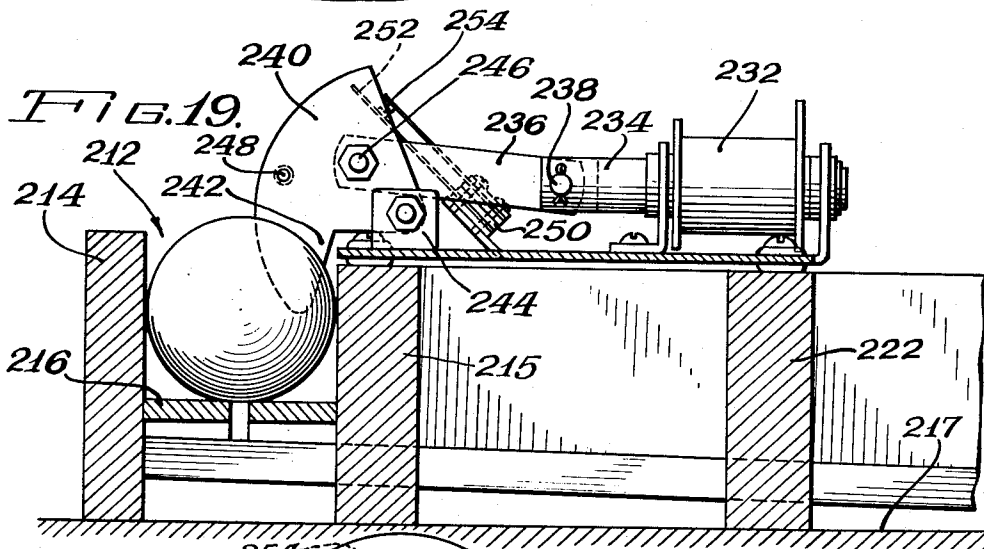
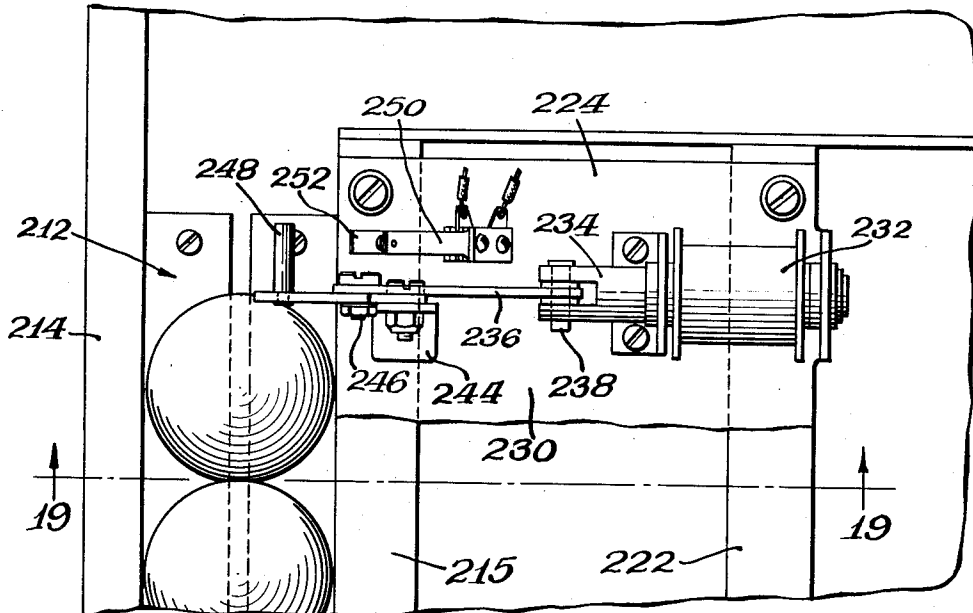
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FIG. 18.



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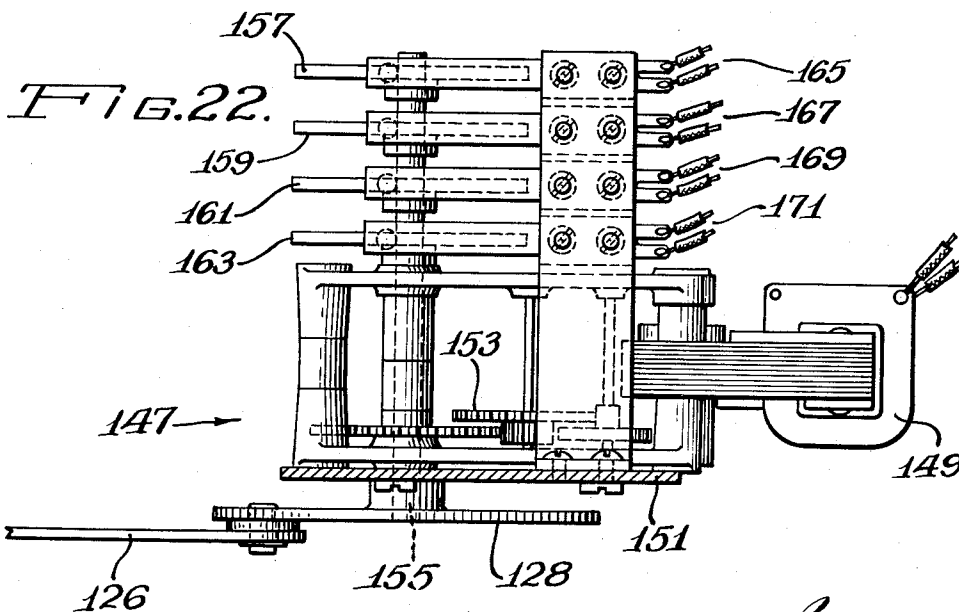
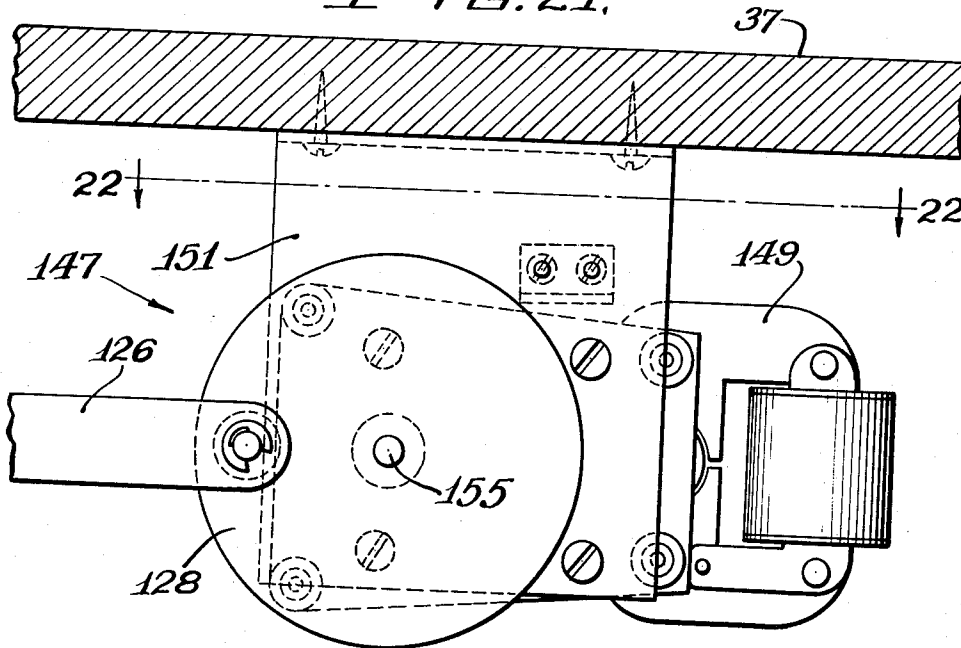
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FIG. 21.



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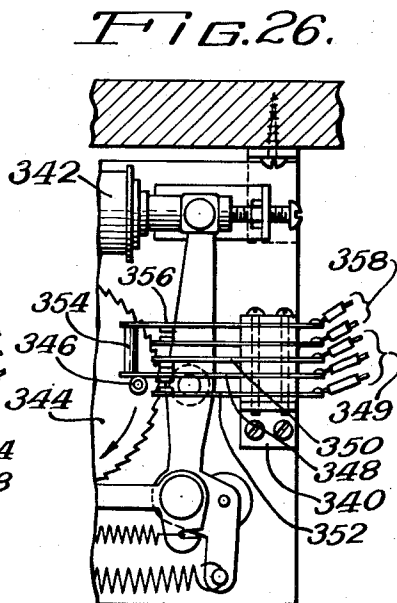
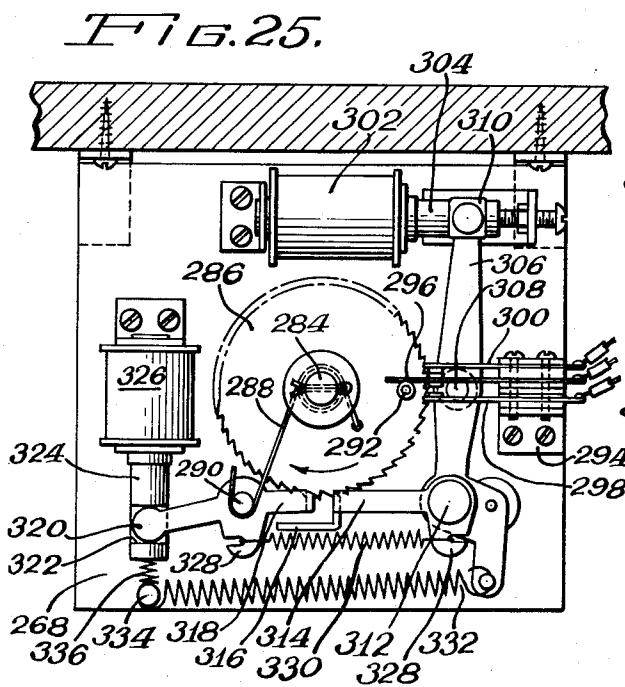
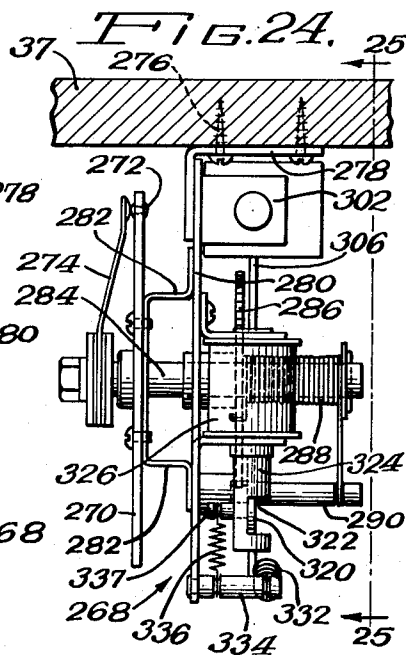
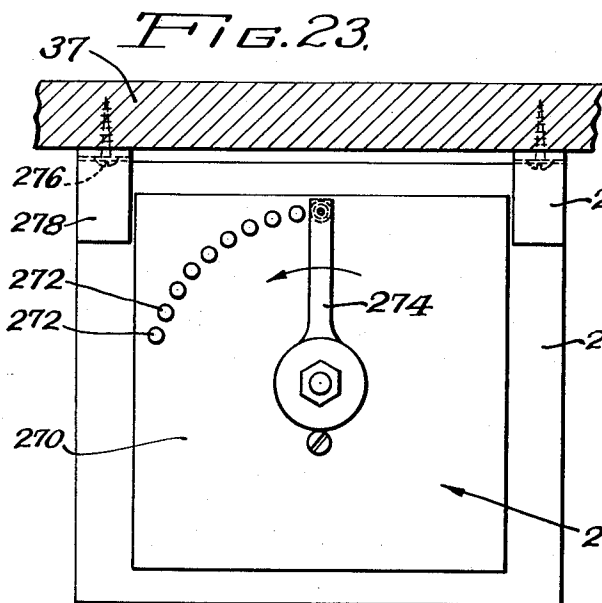
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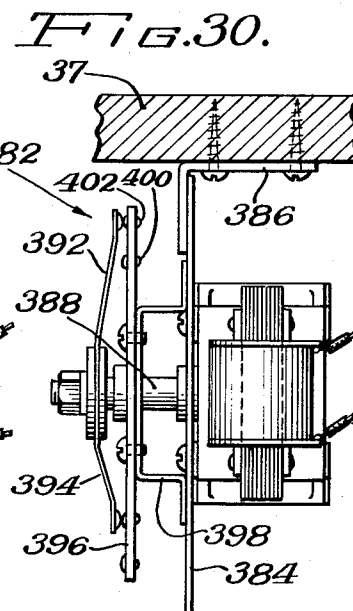
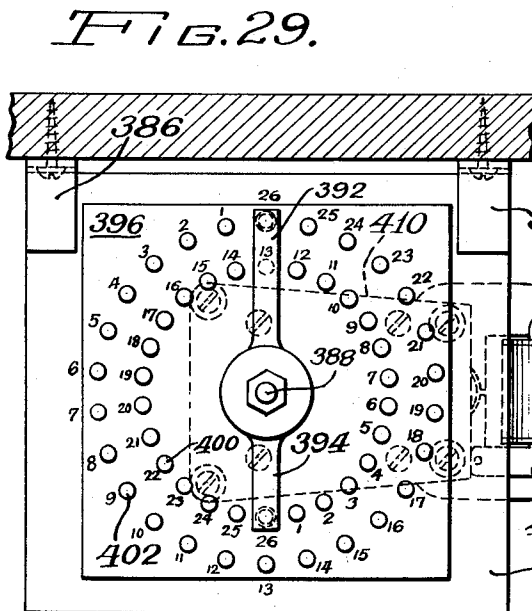
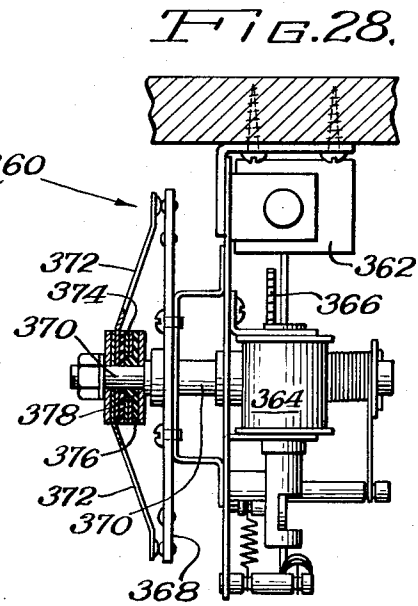
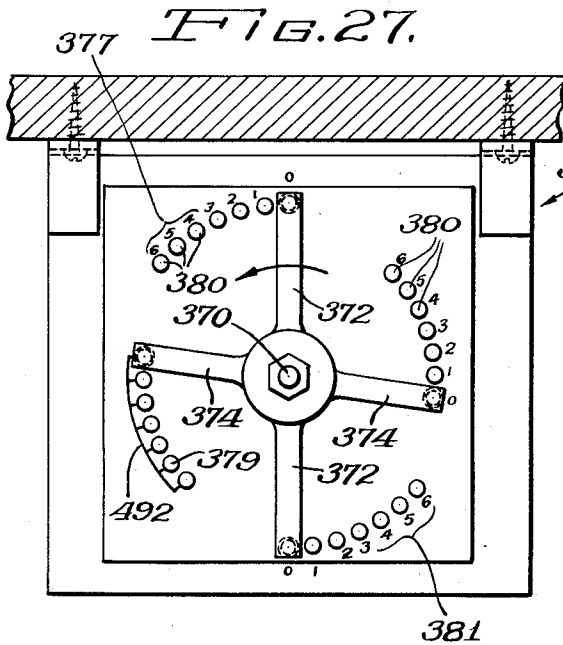
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COIN-OPERATED GAME

