Aug. 24, 1943. C. W. HARTWIG 2,327,350

BOWLING ALLEY

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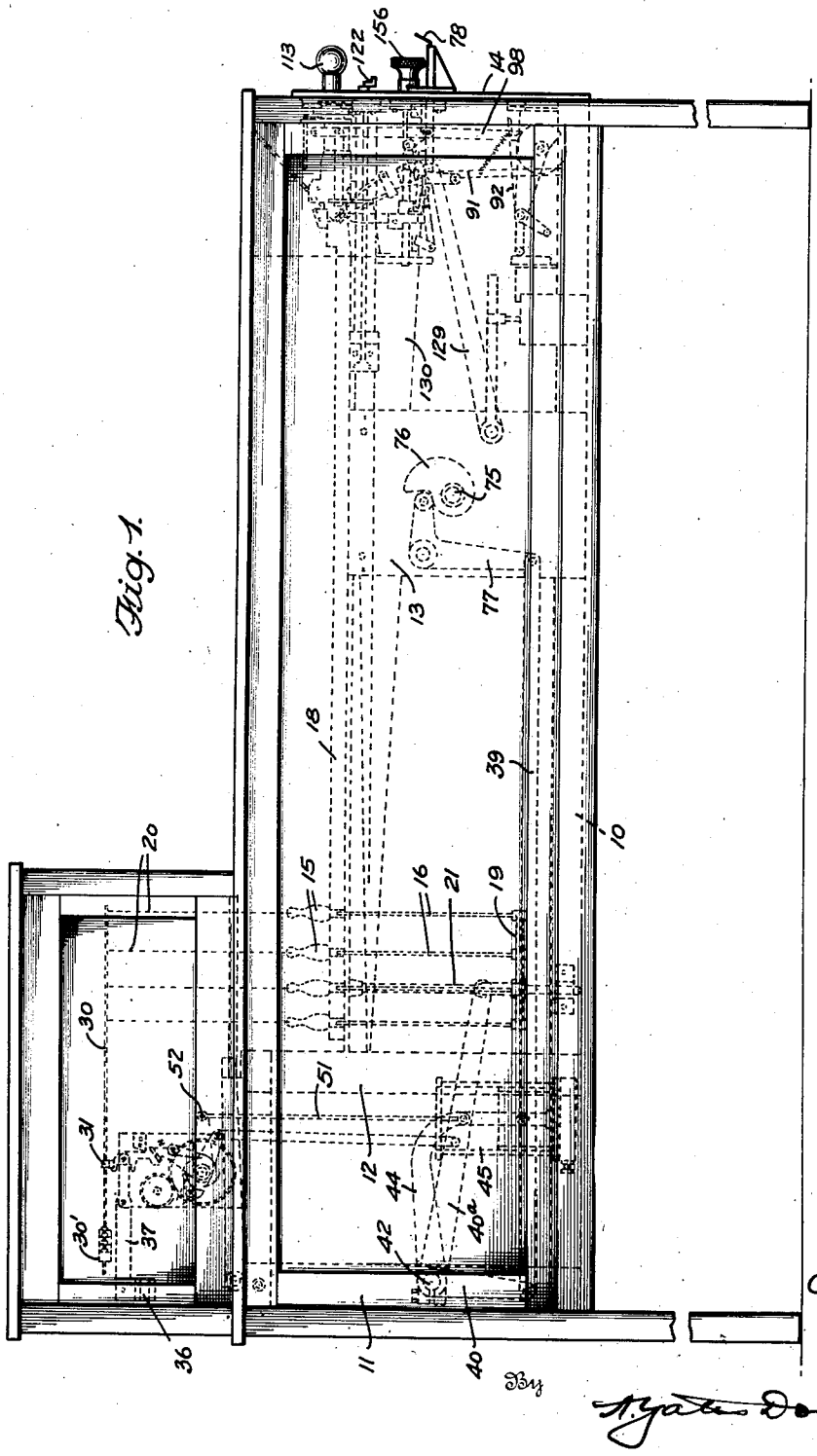


Fig. 1.

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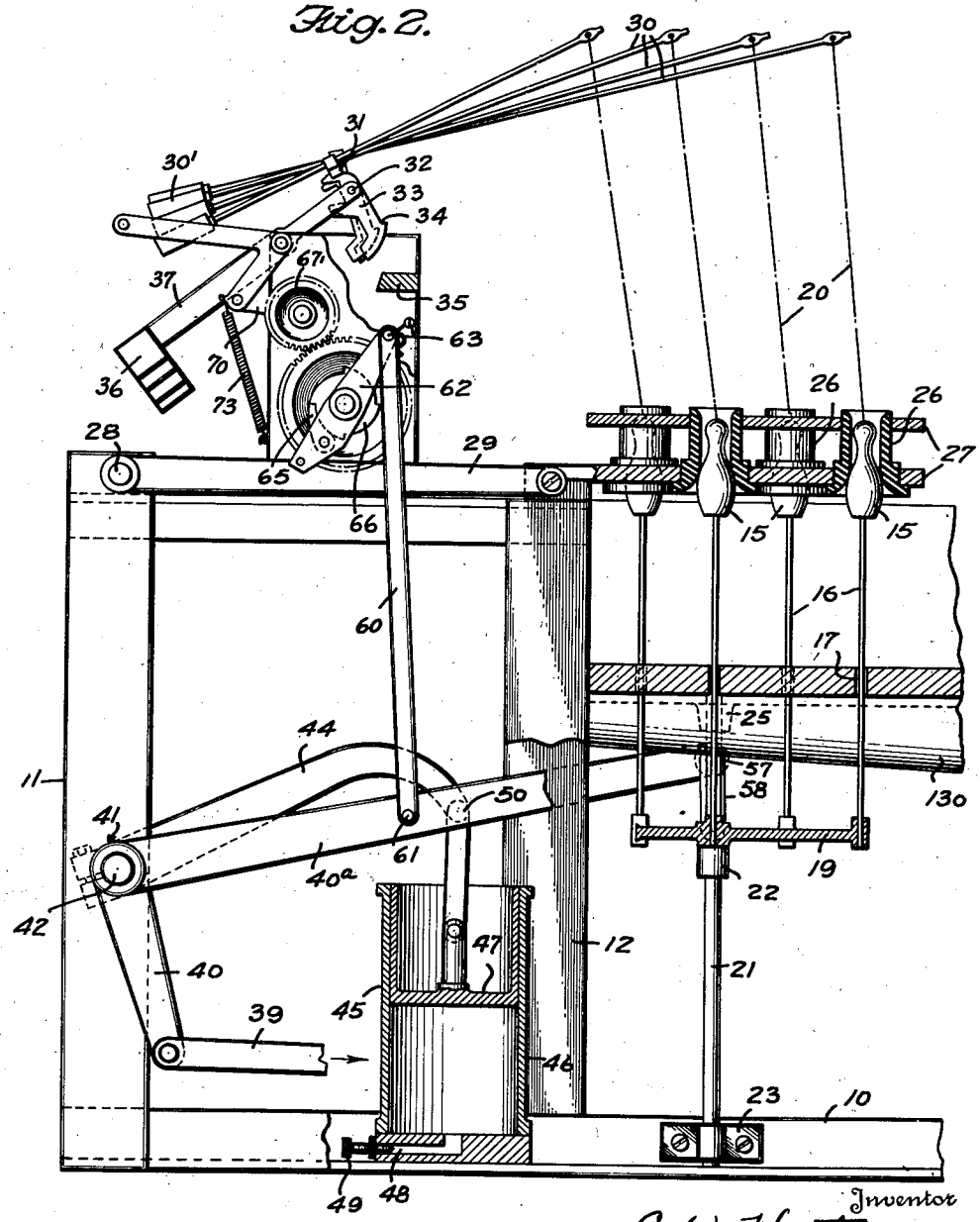
By
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BOWLING ALLEY

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Fig. 2.