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FIG. 31.

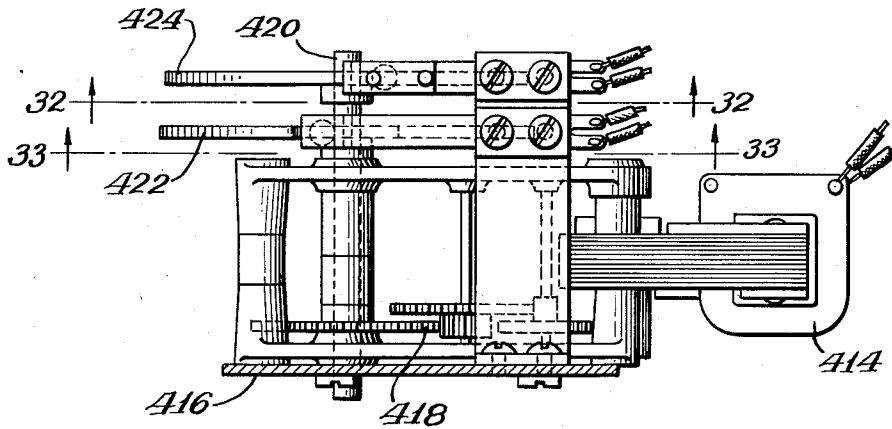


FIG. 32.

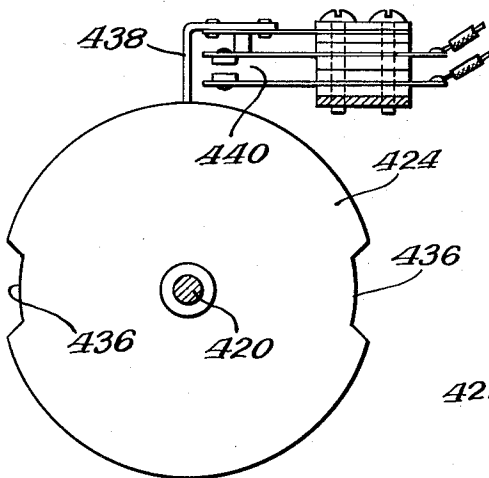
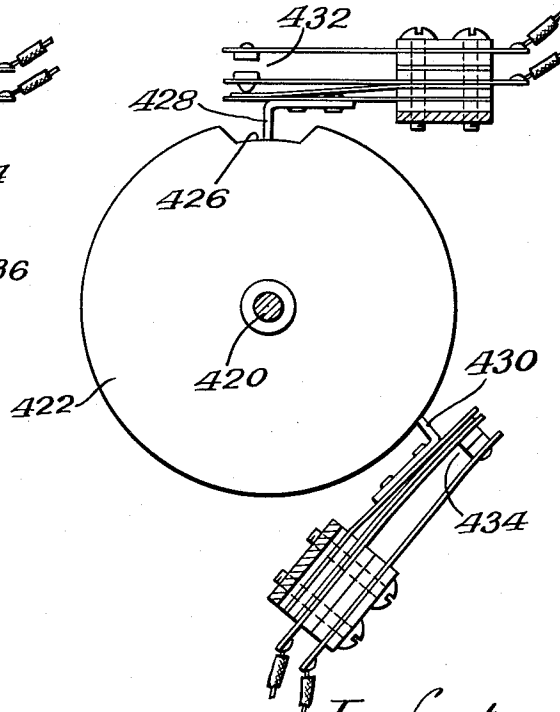


FIG. 33.



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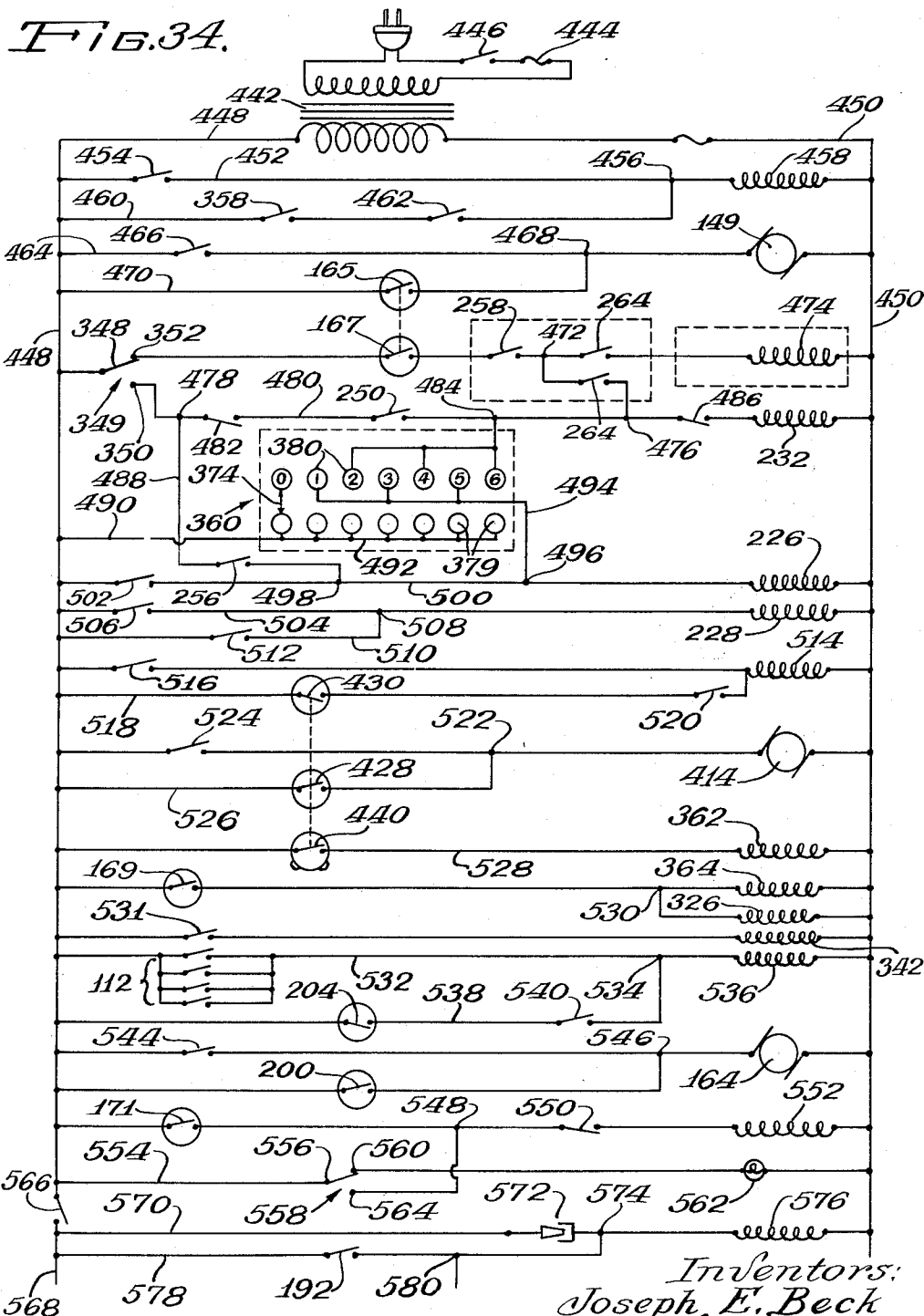
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COIN-OPERATED GAME