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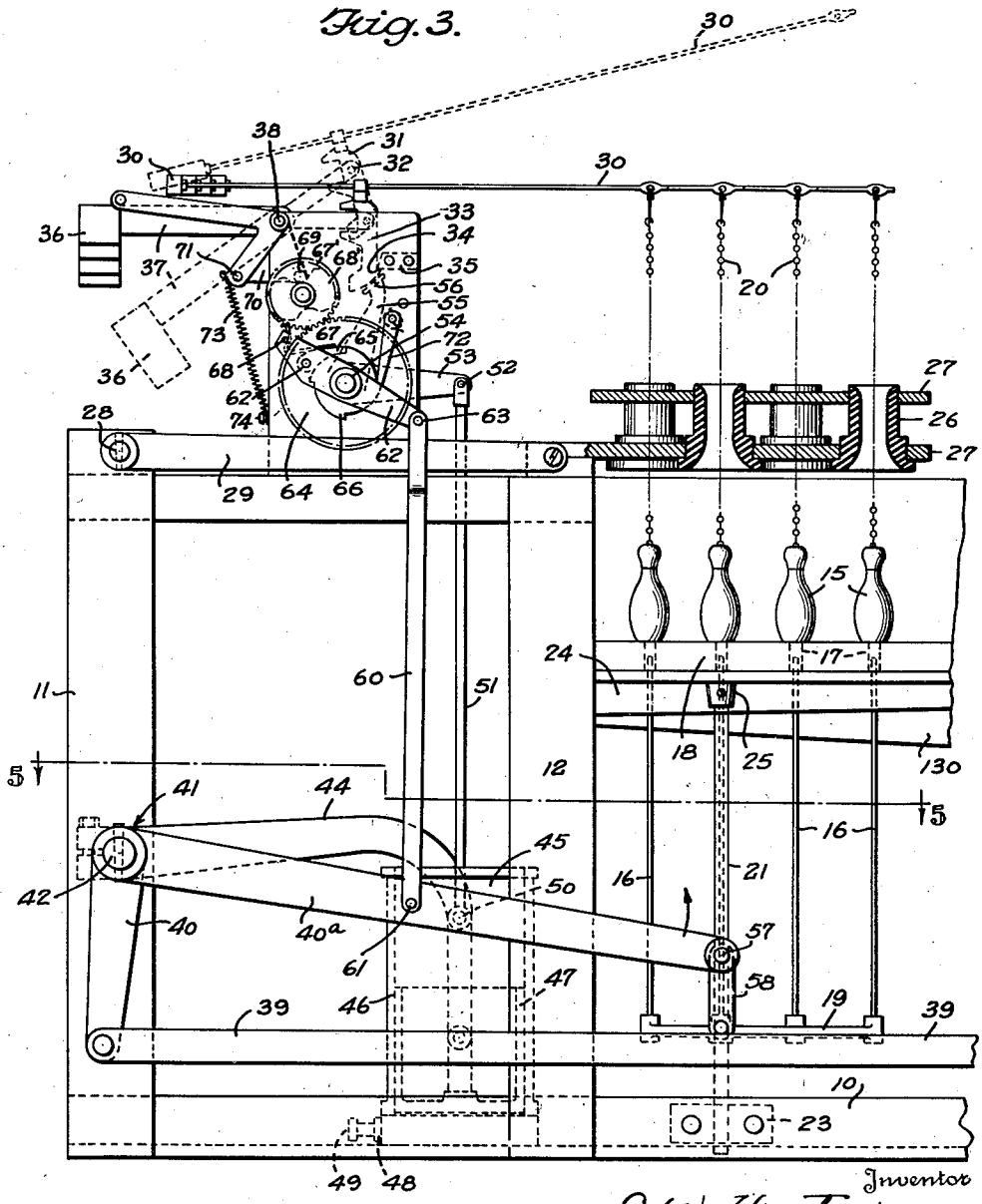
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Aug. 24, 1943. C. W. HARTWIG 2,327,350

BOWLING ALLEY

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Fig. 3.



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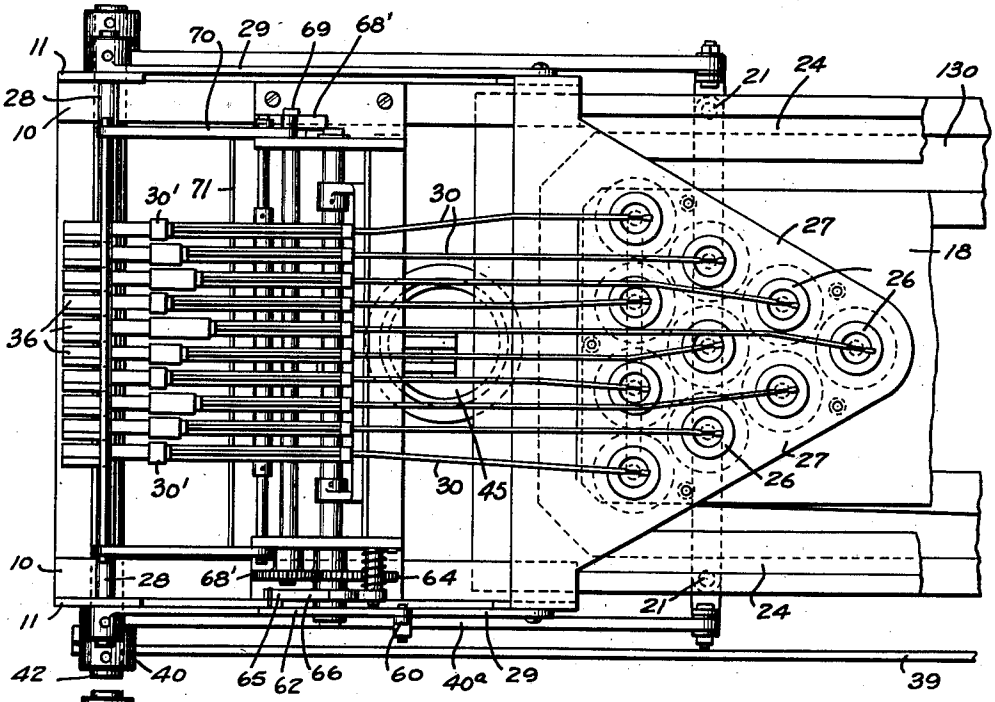
Attorney

Aug. 24, 1943. C. W. HARTWIG 2,327,350

BOWLING ALLEY

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Fig. 4.