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16 Sheets-Sheet 15



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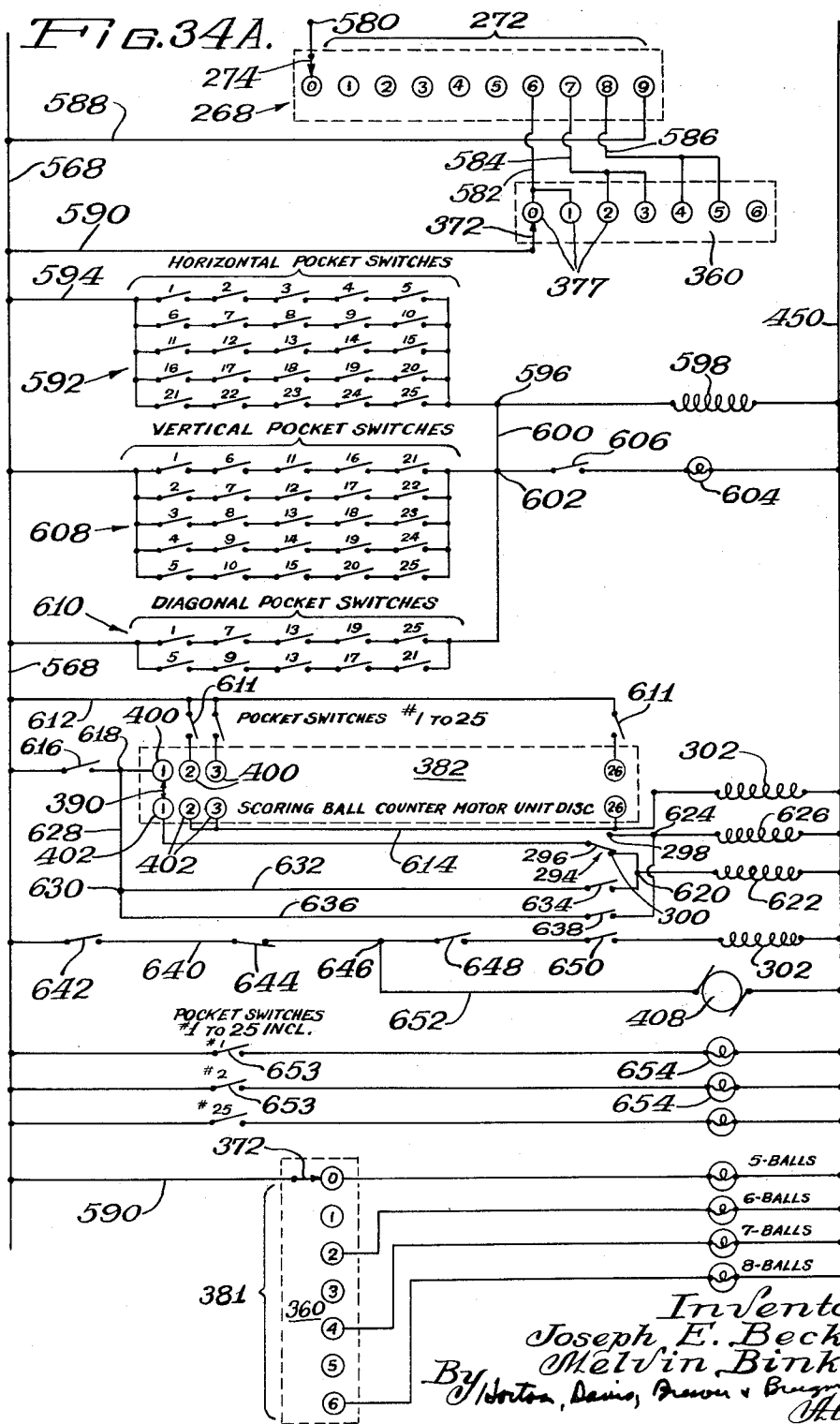
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3,044,778

COIN-OPERATED GAME

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16 Claims. (Cl. 273-125)

Our invention relates generally to a coin-operated game and, in its described embodiment, to a free ball game of that general type commonly known as the "5-in-line" game.

The "5-in-line" game is one wherein balls or other objects are delivered to a playing surface to fall into pockets therein, the intention being to drop the balls into pockets which register on a scoring panel as being on a line. The game is closely analogous in its scoring to Bingo and in the described embodiment is presented exactly like a Bingo board. A pocket array consisting of a square of twenty-five numbered holes is provided on a table surface and a square showing a similar arrangement of numbers is shown on a scoring panel. As the balls are delivered to the table to drop into the pockets, the corresponding squares in the scoring board are illuminated and, upon the completion of a straight line of five filled holes or five lighted signals, a win is declared. Although we have described our invention in terms of a game of this character, it will be apparent that there need be no necessary correlation between the pocket array and the arrangement of the scoring panel, that the pockets need not be set up in the form of a square, that any arbitrary series of scoring lines can be established and that it is not essential that five aligned signals be established to constitute the win. Balls may be dropped, for instance, in three holes to register a predetermined alignment of three scoring squares to constitute a win.

The "free ball" feature of the described embodiment refers to a game which is not wholly under glass as in the commonly known pin ball type games. As our game is described, the balls are delivered directly into the hands of the player for his personal and direct manipulation.

Our invention, as will be evident from the described embodiment, has several features which as far as we know are significantly novel, inventive and useful in the art, and the attainment of these features may be regarded as the object of our invention.

Our game includes a playing table which is approachable by a player from all sides thereof, so that, by the exercise of skill, a player may direct his ball substantially directly into any pocket without substantial interference from multiple obstacles, balls already played or empty pockets. Our invention, likewise, contemplates the use of ball-receiving pockets in a playing table which are situated at different discrete levels, which imparts an element of difficulty and interest to the game. The provision of different pocket levels is achieved by the use of certain portions of the pocket array forming pockets floors and carrying switches for other portions of the pocket array.

A free ball game imposes substantial problems in itself, in that complete enclosure of the playing table is not possible. Techniques may be devised to cheat the game, one of which may be guiding the balls from the open portion of the playing surface. Another feature of our invention, therefore, is the provision of a mechanism to prevent cheating of this sort. Another method of cheating lies in the introduction of an extra ball into the game from some outside source. Our invention incorporates means for counting the number of balls played in the event of a recorded win and throwing the machine on TILT in the event that a ball not purchased is sensed in the playing surface.

It will often occur that a player having used his five

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balls, for instance, which he gets on his initial deposit of a coin, will have completed a scoring line, but for one pocket. Our game incorporates a provision whereby other balls may be purchased individually so as to give the player an opportunity to complete the line. Our mechanism for achieving both the initial quantity purchase of balls and the subsequent individual purchase of balls is a feature unknown in the art, so far as we are aware. As a still further feature of novelty, this mechanism is integrated with the mechanism which can detect the existence of introduced balls so that, whenever the number of balls present in the pocket array exceeds the number of balls purchased, the win will be thrown out and the game go on TILT.

Other objects and advantages of this invention will be apparent from the following description and drawings, of which:

FIG. 1 is a perspective of a device embodying our invention;

FIG. 2 is a front elevation of the scoring board;

FIG. 3 is a central vertical longitudinal section through the device of FIG. 1;

FIG. 4 is a partial plan view of the underside of the cover of the device, taken substantially from the line 4-4 of FIG. 3, looking in the direction of the arrows;

FIG. 5 is a section taken substantially along the line 5-5 of FIG. 3, looking in the direction of the arrows;

FIG. 6 is a section taken substantially along the line 6-6 of FIG. 3, looking in the direction of the arrows;

FIG. 7 is a section taken substantially along the line 7-7 of FIG. 3, looking in the direction of the arrows;

FIG. 8 is a top plan view of the pocket array of my device, taken substantially along the line 8-8 of FIG. 7, looking in the direction of the arrows;

FIG. 9 is a top plan view of the shutter underlying the pocket array and may be regarded as being taken from the line 9-9 of FIG. 7;

FIG. 10 is a partial plan section of the pocket array of my invention illustrating one of the flaps associated therewith and may be considered as being taken along the line 10-10 of FIG. 6, looking in the direction of the arrows;

FIG. 11 is a view similar to FIG. 10, showing, however, a modified form of flap;

FIG. 12 is a section taken substantially along the line 12-12 of FIG. 11, looking in the direction of the arrows;

FIG. 13 is an enlarged side elevation of the door-operating mechanism;

FIG. 14 is a top plan view taken substantially along the line 14-14 of FIG. 13, looking in the direction of the arrows;

FIG. 15 is a front elevation taken substantially from the line 15-15 of FIG. 13, looking in the direction of the arrows;

FIG. 16 is a section taken substantially along the line 16-16 of FIG. 14, looking in the direction of the arrows;

FIG. 17 is a side elevation of the door-operating mechanism shown, however, in a different relation of the parts;

FIG. 18 is an enlarged top plan view of the ball-release mechanism;

FIG. 19 is a side elevation of the ball-release mechanism taken substantially from the line 19-19 of FIG. 18, looking in the direction of the arrows;

FIG. 20 is a partial side elevation of the ball-release mechanism as illustrated in FIG. 19 showing, however, a different relation of the parts;

FIG. 21 is an enlarged side elevation of the shutter-operating mechanism as illustrated in FIG. 3;

FIG. 22 is a top plan view of the shutter-operating mechanism taken substantially from the line 22-22 of FIG. 21, looking in the direction of the arrows;

FIG. 23 is an enlarged elevation of the face of the scoring ball counter step-up unit as illustrated in FIG. 3;

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FIG. 24 is a side elevation of the scoring ball counter step-up unit as illustrated in FIG. 23 and may be regarded as being taken from the right-hand side of the unit as illustrated in FIG. 23;

FIG. 25 is an elevation of the back side of FIG. 23 and may be regarded as being taken from the line 25—25 of FIG. 24, looking in the direction of the arrows;

FIG. 26 is a partial front elevation of the played ball counter step-up unit;

FIG. 27 is an elevation of the face of the extra ball step-up unit as illustrated in FIG. 3;

FIG. 28 is a side elevation, partially in section, of the extra ball step-up unit taken from the right side of the unit as illustrated in FIG. 27;

FIG. 29 is an enlarged elevation of the face of the scoring ball counter motor unit as illustrated in FIG. 3;

FIG. 30 is a side elevation of the scoring ball counter unit, viewing the unit of FIG. 29 from the right side;

FIG. 31 is a top plan view of the extra ball motor assembly;

FIG. 32 is a side elevation of one of the cams carried by the extra ball motor mechanism and is taken substantially from the line 32—32 of FIG. 31, looking in the direction of the arrows;

FIG. 33 is a side elevation of the other cam carried by the extra ball motor mechanism and is taken substantially from the line 33—33 of FIG. 31, looking in the direction of the arrows;

FIGS. 34 and 34A are, together, a diagrammatic representation of the wiring circuit.

Description

In FIG. 1 is illustrated a machine incorporating our invention. It includes a boxlike base 35 mounted on legs 36 and having inside a playing table 37. The playing table is surrounded by a rim 38 having a billiard-table type rail with rubber bumper strips 39 thereabout. It may have a pair of coin slots 40 and 41, one being for a new game and the other being for extra balls. It likewise includes an open ball delivery box 42 extending out from the front of the base. The table has a playing line 43 marked on the table surface behind which balls are to be struck by a cue.

The portion of the table to the front of the playing line is open. Rearwardly of the playing line, however, the table is covered by an inclined transparent window 44 suitably supported in frame members 45. A scoring square or pocket array 46 is situated toward the rear of the table under the window 44 and consists of twenty-five pockets 47. A vertical transverse transparent baffle with billiard table rails at the bottom thereof 48 is situated immediately in front of the scoring square to prevent balls being shot directly into the scoring square and to force the players to bank the balls off the rails 39 to make a score.

Lights 59 are secured to the underside top of the frame member 61 to illuminate the pocket array 46.

The device includes a vertical box 49 standing up from the rear end of the machine and having the scoring face 50 thereon. The scoring face includes a representation 51 of the square of pockets hereinafter referred to as the score. It likewise includes a tilt signal 52, a won game signal 53, and ball signals 54, indicating the number of balls used in the event that more than five balls are employed.

Pocket Array

Referring particularly to FIGS. 3—12, the pocket array or scoring square 46 consists of a square hole 55 formed in the surface of the playing table 37 and is surrounded by inwardly sloping surfaces 56 to direct the balls into the pockets 47. Wooden flaps 57 are secured to the underside of the sloped portion 56 of the playing table to extend inwardly of the sloped surfaces 56. The flaps 57 are rectangular members bevelled at a 45° angle at their inner corners as at 58. In the illustrated embodiment,

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the flaps have three holes 60 therein constituting pockets 47 proportioned to pass a playing ball 62. On the bevelled edges, a semi-circular notch 64 is formed which, together with the next adjacent flap, constitutes the pocket 47.

The attachment of the flaps to the playing table is best illustrated in FIG. 6. Two spacers 66 are secured to the top side of the flaps adjacent the outer edge thereof and bores 68 are formed vertically through the flap and spacer. A screw 70 having a shank substantially smaller than the bores 68 passes through the bores into the underside of the table 37. A spring 72 is interposed between the head of screw 70 and the underside of the flap 57 to urge the flap 57 and spacer 72 against the underside of the playing table 37. Each flap is secured at two points to the underside of the playing table parallel to the associated edge of the hole 55. The effect of this mounting is to permit the inner edge of the flap to swing downwardly under the weight of a ball.

A switch-actuating arm 74 is secured to the outer edge of the flap to extend outwardly therefrom.

Four flaps are employed which together provide an inner frame for the scoring square and afford the sixteen peripheral pockets 47 for the square, the corner pockets being defined by the semi-circular notches 64 in adjoining flaps.

FIGS. 11 and 12 illustrate an alternative, metal flap 76. In this case, the flap 76 is identical with the formerly described flaps in plan. In section, the outer portion 78 of the flaps which underlies the inclined surfaces 56 is horizontal. On the line where the flap emerges inwardly from the surface 56, the metal extends vertically upward as at 80 to the plane established by the surface 56 and then slopes inwardly and downwardly 82 in that same plane. The flap terminates in a vertical downward extension 84. The inwardly and downwardly sloping surface 82 has the three full holes 86 and the semi-circular notches 88 in the same form and position as in the first described form of flap.

Since the metal flap lacks thickness, we provide L-shaped members 90 secured to the horizontal portion 78 of the flap and extending downward at their inner ends 92 to provide a back for the pocket to hold the ball exactly centered in the pocket.

In this modification, the horizontal portion 78 is secured at its outer edge at two points 94 in pivotal relation to the underside of the playing table 37 through a spacer 96 attached to the underside of the playing table. The attachment 94 permits pivotal movement of the flap. The flap is also secured 98 adjacent the inner edge of the square hole 55 with the same loose-fitting screw 100 and spring 102 arrangement as in the first described form, whereby the flap may move up and down on the screws 100. This modification likewise has a switch operating arm 104 extending outwardly therefrom.

A pair of mounting boards 106 are secured to the underside of the playing table 37 on either of the lateral sides of the scoring square 46 to extend vertically downward therefrom. The boards are apertured as at 108 to permit the actuating switch arms 74 to make connection with the movable blade 110 of a switch 112 secured to the underside of table 37 outside the board 106. The mounting boards have a pair of horizontal rails 114 spaced apart on the facing surfaces to define a guide for a movable shutter 116.

The shutter 116 is a square board having its side edges 65 between the rails 114. Its edges underlie the sloping surface 56 and the exposed portion of the flaps 57 and it has a set of nine holes 118 in the center thereof. The holes 118 in the shutter and holes 60, 64 in the flaps define the scoring square of twenty-five pockets 47.

The shutter has a normal playing position which is illustrated in FIGS. 8 and 9. This is that position which the shutter occupies during the time the player of the game is shooting balls into the scoring square.

The shutter has normally upstanding, switch-actuating points 120 mounted therein which are centered under the

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pockets 47 in the flaps 57 when the shutter is in its normal playing position. The underside of the shutter has a plurality of normally open multiple circuit switches 122 adapted to be actuated by the points 120. When a ball is lodged in one of the pockets 47 of the flaps 57, the point is depressed, thereby closing the circuits through the switch 122. Between the five switch points 120 which underlie the lateral pockets 47 and the side flaps 57 are four holes 123 larger than the playing balls. The shutter has a bracket 124 secured to its forward edge. An arm 126 is secured at one end to the bracket and at the other end to a crank disk 128.

A ball-retaining board 130 is secured by screws 132 to the bottom edges of the mounting boards 106. The ball-retaining board has normally upstanding switch points 132 situated centrally under the nine holes 118 in the center of the shutter. Here again, multiple switches 134 are secured to the underside of the ball-retaining board to be actuated upon depression of the points 132.

The ball-retaining board has a row of seven slots 138 oriented front to back and extending transversely across the back part thereof. The center five of these slots are aligned with the vertical or front to back rows of pockets 47. The forward end of these slots are generally vertically aligned with the holes 60 in the back flaps. Progressing forwardly from the row of the seven slots 138, the ball-retaining board has a series of three holes 140 in longitudinal alignment with the second and sixth slots 138 so as to be vertically aligned with the three full holes 60 formed in the side flaps 57 and another slot 142 in alignment with the holes or pockets formed by the semi-circular notches 64 in side flaps and the front flap.

Again progressing to the front from the row of slots 138, the ball-retaining board has a series of two holes 144, and an elongated slot 146 in longitudinal alignment with the third, fourth and fifth slots 138. The switches 134 referred to above are situated in the bridges 148 between these holes and slots 138, 144, 146. It will thus be evident that the holes and slots 144, 146, will be out of register with the holes 118 in the shutter when the shutter is in its normal playing position and the bridges 148 will lie directly under the holes 118 as may be best seen in FIG. 8. The slots 146 extend from their visible edge in the fourth row of holes forwardly (FIG. 8) to underlie the forward row of holes 60 in the front flap 57 and extend somewhat forwardly thereof.

To restate this arrangement of holes whereby the pockets 47 are defined, the holes 60, 64 in the flaps have bottoms supplied by the shutter 116 in playing position, and the playing holes 118 in the shutter have bottoms supplied by the ball-retaining board 130. The shutter carries the switches 122 which underlie the holes in the flaps 57 and the ball-retaining board 130 carries the switches 134 which underlie the playing holes 118 in the shutter. As will be subsequently brought out, when a cycle of operation of the machine is started, a ball-release shutter motor drives the crank disk 128 through 360° which moves the shutter, by means of arm 126, forwardly in the tracks defined by the rails 114, so as to discharge balls from the scoring square, and then moves the shutter back again to playing position.

During the course of forward movement of the shutter the holes 123 in the shutter are aligned with the forward four holes in the side shutters. The holes 140 and the slots 142 are in permanent alignment with these pockets in the side flaps, and the balls thus may fall straight down through the ball-retaining board 130. The back edge of the shutter surface is the floor for the pockets 47 in the back flap. Forward movement of the shutter draws the back edge of the shutter out from under the holes 60 in the flap. Slots 138 are in permanent alignment with the holes 60 in the back flap. The balls in the back flap are permitted to fall through slots 138 in the ball-retaining board.

As stated, the bridges 148 normally constitute the

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bottom for the pockets 47 defined by the center holes 118 of the shutter. As the shutter, therefore, is drawn forward, the holes 118 move into alignment with the holes 144 and slots 146 in the ball-retaining board, and balls in the center nine pockets are thus permitted to fall through the ball-retaining board 136.

The front flap pockets 60 are in permanent alignment with slots 146. Balls in these pockets are discharged by moving the front three pockets of the shutter pockets 118 into alignment with the front flap pockets 60. The first and seventh slots of slots 138 are provided to accommodate balls that may get back of the shutter and in a corner by virtue of a tilting of the machine, etc.

The balls thus fall through the shutter and the ball-retaining board to the inclined floor board 148, sloping toward the front of the machine.

The ball-release shutter motor assembly 147 is best illustrated in FIGS. 21 and 22. A motor 149 is supported in a frame 151 which, in turn, is secured to the underside of the playing table 37. The motor assembly includes a set of reducing gears 153 which drive an output shaft 155. The output shaft extends through the frame 151 and has the crank disk 128 secured thereto. The output shaft also extends out of the frame on the other side and has four cams 157, 159, 161 and 163 operating respectively the four switches 165, 167, 169, and 171. These cams and switches will be described later in conjunction with the electrical circuit.

Anti-Cheat Door

A shaft 152 spans the frame members 45 immediately forward of the window 44 and is journaled for rotation therein. A door 150, desirably a rectangular panel of transparent plastic, is secured at one edge to the shaft as by screws 154, and is proportioned to fit closely between the frame members 45 and, when situated vertically, to miss narrowly the surface of the table 37. A bracket 156 is secured to one side edge of the door, and a link 158 is rotatably connected at one end to the bracket 156, extends downwardly through the table 37 in a slot 160 in the edge of the table and is rotatably connected at its other end to a crank arm 162.

The door-operating mechanism is illustrated particularly in FIGS. 13, 14, 15, 16 and 17. A door motor 164 is mounted by means of a frame 166 to the underside of the table 37. The motor includes reduction gearing 168 and an output shaft 170 extending at one end through the frame 166. On that end of the shaft 170 which extends out of the frame 166, a kidney-shaped cam 172 is secured.

A stud 174 is secured to the frame remote from the shaft 170 to extend outward from the frame on the opposite side thereof from the motor 164. The crank arm 162 is rotatably mounted on stud 174 to lie in a plane outside cam 172. A second switch control arm 176, very like the crank arm 162 in configuration, is likewise mounted for rotation on stud 174, spaced inside the crank arm 162 so as to ride against cam 172. A second stud 178 extends outward from frame 166 below the two arms, and coil springs 180, 182 are connected at one end to the stud 178 and at the other end to each of the arms to urge the arms normally downwardly.

The switch control arm has an L-shaped member 184 secured to the face thereof, one arm of the member extending outwardly from the arm 176 and constituting a tongue 186. The tongue 186 underlies the crank arm 162. A second L-shaped member 188 is also secured to the face of arm 176 and extends upwardly above the arm. It terminates at its upper end in a bent over portion 190 also extending outwardly.

A normally closed switch 192 is secured to the crank arm 162 to rotate therewith. The contacts 194 are situated on blades 196, 198, the upper 198 of which extends beyond the contacts to overlie at its end the bent over portion 190 of the L-shaped member 188.

The other end of shaft 170 also carries a cam 196. The cam is circular and has a notch 193 in the periphery thereof. A normally open switch 200 has a cam follower 202 which lies in the notch 193 at index position of the shaft 170. A second switch 204 has a cam follower 206 riding elsewhere on the periphery of the cam 196 so as to be closed at index but opening momentarily in a cycle of the cam 196.

The anti-cheat door mechanism operates as follows: When a ball is struck to the scoring end of the table and falls on one of the flaps 57, the flap switch 112 is closed, which energizes the door motor 164 to drive shaft 170 through a full cycle. At this point, the door 150 is open as illustrated in the full lines in FIG. 13 to permit the balls to pass thereunder. The high side of cam 172 is bearing against arm 156 and the tongue 186 engages crank arm 162 to hold it in a position parallel with arm 156. When the motor starts, cam 172 rotates to permit arm 176 to fall under the influence of spring 182. Arm 162 follows arm 176 by virtue of its bearing against tongue 186. Since the arms move together, and since switch 192 is normally held open by the bent over portion 190 of L-shaped member 188, the switch will be held open through the full cycle of movement as illustrated in FIG. 13.

The cam 172 continues its full cycle to the dotted line position of FIG. 13 and raises both arms back to the starting position of the full lines.

Should a player, however, attempt to guide the ball with his cue 207 by sliding it under the door 150 as illustrated in FIG. 17, the ball depressing the flap 57 will energize the motor 164 as before and rotate the cam 172. The cue, however, extending under the door 150 as shown in FIG. 17, will hold the door 150 open and prevent arm 162 from following arm 176. Under this circumstance, the bent over portion 190 of L-shaped member 188 drops away from its position against switch blade 198 and permits the contacts 194 to close. Closure of these contacts will register a TILT on the machine and the game will be discontinued as will be subsequently described when the wiring diagram is discussed.

Extra Ball Mechanism

Referring particularly to FIGS. 5, 7, 18, 19 and 20 as stated above, when the shutter is operated to release the balls for a new game, they fall onto the inclined floor board 148 which slopes toward the front of the machine. A sloping wall 208 is mounted on the floor board to direct the balls into the entry end 210 of a ball trough 212. The ball trough is formed by two rails 214, 215, spaced a ball's width apart on the floor 217 of the base 35, and by two strips spaced apart and secured to rails 214, 215, defining centrally slotted trough floor 216. The trough slopes downwardly from its entry end 210 to its exit end 218 and leads to a forwardly sloping passageway 220 leading to the open, ball delivery box 42.