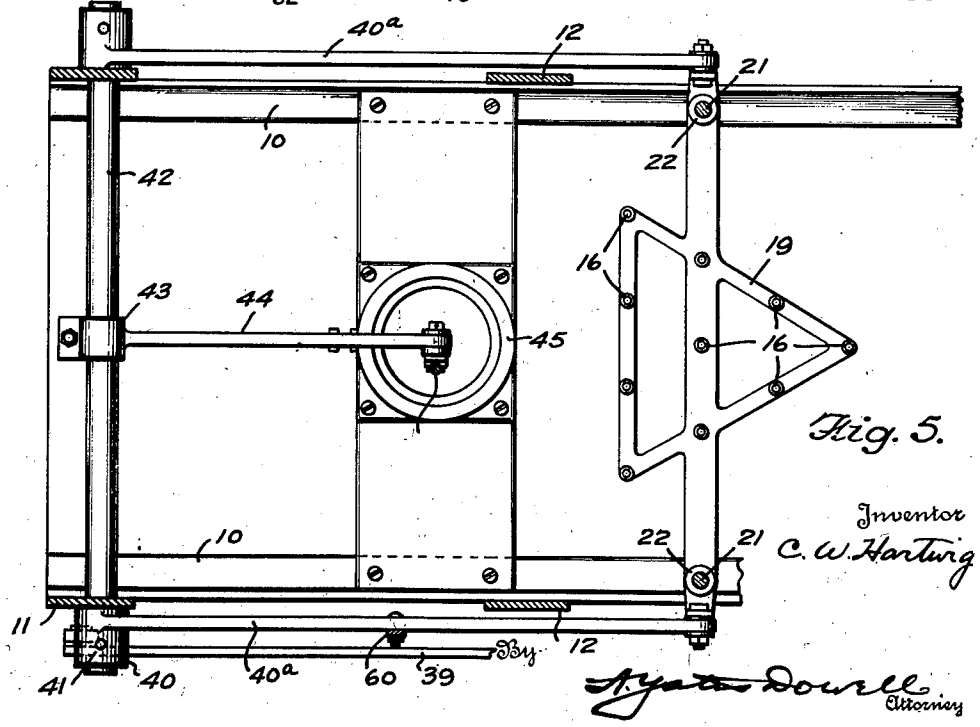


Fig. 5.

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BOWLING ALLEY

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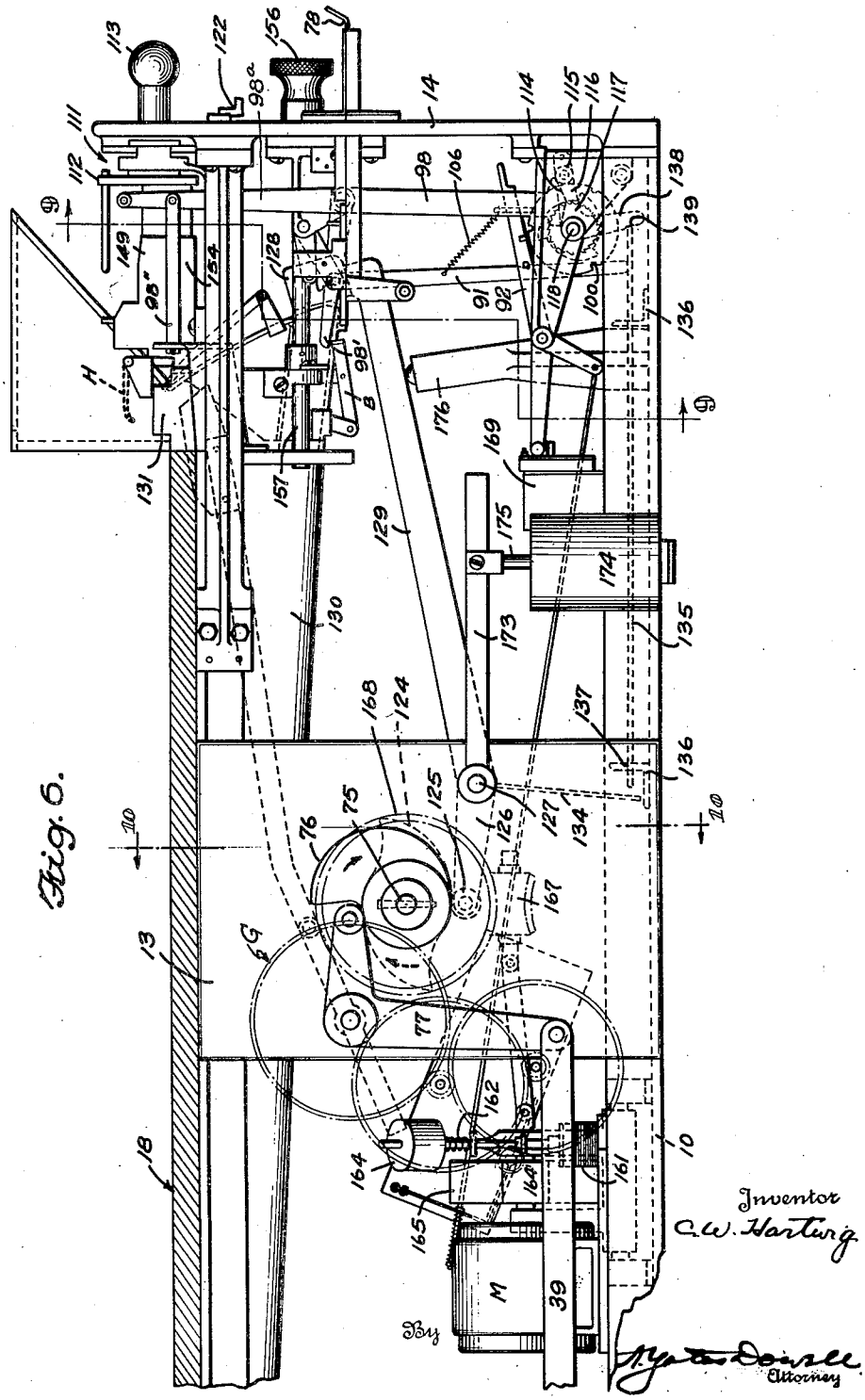


Fig. 6.