A third rail 222 is also secured to the floor 217 of the base on the opposite side of rail 215. Rails 215 and 222 support three solenoid-operated ball-release fingers 224, 226 and 228.

FIGS. 18, 19 and 20 illustrate the first ball-release mechanism 224. This mechanism includes a base plate 230 secured at its ends to rails 215 and 222. A solenoid 232 is secured to the rear of the plate 230 and an armature 234 extends forwardly therefrom. The armature has an arm 236 pivotally secured thereto by pin 238 for movement in a vertical plane.

The finger 240 proper may be considered as being about a 60° segment of a disk having a point 242 extending from the lower straight edge thereof and following the circular periphery of the disk. To be possibly more descriptive, it resembles a bent finger, wherein the tip of the finger, represented by the point 242, is movable down into the ball trough to block passage of the balls and out of the trough to permit the balls to run past. The finger 240 is mounted vertically at the center of curvature thereof to

a bracket 244 for pivotal movement. The bracket 244 is, in turn, secured to the forward edge of the base plate 230. The free end of arm 236 is secured by bolt 246 above the point of pivotal attachment of the finger to the bracket 244. The finger has a switch-operating shaft 248 extending laterally therefrom.

A normally open switch 250 is secured to the base plate 230 beside the finger and has a switch blade 252 extending up into the path of movement of the shaft 248.

The movement of the finger is shown in FIGS. 19 and 20. When the finger is in ball-blocking position (FIG. 19), the solenoid 232 is de-energized. The finger tip 242 extends down into the trough to bar the passage of the balls and the shaft 248 is removed from switch blade 252 so that the contacts 254 of the switch stand open. Energization of the solenoid retracts the finger to ball-releasing position as illustrated in FIG. 20 and the shaft 248 is brought to bear against the switch blade 252 to close switch 250.

The second ball release 226 is constructed in identical fashion with the first ball release 224 and the third ball release 228 is likewise similar except that it lacks the switch and switch-operating shaft of the first ball release 224. The second ball-release switch is identified by 256.

In the illustrated embodiment of our game, eight balls will be employed. A normally open switch 258 is secured to the underside of the trough floor 216. Switch 258 has a switch-operating finger 260 extending up in the slot 262 in the trough floor defined by the two spaced strips which constitute the trough floor. As the eight balls line up in the ball trough 210 behind the first ball-release finger 240 (FIG. 7), finger 260 occupies a position to be depressed by the fifth ball to close switch 258. A second, normally open switch 264 is also secured to the underside of the trough floor and has a finger 266 extending up through the slot in the floor positioned to be depressed to switch-closing position by the eighth ball.

FIGS. 23, 24 and 25 illustrate the scoring ball step-up unit 268. It includes a support 280 secured to brackets 278 which, in turn, is secured to the underside of table 37 by screws 276. A face 270 is secured to the support 280 in spaced relation therefrom by brackets 282. The face has, in the illustrated embodiment, ten terminals 272, numbered 0 through 9 mounted in an arc thereon. At the center of the arc a conducting contact finger 274 is mounted on a shaft 284 which extends through the support 280, and a ratchet wheel 286 is secured to the shaft 284 on the other side of the support 280. A return spring 288 is wrapped around the shaft 284 and secured thereto at one end and anchored at its other end to a pin 290 secured to the support to stand outward therefrom. The tendency of the spring is to rotate the finger 274 in a clockwise direction or toward the zero terminal as illustrated in FIG. 23. The ratchet wheel has a switch-operating stud 292 secured thereto.

A two-way switch 294 is secured to the support 280. Switch 294 has a long central blade 296 extending into the path of movement of stud 292. Blade 296 is normally biased to make contact with the lower blade 298 of the switch. However, when finger 274 occupies its illustrated position (FIG. 23) on the zero terminal, stud 292 carries switch blade 296 away from blade 298 and into contact with the upper blade 300. Blade 296 likewise constitutes a stop for return movement of the ratchet wheel under the influence of return spring 288.

A step-up coil 302 is also secured to support 280 and has a notched armature 304. An arm 306 is pivotally secured to support 280 as at 308. One end 310 of the arm is engaged in the notch in the armature 304. The other end has a ratchet-operating finger 314 pivotally secured thereto by rivet 312 which bears against the periphery of the ratchet wheel 286. The operating ratchet finger also includes an extension 316 continuing out beyond the operating end of the finger but spaced away from the ratchet wheel 286. A ratchet holding finger 318 is pivotally secured to pin 290 and likewise bears against

ratchet wheel 286 under extension 316. The other end 320 of the ratchet holding finger is lodged in a notch 322 in the armature 324 of a re-set coil 326 likewise secured to support 280.

Hooks 328 are formed on the ratchet-operating finger and ratchet holding finger respectively and are interconnected by a spring 330 to urge the two fingers into contact with the ratchet wheel. The armatures 304 and 324 of coils 302 and 326 are biased toward extension by, respectively, a spring 332 connected at one end to a post 334 and at the other end to arm 306 and by a spring 336 also connected to post 334 at one end and to a stud 337 on the armature 24 at the other.

Periodic energization of coil 302 will retract the armature and rotate arm 306 (FIG. 25) in a counter clockwise direction to engage a succeeding notch on the ratchet wheel 286. De-energization of the coil permits the return of the armature to its starting position, and a consequent movement of the ratchet wheel 286 to move finger 274 to the next contact 272. The first of these movements draws stud 292 away from switch blade 296, opens the upper contacts and closes the lower contacts.

After the ratchet wheel has been moved, energization of the re-set coil 326 retracts the armature which moves the holding finger out of contact with the ratchet wheel and against extension 316 which lifts the operating finger 314 also out of contact with the ratchet wheel. The ratchet wheel is thus free to revolve to starting position under the influence of spring 288 until stud 292 intercepts switch blade 296.

FIG. 26 illustrates the played ball counter step-up unit 338 which is identical in form with the scoring ball step-up unit 268, except that it lacks the terminals 272 and finger 274 and incorporates a different switch 340. It possesses an identical step-up coil 342 and re-set coil (not shown), a ratchet disk 344 and switch-operating stud 346. Switch 340 includes a two-way make-before-break switch 349 and an interconnected normally closed switch 358. Two-way switch 349 has a long blade 348 normally biased to close against lower blade 350, but movable by stud 346 to break contact with blade 350 and close against upper blade 352. A spacer 354 extends from the long blade 348 to the blade 356 of the normally closed switch 358.

The played ball counter step-up unit is solely concerned with the operation of the switch elements of switch 340 by the stud 346. Switch 358, as stated, is normally closed and blade 348 is normally closed against blade 350 and open with respect to blade 352. Movement of stud 346 closes blade 348 against blade 352 and opens switch 358 and the circuit through blade 350.

FIGS. 27 and 28 illustrate the extra ball step-up unit 360. This again is mechanically very similar to the scoring ball counter step-up unit as illustrated in FIGS. 23 through 25. It includes a step-up coil 362, a re-set coil 364, a ratchet disk 366, a contact face 368 and a shaft 370. It has no equivalent to the switch 294 of the scoring ball counter step-up unit or 340 of the played ball counter step-up unit. The shaft has secured thereto two sets of contact fingers 372 and 374, the fingers of each pair extending oppositely from one another. The fingers 372 are longer than fingers 374 and, as may be appreciated from FIG. 28, are in contact with one another and in electrical contact with the shaft 370. Contact fingers 374 are in contact with each other but insulated from shaft 370 by an insulating bushing 376 and washer 378. Each of the contact fingers has an arc of, in this embodiment, seven contacts, 377, 379, 380 and 381 arranged under it and numbered 0 through 9 so that each of the contact fingers 372 and 374 occupies the same relative contact in its associated arc. The contact arcs associated with the fingers 272 lie outwardly from the shaft 370 a greater radial distance than the contact points associated with the fingers 374.

FIGS. 29 and 30 illustrate the scoring ball counter

motor unit 382. This device includes a platelike support 384 having brackets 386 at its upper end by which it is secured to the underside of the playing table 37. The support has a rotatable shaft 388 extending therethrough and mounting in insulated relation a contact arm having a long finger 392 on one side of the hub and a short finger 394 on the other side.

A contact face 396 is supported in spaced relation from the support 384 by brackets 398 and has an inner 400 and an outer 402 circle of contact points. The outer circle is contacted by finger 392 and the inner circle by short finger 394. In the illustrated embodiment, each circle consists of twenty-six contact points numbered "1" through "26." On the back side of the support 384, shaft 388 is driven by a motor 408 through appropriate reduction gearing indicated generally by 410.

FIGS. 31, 32 and 33 illustrate the extra ball motor mechanism 412. It includes a motor 414 supported by a support 416 from the underside of the table 37 which drives reduction gearing 418 having an output shaft 420. The shaft 420 mounts two cams 422 and 424. Cam 422 has a single notch 426. A pair of cam followers 428 and 430 bear against the surface of the cam 428 angularly displaced from each other. Cam follower 428 actuates normally open switch 432 and cam follower 430, switch 434. Cam follower 428 is situated in notch 426 and switch 432 is open when cam 422 is at index position.

Cam 424 has two spaced notches 436 therein. Cam follow 438 rides on cam 424 and actuates normally closed switch 440. Cam follower 438 lies outside the notches 436 at index position and switch 440 is therefore open.

Wiring Diagram

In the wiring diagram, line current is fed to a transformer 442 through a fuse 444 and switch 446. The secondary of the transformer is connected on one side to line 448 and on the other side to fused line 450. A regular coin play circuit 452 having a normally open, coin-actuated switch 454 is connected through a terminal 456 to energize the regular play relay 458. Another circuit 460 interconnects conductor 448 and terminal 456 and includes played-ball counter step-up switch 358 (FIG. 26) and a regular play relay, lock-in switch 462. Circuit 464 is connected across normally open shutter motor start switch 466, closed by regular coin play relay 458, to terminal 468 which, in turn, is connected to energize the ball-release shutter motor 149 (FIG. 22). Circuit 470 connects conductor 448 through ball-release shutter motor cam switch 165 (FIG. 22) to terminal 468.

Blade 348 of two-way, make-before-break switch 349 (FIG. 26) is connected to conductor 448. Contact 352 of switch 349 is connected through ball-release shutter motor cam switch 167 and the fifth ball switch 258 (FIG. 7) to terminal 472. Terminal 472 is connected to the two eighth ball switches 264 in parallel; through one switch to energize the played-ball counter step-up unit re-set coil 474 (not otherwise shown, but see FIG. 26) and through the other switch 264 to terminal 476.

The other contact 350 of the two-way switch 349 is connected to terminal 478. A circuit 480 having a normally closed pocket flap relay actuated switch 482 and the first ball release switch 250 (FIG. 18) therein leads to a terminal 484 and thence to terminal 476. Terminal 476, in turn, is connected through a normally closed regular play coin relay actuated switch 486 to energize the first ball release solenoid 232.

Terminal 478 also has a lead 488 connected thereto which leads through the normally open, second ball release switch 256 to a terminal 498. Contacts 379 of the extra ball step-up unit 360 (FIG. 27) are interconnected and energized through a conductor 490 connected to lead 448. The contact bridge in the diagram represents the opposed fingers 374 and the opposite set of contacts represents the contacts 380. It will be noted that the zero contact of contacts 380 is a dead contact. Contacts

numbered 1, 3 and 5 of contacts 380 are connected to a lead 494 which is connected to a terminal 496. Contacts numbered 2, 4 and 6 of the contacts 380 are connected together and to terminal 484.

A lead 500 is connected through a normally open, regular play coin relay operated switch 502 through terminals 498 and 496 to energize the second ball release finger solenoid 226. Another lead 504 is connected through another normally open regular play coin relay actuated switch 506 and a terminal 508 to energize the third ball release finger solenoid 228. Another lead 510 interconnects conductor 448 and terminal 508 through a normally open, flap relay actuated switch 512.