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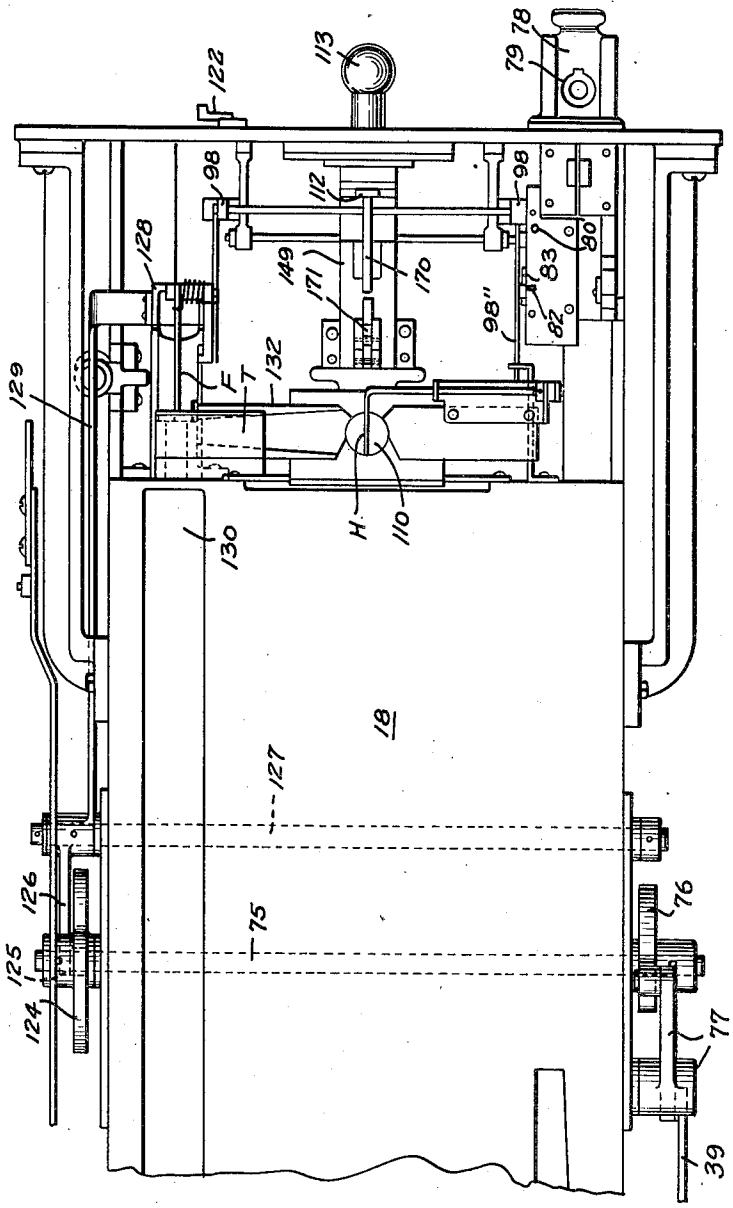


Fig. 7.

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BOWLING ALLEY

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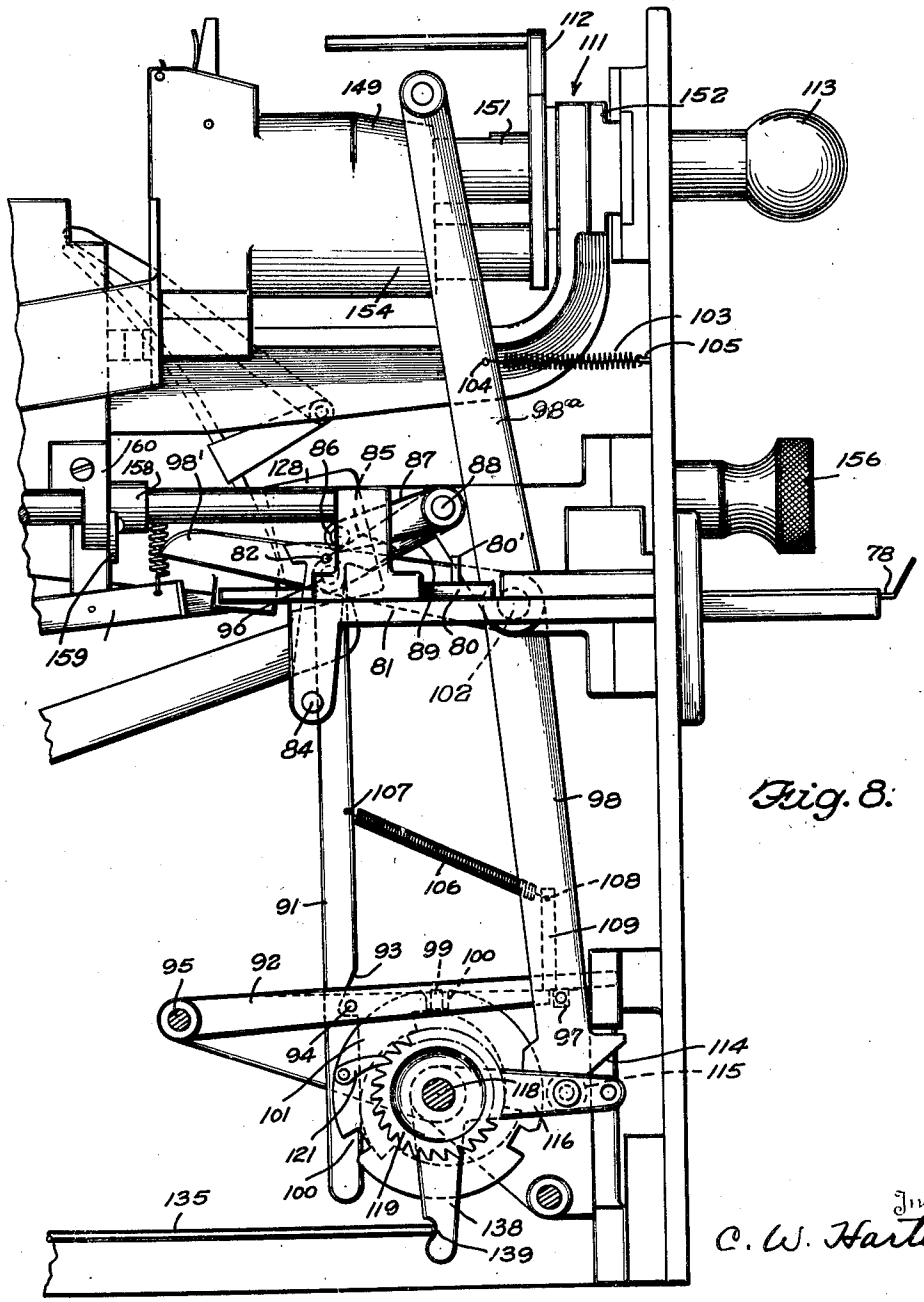


Fig. 8.