An extra ball coin relay 514 is energized through a normally open coin-operated extra ball switch 516. Another lead 518 extends through extra ball motor cam switch 430 (FIG. 33) and a normally open extra ball coin relay actuated switch 520 also to energize the extra ball coin release 514. The extra ball motor 414 is energized through a terminal 522 and a normally open extra ball coin relay actuated switch 524. Another lead 526 interconnects extra ball motor cam switch 428 to terminal 522 through extra ball motor cam switch 428 (FIG. 33). The extra ball motor cam switch 440 (FIG. 32) is situated in a lead 528 connected to energize the extra ball step-up unit step-up coil 362 (FIG. 28).

The ball release shutter motor cam switch 169 (FIG. 22), closing momentarily after starting, is connected through terminal 530 to energize the extra ball step-up unit re-set coil 364 (FIG. 27), and the scoring ball counter step-up unit re-set coil 326 (FIG. 25).

The played ball counter step-up unit step-up coil 342 (FIG. 26) is energized through a normally open flap relay actuated switch 531.

The ball pocket flap switches 112 are connected in parallel in a line 532 which is connected through a terminal 534 to energize a ball pocket flap relay 536. Another line 538 is connected to energize terminal 534 through door motor cam switch 204 (FIG. 16), switch 204 being closed at index and opening momentarily after start, and a normally open ball pocket flap relay actuated switch 540. The door motor 164 is energized through a normally open ball pocket flap relay actuated switch 544 and a terminal 546. Terminal 546 is also energized through door motor cam switch 200 open at index.

Ball release shutter motor cam switch 171, closing momentarily after starting, is connected through a terminal 548 and a normally closed tilt relay actuated switch 550 to energize a lock-in relay 552. A lead 554 extends from conductor 448 to the movable contact 556 of a lock-in relay actuated, two-way switch 558. When the lock-in relay is not energized, contact 556 makes a circuit through contact 560 to energize a tilt light 562. When the relay is energized, the circuit to the tilt light is broken and contact 556 makes a circuit through contact 564 to energize terminal 548.

A normally open, lock-in relay actuated switch 566 is interposed in conductor 448 at this point to break that part of the circuit under the part hitherto described or the operating circuit. The part yet to be described may be characterized as the scoring circuit. The scoring circuit is in series with switch 566. That portion of conductor 448 beyond switch 566 and in the scoring circuit will be identified as conductor 568.

A lead 570 connected to conductor 568 extends to a pendulum tilt switch 572, to a terminal 574, and thence to energize the tilt relay 576. Another lead 578 has the door switch 192 (FIG. 17) therein and thereafter extends to a terminal 580 and thence to terminal 574. The finger 274 of the scoring ball counter step-up unit 268 is connected to terminal 580 (FIG. 23). Contacts zero to No. 5 are dead contacts and have no electrical connections thereto. Contact No. 6 is connected 582 to contacts zero and No. 1 in parallel of the contacts 377 of the extra ball step-up unit 360 (FIG. 27). Contact No. 7 of the

scoring ball counter step-up unit is connected 584 to contacts Nos. 2 and 3 in parallel of contacts 377 of the extra ball step-up unit. Contact No. 8 of the scoring ball counter step-up unit is connected 586 to contacts Nos. 4 and 5 of the contacts 377 of the extra ball step-up unit. Contact No. 9 of the scoring ball counter step-up unit is connected to conductor 568 by lead 588. Contact No. 6 of the contacts 377 of the extra ball step-up unit 360 is a dead contact. Finger 372 is connected to conductor 568 by lead 590.

Although there are many possible arrangements of scoring switches, including combinations considerably more economical in the use of switches which are well known in the art, we have elected to illustrate the arrangement of the scoring switches as will now be described for reasons of simplicity and ease of comprehension. The ball pocket switch 136 underlying pocket No. 13 is adapted to close six circuits. It appears in one horizontal alignment, one vertical alignment, two diagonal alignments and two other circuits to be later described. The switches underlying pockets Nos. 1, 7, 19, 25, 5, 9, 17 and 21 are five element switches or close five circuits, since each of these pockets appears in a horizontal, vertical and one diagonal alignment in addition to the other circuits to be later described. The remaining pockets have four element switches thereunder or switches which close four circuits, one vertical and one horizontal alignment and the other later described circuits.

Considering the bank 592 of horizontal pocket switches, the switches required to record any completed line across are connected together in series and the five series-connected sets of five switches are connected together in parallel and to conductor 568 by lead 594 and to terminal 596. Terminal 596 is connected to conductor 450 through a scoring relay 598. Terminal 596 is likewise connected through lead 600 to terminal 602. Terminal 602 is connected to energize a WIN signal or light 604 through normally open scoring ball counter stop relay actuated switch 606.

The pocket switches for vertical alignment 608 are similarly arranged. The switches required to define a vertical line are connected together in series and the several lines of switches are connected together in parallel, the block being interposed between conductor 568 and terminal 602. The same situation pertains with the block of diagonal pocket switches 610.

Of the two remaining switch elements of the pocket switches 122, 134, one of the elements of each of the switches is connected on one side by lead 612 to conductor 568 and on the other side to the correspondingly numbered contacts of the inner circle of contacts 400 on the scoring ball counter motor unit 382 (FIG. 29). The opposite, correspondingly numbered contacts of the outer circle 402 are connected to lead 614 which is connected to energize the scoring ball counter step-up relay 302 (FIG. 25).

A normally open, score relay actuated switch 616 is connected between conductor 568 and terminal 618. Terminal 618, in turn, is connected to the zero terminal 400 of the scoring ball counter motor unit. The zero contact of the outer circle 402 is connected to the movable contact 296 of the two-way switch 294 of the scoring ball counter step-up unit 268 (FIG. 25). When the ratchet wheel 286 is at index position, the circuit is closed through contact 300 which is connected to a terminal 620 which, in turn, is connected to energize the scoring ball counter motor start relay 622. The other contact 298 of switch 294 is connected to a terminal 624 which, in turn, is connected to energize the scoring ball counter motor stop relay 626.

A lead 628 is connected to terminal 618 and extends to a terminal 630. Another lead 632 extends to terminal 620 through a normally open ball counter motor start relay actuated switch 634. Terminal 630 has another lead 636 connected thereto which extends to terminal 624

through a normally open, ball counter motor stop relay actuated switch 638.

A line 640 extends from conductor 568 through a normally open score relay actuated switch 642, a normally closed scoring ball counter motor stop relay actuated switch 644, a terminal 646, a normally open scoring ball counter motor start relay actuated switch 648, a normally open scoring ball counter step-up relay actuated switch 650 to energize the scoring ball counter step-up coil 302. A lead 652 extends from terminal 646 to energize the scoring ball counter motor 408 (FIG. 29).

The last of the switch elements 653 of the pocket switches are connected between conductors 568 and 450 to energize ball pocket lights 654 which illuminate the numbered squares in the scoring square representation 51.

Lead 590 energizes finger 372 of the extra ball step-up unit which makes contact with the remaining set of contacts 381 thereof. The zero terminal of contacts 381 is connected to illuminate the "5 balls" signal 54 on the score-recording face (FIG. 2). The No. 2 terminal is connected to the "6 balls" signal, the No. 4 terminal to the "7 balls" signal and the No. 6 terminal to the "8 balls" signal.

Operation

The operation of our device is as follows. When a game is to be played, a coin is inserted in slot 40 (FIG. 1) which closes momentarily regular play coin switch 454 and energizes the regular play relay 458. The regular play relay, in turn, closes the regular play lock-in relay switch 462. The played ball counter step-up unit ratchet wheel 344 (FIG. 26) is in a position displaced from index as a carry-over from the preceding game. In this circumstance, switch 358 is closed and a holding circuit extends through closed switches 358 and 462 to maintain the energization of the regular play relay 458.

The regular play relay closes switch 466 to close the circuit to the ball-release shutter motor 149, and it begins to rotate. The ball-release shutter motor 149 drives the crank disk 128 to cause the shutter 116 to move forward and backward in the guides 114. As it moves to its forward end of travel, it has removed itself from its position under the pockets 60 in the flaps 57 either by withdrawing itself entirely from under the pockets in the rear-most flap, or by positioning one of the holes 123 of the shutter directly under the holes 60 of the flaps 57. The balls in the flap pockets 60 are thus permitted to fall through the holes 123 in the shutter and through the holes and slots 140, 142 in the ball-retaining board 130 to the inclined floor 148. The pocket holes 118 in the shutter are moved with respect to the retaining board 130 so as to position themselves over the holes 144 and slots 146 in the ball-retaining board and permit the balls in the shutter pockets to fall through to the floor 148. Should the balls not fall through on one oscillation of the shutter, the shutter will continue to oscillate until all the balls are discharged from the scoring square.

The balls, falling onto the inclined floor 148, roll forward and are directed by the sloping wall 208 into the entry end of the ball trough 212. The shutter continues to oscillate until all of the balls are in position in the trough 212.

During the operation of dropping the balls through the scoring square and moving them into the trough 212, the first ball-release finger 224 extends down into the trough to block passage of the balls and the second and third ball-release fingers 226 and 228 are raised.

When all of the balls are assembled in the trough 212, it will be noted that the switch-operating fingers 260 and 266 of the fifth ball switch and the eighth ball switches 258, 264 respectively are depressed and the switches closed (FIG. 7).

Reverting to the wiring diagram, the ball-release shutter motor cam switch 165 is a carry-over switch open at index. It will also be recalled that the played ball counter

step-up unit is not at index position and that contact 348 of switch 349 is closed on contact 352. Ball-release shutter motor cam switch 167 is closed at index and opens momentarily elsewhere.

As the fifth and eighth ball switches 258, 264 are closed, the played ball counter step-up unit re-set coil 474 is energized through contact 352, cam switch 167 at a period when the cam switch is closed, and switches 258 and 264. The ratchet disk 344 of the played ball counter step-up unit is thus returned to index position to bring stud 346 to bear against blade 348, open switch 358 through which the regular play relay 458 is energized and move contact blade 348 to contact 350 to close a circuit through to terminal 478.

Upon this occurrence, the circuit energizing the regular play relay 458 is broken, which likewise breaks the circuit through switch 466 to the ball-release shutter motor 149. The ball-release shutter motor, however, continues to be powered through lead 470 and the ball-release panel motor cam switch carry-over 165 until the motor arrives at index position, at which time switch 165 opens and motor 149 is de-energized.

It will be recalled that switch 349 is a make-before-break switch. A circuit is formed through contact 352, ball-release shutter motor cam switch 167 which is closed as the motor 149 stands at index, the fifth ball switch 258, the eighth ball switch 264, terminal 476, the normally and now closed regular play coin relay actuated switch 486 to energize the first ball-release coil 232. Upon re-setting of the played ball counter step-up unit, contact 348 breaks this circuit but closes first on contact 350 to establish circuit through the normally closed ball pocket flap relay actuated switch 478, the holding switch 250 for the first ball release 224, terminal 476 and the normally closed switch 486 to continue the energization of the first ball release.

It was stated above that the second and third ball release fingers are elevated to permit the balls to travel through the trough to rest against the depressed first ball release finger 240. The second ball release finger 226 is energized through regular play relay actuated switch 502 and the third ball release finger 228 through regular play relay actuated switch 506 to withdraw these fingers from the trough. Upon de-energization of the regular play relay 458 as described above, the circuit to the third ball release finger 228 is broken by the opening of the switch 506. The energization of the second ball-release coil 226 closes second ball release switch 256. When contact 350 of switch 349 is energized, a holding circuit through terminal 478 and closed switch 256 is established to continue energization of the second ball-release coil 226 even though switch 502 has been opened by the de-energization of the regular play relay 458.

The mechanical effect is that the third ball release finger 228 drops into the trough to bar passage of the last three of the eight balls. The first ball release finger 224 is raised and the second ball release finger 226 is maintained in its raised position to permit the five forward balls to roll through the trough into the passageway 220 and into the ball delivery box 42.

The net effect of this series of operations is that the balls have been delivered for playing, the shutter motor 149 has been stopped with the shutter in its ball-receiving, pocket-defining position and the machine is ready to receive the first played ball.