Inventor
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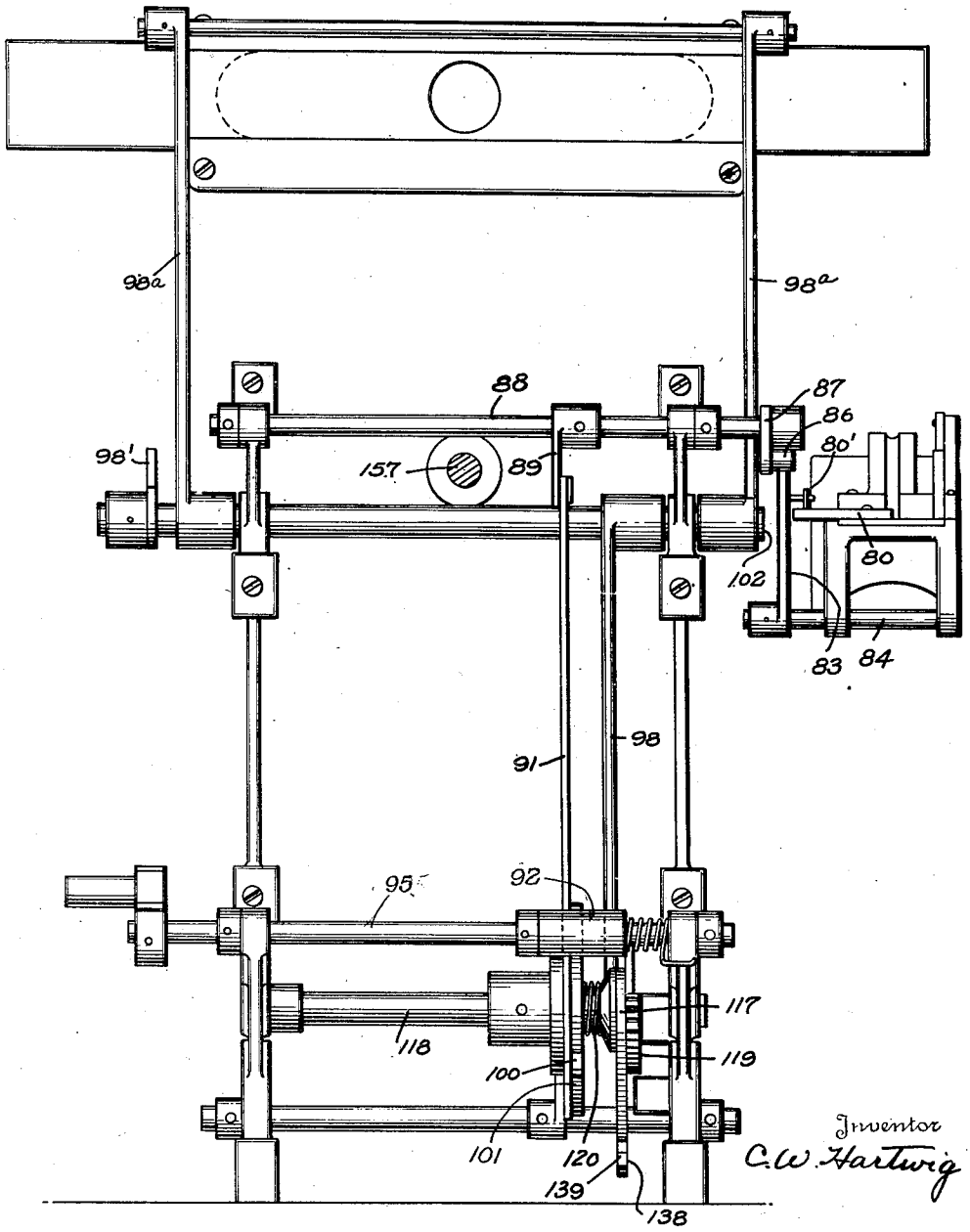
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Fig. 9.



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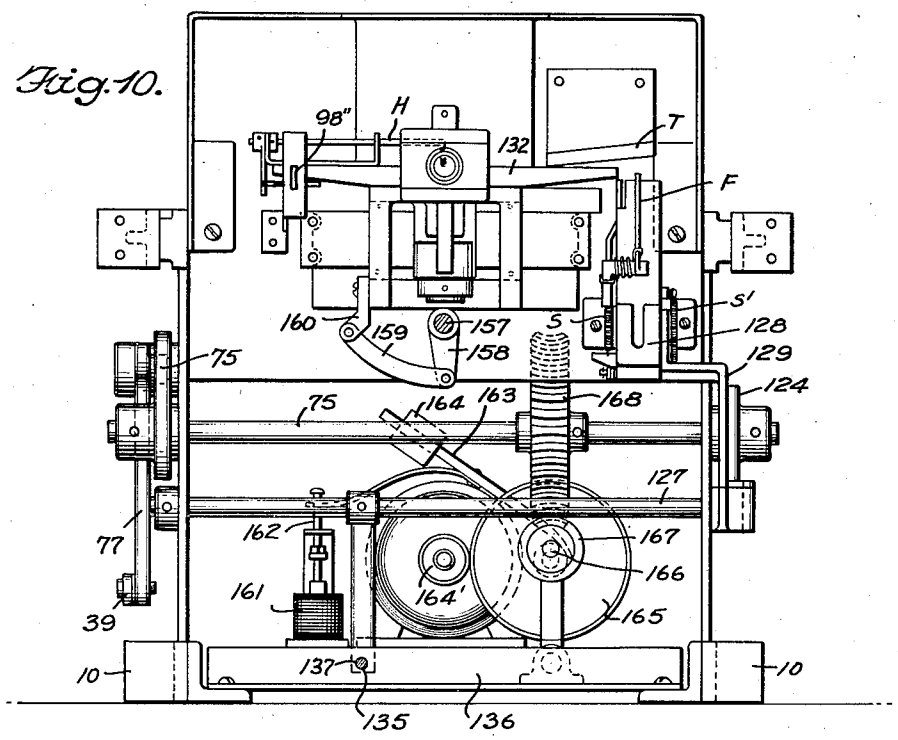
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BOWLING ALLEY

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Fig. 10.



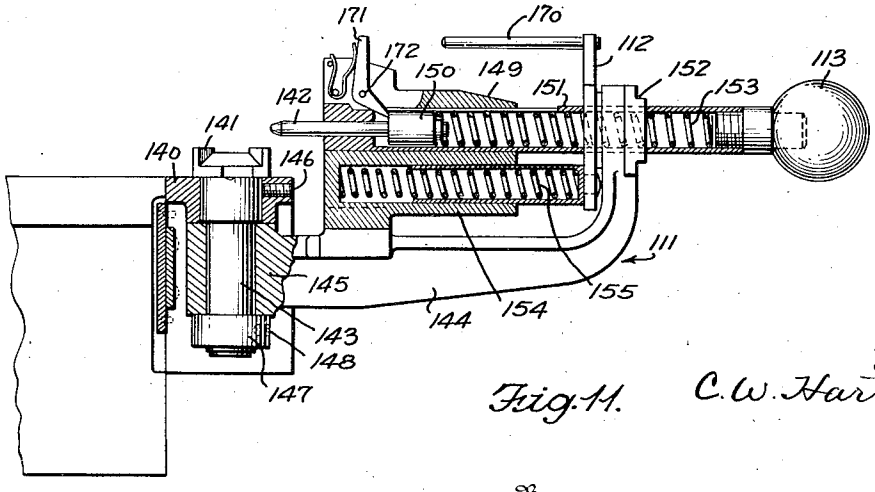


Fig. 11.