Prior to this point, however, certain other operations are performed. Ball-release shutter motor cam switch 169, which closes momentarily after starting, closes circuits through the extra ball step-up unit re-set coil 364 and the scoring ball counter step-up unit re-set coil 326 through terminal 530. The extra ball step-up unit 360 and the scoring ball counter step-up unit 268 are thus returned to zero position, the stud 292 of the scoring ball counter step-up unit 268 moving blade 296 against contact 300 of switch 294 (scoring circuit). The ball-release

shutter motor cam switch 171, which closes momentarily after starting, closes a circuit through the normally closed tilt relay actuated switch 550 to energize the lock-in relay 552. Energizing the lock-in relay closes a holding circuit through lead 554, the two-way switch 558, terminal 564, terminal 548 and normally closed switch 550 to maintain the lock-in relay in energized condition. Likewise, lock-in relay actuated switch 566 is closed to close the circuit to the scoring circuit. It will be noted that the lock-in relay may be energized indefinitely through a series of games until the tilt relay actuated switch 550 should be opened.

The player takes a ball from the ball delivery box 42, places it on the exposed portion of the table 37 behind the playing line 43, and strikes it with a cue against one of the side rails to bank the ball around the baffle 48 and direct it into the scoring square either directly or by attempting further banking against the back rail and possibly the other side rail. In following this movement, the ball rolls on to one of the flaps 57 and falls into one of the pockets 47 either in the flap or in the shutter 116. As the ball rolls onto the flap, that flap is depressed and its associated flap switch 112 is closed, which closes a circuit through one of switches 112, lead 532 and terminal 534 to energize the ball pocket flap relay 536. Energizing this relay closes ball pocket flap relay actuated switch 542. The door motor cam switch 204 is closed at index and opens momentarily after the motor carry-over switch closes. Thus, the ball pocket flap relay is actuated until the door motor 164 has started to turn and moved the carry-over cam switch into closed position. At this point, cam switch 204 is opened, breaking the circuit to the ball pocket relay 536 and hence re-opening ball pocket flap relay actuated switch 542.

Motor 164 is energized initially through ball pocket flap relay actuated switch 544 and terminal 546. As it starts to rotate, however, the door motor carry-over switch 200 is closed to complete the circuit to the motor through that switch and terminal 546. The motor thus continues to be energized regardless of the de-energization of the ball pocket flap relay until index position is again achieved.

Turning to FIGS. 13 through 17, the cam 172, shown in full lines in FIG. 13 at its index position, revolves and permits spring 182 to draw switch control arm 176 pivotally downward. Spring 180 urges crank arm 162 downward to follow arm 176 against the tongue 186 which, in turn, draws the link 158 downward and pivots the door 150 to a vertical position closely against the table 37. In this fashion, a player is prohibited from attempting to guide the ball with his cue to make the ball drop into a particular desired pocket. Should a player attempt to force the door as illustrated in FIG. 17, the switch control arm 176 will still descend, but arm 162 will be prohibited from following. The angular separation of the two arms then will cause the bent over portion 190 of the L-shaped member 188 to be withdrawn from its position of supporting blade 198 to maintain contacts 194 apart. Switch 192 thus closes.

Reverting again to the wiring diagram, the tilt relay 576 is, of course, normally de-energized through the normally open pendulum tilt switch 572 and also through the parallel circuit 578 including the normally open door switch 192. When the door switch closes as described above, the tilt relay is energized. Energizing the tilt relay opens switch 550 which, in turn, de-energizes the lock-in relay, moves the two-way switch 558 to break the holding circuit to the lock-in relay and closes on contact 560 to energize the tilt light 562. It likewise opens the lock-in relay actuated switch 566, which closes the circuit to the scoring portion of the wiring diagram.

Closure of the pendulum tilt switch 572 will, of course, have the same effect.

Energization of the ball pocket flap relay 536 opens the normally closed flap relay actuated switch 482 and

thus breaks the circuit to the first ball release coil 232, so permitting the first ball release finger 240 to descend into ball-blocking position in the trough 212. The second ball release finger 226 continues in its elevated energized condition. The ball pocket flap relay also closes switch 512 to close the circuit to the third ball release finger 228, raises that finger and permits the three balls behind it to run forward in the trough to lodge against the first ball release finger 240. The third ball release finger will elevate with each ball played so as to make certain the eventual passage of the three remaining balls.

The ball pocket flap relay likewise closes switch 531 which energizes the played ball counter step-up unit step-up coil 342 (FIG. 26) and closes blade 348 of switch 349 against contact 352 again, breaking the circuit through which the first ball release finger coil 234 is energized and permitting subsequent energization of the first ball release coil only through extra ball step-up unit 360.

The ball, having depressed one of the flaps, lodges in a pocket, depresses the switch-actuating point 120 underlying the pocket and closes the multiple switch 122 associated therewith. One of the switch units then appears as closed in the bank of horizontal pocket switches 592. Another of the multiple switch units appears as closed in the bank of vertical switches 608 and should the pocket into which the ball falls lie on one of the diagonals of the scoring square, the appropriate switch will be closed in that bank 610. Another of the multiple switch units closes a circuit through to the light 654 behind that number on the scoring face 50. The last of the multiple switch units 611 closes to energize the associated contact 400 on the scoring ball counter motor unit disk 382.

The remaining four balls are shot in similar fashion and they act as in the case of the first ball on the flaps and in the pockets, and this marks the termination of the game unless extra balls are desired, which situation will be described hereafter.

Should the player succeed in completing either a horizontal, vertical or diagonal line and so close one of the series of switches through the scoring banks, the score relay 598 is energized. Upon energization of the score relay 598, score relay actuated switch 642 is closed and the scoring ball counter motor 408 (FIG. 29) is energized through that switch, the normally closed scoring ball counter stop relay actuated switch 644, terminal 646 and lead 652. It is not assumed that this motor will have stopped in the previous game on the zero contacts.

The score relay 598 likewise closes switch 616 and energizes terminal 618 and the zero contact 400. The finger 390 revolves until it makes contact across the zero terminals 400 and 402. A circuit is thus closed through the two-way switch 294, contact 300 and terminal 620 to energize the scoring ball counter start relay 622. The energizing of this relay closes switch 648, and a holding circuit through start relay actuated switch 634 is established to maintain energization of the start relay. As the finger then makes contact with the successive terminals 400, 402, it will encounter energized contacts 400 by virtue of the pocket switch elements 611 being closed.

The finger thus closes the circuit from conductor 568, lead 612, the pocket switch 611, contacts 400 and 402 and line 614 to energize the scoring ball counter step-up relay. This closes switch 650 and a pulse is delivered through the closed switches 642, 644, terminal 646, closed switch 648 and momentarily closed switch 650 to energize the scoring ball counter step-up unit step-up coil 302. This advances finger 274 to the No. 1 contact of the contacts 272. At the same time, stud 292 is moved away from blade 296 of switch 294, the circuit to terminal 300 is broken and a circuit to terminal 298 is established.

The scoring ball counter motor continues to operate and move the finger 390 to search out closed pocket switch elements 611, and each time a closed pocket switch is discovered, a pulse is delivered to the scoring ball

counter step-up unit. This continues until the finger 390 again arrives at the zero contact position, at which time the now energized terminal 298 of the two-way switch 294 energizes the scoring ball counter stop relay 626. Energization of this relay opens normally closed switch 644 and de-energizes the scoring ball counter motor 408. Scoring ball counter step relay actuated switch 638 is likewise closed to establish a holding circuit for the stop relay 626 should the motor 408 coast past the zero-zero terminals.

If five balls are counted, finger 274 of the scoring ball counter step-up unit will have moved to the No. 5 counter terminal 272 and, as may be noted at the top of FIG. 34a, contacts zero through No. 5 are dead terminals. Should a player wish to cheat the game by introducing another ball as from a pool table, etc., the scoring ball counter motor will deliver six pulses to the scoring ball counter step-up unit and move the contact finger 274 to the No. 6 contact 272. It will be noted that the No. 6 contact is normally energized, unless extra balls are called for, through lead 590, contact finger 372, of the extra ball step-up unit 360, and lead 582. Likewise, contact finger 274 of the scoring ball counter step-up unit is connected to terminal 580 which, in turn, is connected to terminal 574 which energizes the tilt relay 576. Therefore, a sixth ball present in the scoring square, unless it has been paid for, will energize the tilt relay, show TILT on the scoring face, and break the circuit to the scoring section of the diagram.

When the five balls in a winning combination have been counted, as stated before, the scoring ball counter stop relay 626 is energized. This relay closes switch 606 and makes a circuit through the formed line of closed pocket switches, and switch 606, to energize the WIN light 604.

When a player has shot his five balls, which he bought with his first coin deposit, and has not completed a line and a win, he may obtain additional balls by the deposit of another coin for each ball. When the coin for an extra ball is deposited, it closes, momentarily, the extra ball coin switch 516 which energizes the extra ball coin relay 514. This, in turn, closes a parallel circuit to the extra ball coin relay through the extra ball motor cam switch 430, which is closed at index and opens momentarily during revolution and the extra ball coin relay actuated switch 520. Energization of the extra ball coin relay closes switch 524 which energizes the extra ball motor 414. Rotation of the motor away from index first closes extra ball motor cam operated carry-over switch 428. Upon continued rotation, switch 430 momentarily opens to de-energize the extra ball coin relay. Rotation of the extra ball motor rotates cam 424 (FIG. 32) to effect two momentary closures of switch 440 to deliver two pulses to the extra ball step-up unit coil 362. On the first pulse, shaft 370 (FIG. 27) of the extra ball step-up unit 360 rotates to bring contact fingers 374 across the No. 1 contacts 379, 380.

It will be recalled that after the ball pocket flap relay 536 has been once energized in the course of playing the first five balls, the first ball release finger coil 232 is de-energized by virtue of the open two-way switch 349. The second ball release finger coil 226 is also de-energized by virtue of the open regular play coin relay actuated switch 502 and, again, the open two-way switch 349. The third ball release finger coil 228 is periodically energized with each movement of the ball pocket flap but de-energized after the weight of the ball is off the flaps.

As stated before, contacts 379 are all energized through lead 490. The bridging, therefore, for the No. 1 contacts 379, 380 energizes the second ball release coil through lead 494 and terminal 496, elevating that finger and permitting the three remaining balls to roll down against the first ball release finger 240. As finger 374 of the extra ball step-up unit disk moves off the No. 1

contacts, the second ball release finger is de-energized and that finger descends into the trough to block passage of the last two of the three balls and to enclose the forward ball between itself and the first ball release finger. When the second pulse is delivered by cam switch 440 to the extra ball step-up unit step-up coil finger 374 moves to the No. 2 contacts. A circuit is thus closed through lead 490, the No. 2 contacts of contacts 379, 380, terminals 484 and 476, and normally closed switch 486 to the first ball release finger coil 232. The first ball release finger 240 is thus drawn up out of the trough and the ball lying forwardly of the second ball release finger is permitted to roll out of the trough and into the ball-receiving box 42. This ball again will be struck by a cue so as to lodge within one of the pockets with precisely the same effects as with the first five balls described.

The movement of the extra ball step-up unit shaft 370 likewise carries arm 372 two spaces around on each of contacts 377 and 381. The No. 2 contact of contacts 381 lights the "6" ball panel on the scoring face 50. The No. 2 contact of contacts 377 is connected to contact No. 7 of the contacts 272 of the scoring ball counter step-up unit through lead 584. Assuming that the sixth ball results in a completed line of closed pocket switch elements 611, the scoring ball counter unit will again start to rotate to search out the number of balls in the scoring square. By virtue of the movement of finger 372 off of the zero contact to the No. 2 contact of contacts 377 of the extra ball step-up unit, contact No. 6 of the scoring ball counter step-up unit becomes a dead contact and no circuit will be closed to the tilt relay. If, on the other hand, a player, after getting and playing his sixth ball, introduces another ball into the game from an outside source, seven balls will be counted by the scoring ball counter step-up unit and since the No. 7 contact of the scoring ball counter step-up unit is energized through line 590, finger 372 and No. 2 contact of contacts 377 of the extra ball step-up unit, the tilt relay will be energized.