Inventor
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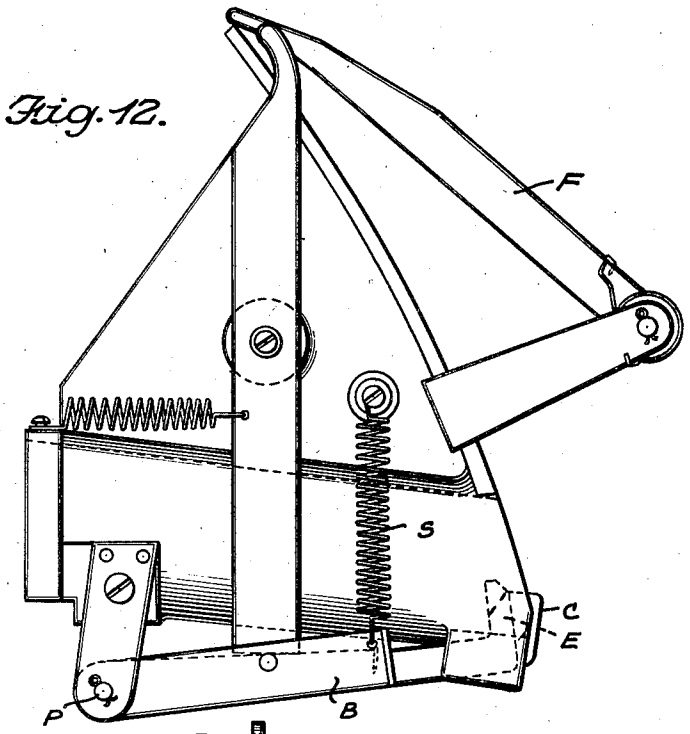
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Aug. 24, 1943. C. W. HARTWIG 2,327,350

BOWLING ALLEY

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Fig. 12.



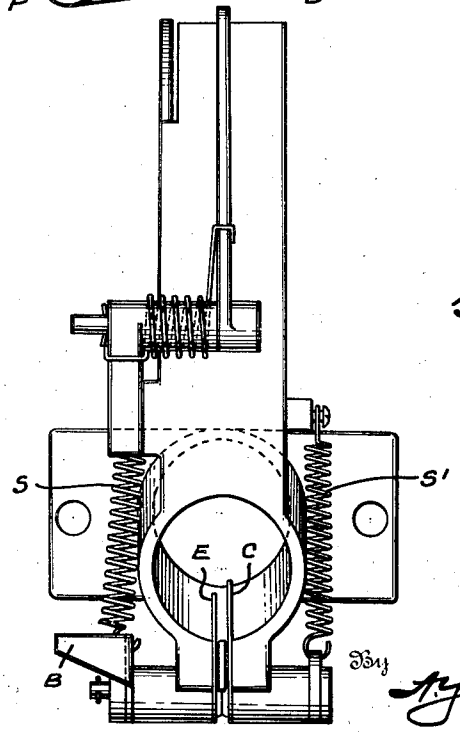


Fig. 13.

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Patented Aug. 24, 1943

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UNITED STATES PATENT OFFICE

2,327,350

BOWLING ALLEY

Charles W. Hartwig, Hastings on Husdon, N. Y.

Application February 9, 1939, Serial No. 255,506

6 Claims. (Cl. 273—44)

This invention relates to game apparatus and more particularly to a bowling alley.

Prior to my invention, it has been common to have an attendant associated with one or two alleys whose duties involved the resetting of pins for each frame removal of fallen pins, and the returning of balls to the player. These duties are laborious, exacting, arduous, and not a little dangerous, as accidents caused by a flying pin or ball have not been infrequent.

It is important that the pins be precisely set up in accordance with the accepted or standard geometrical arrangement, if the game is to be fair to all of the players involved and the scores to be commensurate with the skill of the player. It will be understood, therefore, that it is desirable to eliminate the human element from the arrangement of the pins and insure the same setting of the said pins to all players.

It has been proposed that certain templates be utilized to assist in arranging the pins in a more or less precise manner. These prior devices have been crude and impractical and many of them still require manual adjustment of the template which is of course undesirable.

It is an object of my invention to provide a fully automatic bowling alley of simple and foolproof construction.

It is a further object of my invention to provide an automatic pin setting device for use in conjunction with a bowling alley.

Other objects and the nature and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a side elevation of a miniature bowling alley with part of the mechanism shown in dotted lines;

Fig. 2 is a fragmentary view with part shown in elevation and part in section illustrating the pin aligning mechanism;

Fig. 3 is a view similar to Fig. 2 but with the pins in a different position;

Fig. 4 is a top plan view of the mechanism illustrated in Figs. 2 and 3;

Fig. 5 is a horizontal sectional view taken along line 5—5 of Fig. 3 and looking in the direction of the arrows;

Fig. 6 is a fragmentary side elevational view with parts illustrated in elevation and parts in section, showing that portion of the mechanism adjacent the ball propelling apparatus;

Fig. 7 is a fragmentary top plan view of that portion of the mechanism adjacent the ball propelling mechanism;

Fig. 8 is a fragmentary view illustrating the ball propelling mechanism, the coin slot and the locking mechanism;

Fig. 9 is the view taken along line 9—9 of Fig. 6; and looking in the direction of the arrows;

Fig. 10 is a view taken along line 10—10 of Fig. 6 and looking in the direction of the arrows;

Fig. 11 is a fragmentary view with parts in elevation and parts in section illustrating the ball propelling mechanism;

Fig. 12 is a detail in elevation of a portion of the ball return mechanism; and

Fig. 13 is a side elevational view of the mechanism illustrated in Fig. 12.

Referring to Fig. 1, a base 10 has secured thereto vertical frame members 11, 12, 13 and 14 which together aid in the support of the various elements and mechanisms of the automatic bowling alley to be described. The machine in Fig. 1 is shown with its cabinet in place enclosing the operating mechanism.

Figs. 2, 3, 4 and 5 disclose in detail the mechanism and its operation of the automatic pin setting arrangement of the apparatus. The therein disclosed pins 15 are guided or controlled from both their top and bottom ends respectively, being aligned by rods 16 which are centrally disposed in sliding cooperation with bores 17 arranged in predetermined geometrical pattern through the alley proper 18 at its far end. As the frame 19 of the mechanism is lowered, the pins 15 loosely supported by chains 20 affixed thereto are guided each to their predetermined position on the alley proper whereby all the pins cooperate to form the desired precise geometrical pattern. Vertical shafts 21 permit the bearings 22 formed in the frame 19 to slidably cooperate therewith to insure smooth action of the aligning rods 16. The shafts 21 are fixed to the base 10 by suitable bracket means 23 as shown in detail in Fig. 2 and to the gutters 24 associated with the alley 18 by means of suitable sockets 25.

The pins 15 in their raised position clear of the alley 18 are adapted to be held within sockets 26, formed of rubber or similar cushioning material, and which are adapted to be supported within a frame 27 which in turn is pivotally supported about a shaft 28 which acts as a fulcrum, and comprises side arms 29 which are each fixedly secured to the frame 27 at one of their ends and pivotally secured to the shaft 28 at their opposite ends, whereby when the pins are raised by mechanism to be described the shock trans-

mitted to the sockets 26 by the impact from the ascending pins 15 will be readily absorbed sans transmission of vibration to the apparatus and whereby injury to the chains 20 which may be delicate in their construction is prevented.

Pins 15, referring to Fig. 3 in particular, are constructed in a manner to be described in detail later and when struck by a ball in play they exert a pull upon chains 20 causing a downward or clockwise movement of levers 30 which are fastened to the members 31 which in turn are pivotally supported at 32. This downward pull on the upper portions of chains 20 when sufficient to counteract the pull of gravity on the weights 30' secured to the far ends of the levers 30 effects a clockwise partial rotation of the levers 33 which are formed with hooked ends 34 cooperating with keeper bar 35, whereby when the member 33 is freed therefrom, the relatively large weight 36 arranged on the far end of lever 37, pivotally mounted at 33, causes partial rotation of the lever 37 and fixedly associated elements in a counter-clockwise direction, thereby elevating the pins 15 to the sockets 26. The lever 33 is pivotally mounted at 32 to that end of the lever 37 closer to the pins 15 whereby motion of the lever 37 is transmitted to the pins 15 through the lever 33, the rods 30, and the chains 20. When a reset is desired in the playing of a game on the apparatus, at the end of each frame; that is, when it is desired that the pins be reset for additional play even though some pins may remain standing before the reset is made, all the pins are caused to ascend to their respective sockets 26 as will now be described.

Movement of the pin reset device, later to be described in detail, causes the operating rod 39 to move to the right in the direction of the arrow, referring to Fig. 3, which causes partial rotation of the bell crank 40 in a counterclockwise direction.

This bell crank 40 is secured at its center of rotation 41 to the shaft 42 (see Fig. 5) which rotates therewith. Secured to the shaft 42 by the collar portion 43 of the integrally formed lever arm 44, for corresponding movement therewith, is the dash pot mechanism 45. Cylinder 46 and cooperating piston 47 generally comprise the major elements of the dash pot 45 which prevents too rapid a down movement of the generally horizontal arm 40a of the bell crank 40 when the lever 30 is caused by mechanism, to be later described, to move to the left. The action of the dash pot is controlled by the bleed valve arrangement 48 which may be adjusted by rotation of the knurled thumb screw 49.

Pivotally attached to the lever arm 44 by the pin 50 is a generally vertically operating rod 51 pivotally secured by the pin 52 to the lever 53 mounted for rotation on shaft 54. The side of the lever 53 is arranged to frictionally engage the lever 55 which is also mounted for rotation about shaft 54 in order that when operating rod 51 is caused to move vertically upward, lever 53 will rotate in a counter-clockwise direction and frictionally engage lever 55 causing it to move generally counter-clockwise in order that the engaging plate 56 formed integrally with lever 55 will engage the camlike end of lever 33 and transmit to it a motion causing it to be released from keeper bar 35 at which time the pull of gravity on weight 36 will make for rotation of the lever 37 in counter-clockwise direction, causing the mechanism already described to effect a pull on chain 20 and thereby effect the ascension of all the remaining pins 15 into their corresponding sockets 26.

Further upward movement of the arm 40a of the bell crank 40 which is pivotally attached at its outer end by the pin 57 to the link 58, secured at its lower end to the frame 19 which supports the vertical aligning rods 16, causes precise vertical ascension of the vertical aligning rods 16 until they reach the upper limit of their movement within the bores 53 of the pins 15 within the sockets 26 as shown in Fig. 2. The upward movement of the arm 40a of the bell crank 40 further causes vertical upward movement of the operating member 60 which is pivotally secured to arm 40a by pin 61 at its lower end, and is pivotally secured to the lever 62 by pin 63 at its upper end. The lever 62 transmits its motion to the gear wheel 64 through the medium of pawl member 65 which is pivotally secured to the lever member 62 and is caused to engage ratchet wheel 66 by spring 67 secured to the lever 62 by fastening means 68. Rotation of the lever 62 in a counterclockwise direction brings the pawl 65 around into engagement with a tooth on ratchet wheel 66 which is loosely mounted on shaft 5, and rotation of lever member 62 in a clockwise direction causes rotation of ratchet member 66 in a corresponding direction whereby gear 64 which is fastened to ratchet 66 will likewise move in a clockwise direction and cause movement of the gear wheel 67', with which it meshes, in a counterclockwise direction. The cam member 68' is secured to the gear wheel 67' and its rotation transmits motion through follower roller 69 to lever cam 70, to which is secured, engaging bar 71 which raises levers 37 and permits levers 33 to drop, whereby their respective ends 34 will again engage keeper bar 35.

The spring pressed locking pawl 72 cooperates with the ratchet member 66 to prevent counterclockwise rotation of same as the pawl 62 rotates about the ratchet 66 for engagement with the next succeeding tooth. The lever cam 70 is maintained in its proper position, whereby roller 69 will operatively engage cam 68', by spring 73 which is attached at its upper end to cam member 70 and at its lower end 74 to the frame of the machine.

Referring to Fig. 4 in particular, it is to be noted that the rods 30 are bent so that their ends, to which are secured chains 20, will be in the proper position to correspond with the proper alignment of the pins and further that the weights 30' are of such size as to correspond to the length of the rods 30, i. e. the longer the rod 30 the larger the corresponding weight 30', respectively. With the operation of the mechanism just described the pins 15 secured at their upper ends to chains 20 will descend to their positions on the alley 18 in their proper precise geometrical alignment.

Referring to Fig. 1, the vertical frame element 13 has journaled therein a shaft 75 upon which is fixedly mounted the cam 76 adapted to rotate in the direction of the arrow, as shown, causing the bell crank 77 to oscillate and transmit a generally reciprocatory motion to the horizontally disposed rod 39 whereby the mechanism already described will be caused to function as explained. This shaft is driven from the motor M by a suitable gear train G shown diagrammatically in Fig. 6.

At that end of the alley 18 remote, from the end at which the pins 15 are located, is arranged

the mechanism for propulsion of the balls which are utilized in the game to strike the pins down, the mechanism for returning the balls to the propelling mechanism, and other associated elements. Though the game may be played continuously, in the form illustrated, the mechanism is controlled in a manner similar to other well known coin operated mechanisms, wherein a coin must first be inserted to unlock the mechanism for a period of play, at the termination of which period, the machine again locks until another coin is inserted.