In similar fashion, a seventh ball may be purchased in the event that the sixth ball is unsuccessful. The first ball release finger is then dropped and the second ball release finger raised to permit the two remaining balls to roll forward, and the second ball release finger is dropped and the first ball release finger raised to cause the delivery of the seventh ball, all by virtue of the alternate energization of the operating coils of the two ball release fingers by the extra ball step-up unit disk. Likewise, contact No. 7 of the scoring ball counter step-up unit is de-energized and contact No. 8 energized so as to sense the introduction of an outside ball at this phase in the play. The same situation pertains with respect to the eighth ball except that, since it is never intended there shall be more than eight balls in the game, the No. 9 terminal of the scoring ball counter step-up unit is directly powered and not through the extra ball step-up unit, so that nine sensed balls will energize the tilt relay.

We have described but a single embodiment of our invention. There will be many alternative ways in which the operation of our device can be effected and there are many features exemplified in this embodiment which are capable of introduction into other mechanisms. Likewise, our game itself is capable of taking many forms and is subject to a great deal of variation. We, therefore, desire that our invention be regarded as being limited only as set forth in the following claims.

We claim:

1. A free delivery coin-operated game including a playing table having an area from which balls are played and a covered area having a pocket array therein, means responsive to the deposit of a coin to ready said pocket array for the reception of balls and to deliver a predetermined number of purchased balls to the player,

second means responsive to the deposit of a second coin to deliver a ball in addition to said predetermined number of purchased balls, means responsive to the play of said balls toward said pocket array to interpose temporarily a barrier between said playing area and said covered area, means responsive to the establishment of balls in a particular relation in said pockets to determine a winning combination, means responsive to said determination to count the balls in said pocket array, to count the number of balls sold, and to compare the latter number with the number of balls in said array, and means responsive to said comparing means finding the number of balls sold and the number in said array to be equal to declare a winning combination.

2. A coin-operated game including a playing table having an area from which balls are played and an area having a pocket array therein, means responsive to the deposit of a coin to ready said pocket array for the reception of balls and to deliver a predetermined number of purchased balls to the player, second means responsive to the deposit of a second coin to deliver a ball in addition to said predetermined number of purchased balls, means responsive to the play of said balls toward said pocket array to interpose temporarily a barrier between said playing area and said pocket array, means responsive to the establishment of balls in a particular relation in said pockets to determine a winning combination, means responsive to said determination to count the balls in said pocket array, to count the number of balls sold, and to compare the latter number with the number of balls in said array, means responsive to said comparing means finding the number of balls sold and the number in said array to be equal to declare a winning combination.

3. A free delivery ball game including a playing table having a playing area from which balls are played and a covered area having a pocket array therein, means for preventing the guidance of balls into said pocket array including a door movable to block off said covered area from said playing area, means for resiliently urging said movement of said door, means interposed between said playing area and the necessary path of a ball into said pocket array responsive to the passage of a ball thereby to energize said moving means, a signal, and means responsive to interference with said movement of said door to energize said signal.

4. In a free delivery ball game including a playing table having an area at one end from which balls are played and a covered area at the other end having a pocket array therein, a door movable to block off said covered area from said playing area, a first and a second arm mounted for a pivotal movement in side by side relationship, a cam, means for driving said cam through a full cycle, means necessarily traversed by a ball between said playing area and said pocket array to energize said cam driving means, resilient means urging the first of said arms against said cam, other resilient means urging said second arm in the same direction, a tongue associated with one of said arms and adapted to bear against the other of said arms to cause said second arm normally to follow the cam induced movement of said first arm in a given angular relation, a normally closed switch secured to one of said arms and connected to actuate a signal, an abutment secured to the other of said arms adapted to engage one leaf of said switch to hold said switch open when said arms are in given angular relation, and means connecting said door to said second arm, normally to move said door to said blocking position as said second arm follows said first arm, and said first arm moves from said angular relation with said second arm and said abutment is withdrawn from its said position of maintaining said switch open to make said signal operative upon interference with the movement of said door to blocking position.

5. In a free delivery ball game including a playing

table having an area from which balls are played and a covered area having a pocket array therein, means for preventing the guidance of balls into said pocket array, including door means movable to block off said covered area from said playing area, linkage for moving said door including a crank arm resiliently urged to move said door into said blocking position, a second crank arm normally occupying a fixed angular position with respect to said first arm and normally restraining said first arm from said movement, means for moving said second arm to permit said first arm to move said door to said blocking position and to move said first arm away from said blocking position, a normally closed switch on one of said arms, a member on the other of said arms holding said switch open when said arms are in said angular relation, said holding member being withdrawn from its switch holding position when said first arm is constrained from following said second arm by interference with the movement of said door, a signal, means connecting said switch to said signal, and means interposed between said playing area and the necessary path of a ball into said pocket array responsive to the passage of a ball to move said arm moving means.

6. In a free delivery coin-operated game having a playing table including an area from which balls are played and an area having a pocket array therein, a door movable to block off said playing area from said pocket array and means for moving said door into and away from said blocking position including a cam adapted to be moved through a full cycle, a first arm resiliently urged against said cam to follow said cam, a second arm resiliently urged to follow said first arm in a given angular relation and connected to said door, a switch on one of said arms, an abutment on the other of said arms normally engaging said switch to maintain said switch in one condition as between open and closed, angular displacement of said second arm from said angular relation with said first arm by interference with the movement of said door withdrawing said abutment from said switch to permit said switch to take said other condition, and means interposed between said playing area and the necessary path of a ball into said pocket array responsive to the passage of a ball to move said cam.

7. In a coin-operated game wherein a predetermined number of balls are delivered for play by the deposit of a coin and a winning score is determined by the location of balls in pockets in a pocket array, each of said pockets having a normally open, ball-closed switch therein, ball counting mechanism for comparing the number of balls bought with the number of balls in said pocket array including a ball counter having a terminal thereon connected to each of the pocket switches in said pocket array, a contact finger driven to make successive contact with each of said terminals, a ball counter step-up unit connected to said contact finger having initially as many dead contacts thereon as balls delivered to the player and the next succeeding contact connected to power, a signal, a contact finger on said step-up unit connected to said signal, and means responsive to the establishment of balls in a scoring relation in said pocket array to drive said ball counter to deliver a pulse to said step-up unit for each ball counted, whereby an extra ball in said pocket array closes a circuit through to said signal.

8. In a coin-operated game wherein a predetermined number of balls are delivered for play by the deposit of a coin and a winning score is determined by the location of balls in pockets in a pocket array, each of said pockets having a normally open, ball-closed switch therein, ball counting mechanism for comparing the number of balls bought with the number of balls in said pocket array including terminals connected to be energized individually by any ball-closed switches, means for contacting said terminals successively to obtain a pulse from each energized terminal, and means connected to said contact-

ing means to be actuated proportionately to the number of pulses received, said means including a contact connected to be closed by the reception of more pulses than balls delivered.

9. In a coin-operated game wherein a predetermined number of balls are delivered for play by the deposit of a coin and extra balls may be obtained individually at the option of the player, and a winning score is determined by the location of balls in pockets in a pocket array, each of said pockets having a normally open ball-closed switch therein; counting mechanism for comparing the number of balls bought with the number of balls in said pocket array including terminals connected to be energized individually by any ball-closed switches, means for contacting said terminals successively to obtain a pulse from each energized terminal, a step-up unit connected to said contacting means to be actuated proportionately to the number of pulses received, said unit having one contact thereon positioned to be energized by the reception of one more pulse than the original number of balls delivered, and other contacts situated to be contacted by further pulses delivered to said step-up unit, a signal connected to said one contact to be energized therethrough, and means associated with the delivery of each successive extra ball to transfer the effective connection of said signal to the next successive contact of said step-up unit from said one contact.

10. In a free delivery coin-operated game wherein a winning score is determined by the location of balls in pockets of a pocket array, each of said pockets having normally open ball-closed switches therein, a ball counting mechanism including a ball counter having a terminal thereon connected to each of the pocket switches in said pocket array, a contact finger driven to make successive contact with each of said terminals, a ball counter step-up unit connected to said contact finger having initially as many dead contacts thereon as balls initially delivered to the player and other contacts successive to said dead contacts, an extra ball step-up unit, means energizing said other contacts of said ball counter step-up unit through said extra ball step-up unit, externally operable means to de-energize successively said other contacts of said ball counter step-up unit through said extra ball step-up unit, a signal, a contact finger on said ball counter step-up unit connected to said signal, and means responsive to the establishment of balls in a scoring relation in said pocket array to drive said ball counter to deliver a pulse to said ball counter step-up unit for each ball counted whereby an extra ball in said pocket array closes a circuit through to said signal.

11. In a free delivery game wherein a winning score is determined by the location of balls in a particular arrangement of pockets in a pocket array, each of said pockets having energized, normally open, ball-closed switches therein, said game including provision for obtaining balls in addition to the originally delivered balls, ball counting mechanism including a ball counter step-up unit having as many dead terminals thereon as balls originally delivered, an extra ball step-up unit having successive terminals thereon connected to the terminals of said ball counter step-up unit successive to said dead terminals, a signal, said ball counter step-up unit having a contact finger connected to said signal, said extra ball step-up unit having a contact finger connected to power, a scoring ball counter unit having terminals thereon connected to said pocket switches and a contact finger connected to said ball counter step-up unit, means responsive to the establishment of balls in a scoring relation in said pocket array to drive said ball counter contact finger to deliver a pulse to said ball counter step-up unit for each ball counted in said pocket array, and externally operable means to energize said extra ball step-up unit to advance said contact finger thereof to a successive contact to de-energize a contact successive to said dead contacts of said ball counter step-up unit.

12. A free delivery coin-operated game including a playing table having an area from which balls are played and a covered area having a pocket array therein, means responsive to the deposit of a coin to deliver a predetermined number of purchased balls to the player, second means responsive to the deposit of a second coin to deliver a ball in addition to said predetermined number, means responsive to the establishment of balls in a particular relation to said pocket array to determine a winning combination, means responsive to said determination to count the balls in said pocket array, to count the number of balls sold by the deposit of coins in said means and said second means responsive to the deposit of a coin, and to compare the latter number with the number of balls in said pocket array, and means responsive to finding the number of balls bought and the number of balls in said array equal to declare a winning combination.

13. A game comprising, means to deliver a plurality of balls to be played, a playing table surface, an aperture in said surface toward which adjacent portions of said table surface slope, at least one flap extending inwardly from the edges of said aperture and sloped toward the center of said aperture, said flap having a plurality of ball-receiving pockets therein, a reciprocable panel within said aperture underlying said flap, said panel having a plurality of central ball-receiving pockets therein inside the edge of said flap and a plurality of ball-discharging holes around the periphery thereof and beneath said flap, a stationary panel underlying said reciprocable panel, said stationary panel having a plurality of ball-discharging holes that are large enough to pass said balls, said ball-discharging holes in said stationary panel being in register with the holes in said flap, said reciprocable panel being movable in its own plane between a ball-discharging position wherein said central ball-receiving pockets and said peripheral ball-discharging holes are in register both with the ball-receiving pockets in said flap and the ball-discharging holes in the stationary panel, and a ball-receiving position wherein said central pockets and said peripheral holes are out of register with the ball-receiving holes in said flap and the ball-discharging holes in said stationary panel.

14. The combination as set forth in claim 13 wherein said reciprocable panel carries ball-actuated, score-operating switches which underlie said pockets in said flap and said stationary panel carries ball-actuated, score-operating switches which underlie said central pockets in said reciprocable panel when said reciprocable panel is in ball-receiving position.

15. The combination as set forth in claim 13 wherein said flap is restorably pivoted to tilt downwardly toward the center of said aperture under the weight of a ball and to actuate a switch when tilted which temporarily places a barrier in the path necessarily traversed by a ball.

16. The combination as set forth in claim 13 wherein a plurality of flaps are disposed completely around the perimeter of said aperture.

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