Referring to Figs. 6, 7, and 8, a slide 78 is adapted to receive a coin within the cutout portion 79, and when pushed inwardly with the coin therein permits operating engagement of the slide 78 with operating member 80 formed with projecting lug 80' which is adapted to slide horizontally upon the fixed table portion 81 into engagement with pin 82 carried by swingable cam 83, pivotally supported by stub shaft 84 to the frame of the apparatus.

This operation causes the swingable cam member 83 to rotate in counter-clockwise direction effecting engagement of the cam face 85 with a follower roller 86 secured to arm 87 which transmits a generally clockwise motion through shaft 88 to the arm 89 which is pivotally secured by pin 90 to the vertical depending operating member 91 causing an upward movement thereof and carrying with it the generally horizontally disposed locking lever 92 by reason of a hooked formation 93 integral with member 91 which is adapted to engage pin 94 secured to member 92. The member 92 is arranged to pivot about a pin 95 fixedly secured to the frame. The upward movement of the operating lever 91 when the hooked formation engages pin 94 makes for the rotation of the locking lever 92 in a counter-clockwise direction and lifts the engaging portion 96 of the lever 92 from the locking pin 97 secured to the generally vertical lever member 98 and the locking pin 99 from the slot 100 in wheel 101. The now released lever member 98 will pivot about the pin 102 under the influence of the spring 103 secured at 104 to the lever member 98a and at its other end 105 to the frame of the machine.

The spring 106, fixed at its end 107 to member 91, and at its other end 108 to member 109 secured to the frame, urges the member 91 to rotate in a generally counter-clockwise direction holding the portion 93 in engagement with the pin 94 when the two elements mentioned register. With the lever member 98 released and ready for operation, with a ball 110, see Fig. 7, in position in front of the gun or propelling member generally indicated at 111, the element 112 may be urged in a direction toward the ball by operation of the gun handle 113 until said element 112 engages the upper portion of the lever member 98a, see Fig. 6, against the action of the spring 103, causing the cam surface 114 formed at the lower end of lever member 98 to engage the roller 115 at the end of the arm 116 of the bell crank 117 pivotally mounted on shaft 118 causing same to rotate in a clockwise direction and carry with it ratchet wheel 119 frictionally engaging the side surface of the bell crank 117, said engagement being effected through the medium of spring 120 which urges the ratchet wheel 119 toward the side surface of the bell crank 117. This motion of the lever member 98 causes rotation of the ratchet wheel 119 in an amount equal to one notch when the pawl 121 again locks the ratchet 119. Further movement of the gun handle 113 of the gun or propelling member 111 will cause shooting or propulsion of the ball 110, as will later be described in detail, toward the pins 15 arranged in geometrical alignment at the far end of the alley.

As the ratchet wheel 119 is rotated in an amount equal to one notch, which corresponds to one ball, and when the carrying cup 128 is in its lowermost position, ball elevator stop C is moved downwardly out of the path of the ball. With the gun pushed forward to effect propulsion, arm 98'' contacts arm B and affects movement of arm B downwardly against the action of the spring S, thereby moving ball stop E out of the path of the ball in engagement therewith, and releasing same to roll into carrying cup 128. As motion of the carrying cup is effected upwardly to its uppermost position, ball elevator stop C rises (see Figs. 12 and 13), under the influence of spring S'', to obstruct the path of the next succeeding ball. When the gun is moved rearwardly and the arm 98'' is out of engagement with arm B, ball stop E rises to additionally obstruct the ball path. When the elevator cup C has reached its uppermost position, ball feed lever F acts to feed the ball within the cup to chute T, which directs it to guideway 132, see Figs. 7 and 10, thereby placing the ball in position in front of gun where it is held in place by holding finger H at a predetermined interval before actual propulsion by the gun is effected, the element 112 has been moved far enough by the inward movement of the gun handle 113 to engage and move the pivotally connected members 98 and 98'' and raise the pivotally mounted ball holding finger H, which is in turn engaged by the lever 98'', see Figs. 6 and 7. Fastened to shaft 127, to which arm 129 is also secured, the lever 173 is also associated with dashpot 174 through the medium of rod 175 thereby gradually lowering of the arm 129 may be effected until stop 176 is encountered.

Though several balls may be supplied per frame or set up of the pins, two balls are arranged to be supplied for each set up of the pins. One complete rotation of shaft 75, see Fig. 6, effects the operation of the ball elevating mechanism twice through cam 124 and pin setting mechanism once through cam 76, bell crank 77 and generally horizontally disposed rod 39, the cam 124 having two operating peaks whereas cam 76 has but one. To receive a second ball for the particular game played it is necessary for the operator to depress the member 122 which closes a switch of an electrical circuit, not shown, and causes an electric motor M to rotate shaft 75 by mechanism described later one half a revolution, on which shaft is mounted cam 124 adapted to engage follower 125 arranged on lever 126 pivotally secured to the frame by shaft 127 which lever has a ball carrying cup 128 formed integral with its arm 129.

Rotation of the cam 124, one half revolution, depresses the follower 125 causing the arm 129 to rotate in a generally counter-clockwise direction carrying a ball which has been returned from the alley after having been played, through the medium of return runway 130, upward to a position 131 from which it may run along guideway 132, see Fig. 7, to a position beneath the stop 133 which will be later described in detail and which is disposed in direct firing alignment with the gun or propelling mechanism 111.

Referring again to Fig. 6, as the cam 124 de-

presses the short arm of lever 126, the member 134 secured thereto at its upper portion is rotated in a counter-clockwise direction into engagement with rod 135. Two brackets 136 supported to the frame, as shown, have formed therein openings 137 through which is slidably arranged the rod 135 which, at the lower portion of the gun end of the machine, engages the arm 138 of the bell crank 117 which has formed integral therewith engaging portion 139 which makes for good operative engagement of the rod 135 with the bell crank 117. With rotation of the cam 124 in a clockwise direction, follower 125 is depressed, rotating lever 126 in a counter-clockwise direction causing the member 134 to also rotate in a counter-clockwise direction and engage rod 135 moving it bodily toward the lower portion of the gun end of the apparatus and effecting rotation of the bell crank 117 in a counter-clockwise direction in an amount corresponding to one tooth on ratchet wheel 119. Movement of the bell crank 117 in a counter-clockwise direction does not cause movement of the ratchet wheel as the two are not fastened together but merely frictionally engage each other as already explained and further the locking pawl 121 prevents counter-clockwise rotation of the ratchet wheel 119. The wheel 101 is formed on its periphery at spaced intervals of 120°, with slots 100 as already explained and the ratchet wheel 119 which is adapted to rotate therewith is formed with ten teeth in the sector bounded by radii extending from the center of shaft 118 to two successive slots 100, respectively, whereby once the lever has been raised by the mechanism already described and the locking pin 99 moved out of engagement with the slot 100, see Fig. 8, the wheel 101 may rotate with the pin 99 riding on the outer periphery of the wheel 101 until the next succeeding slot 100 comes into position beneath the pin 99 when the machine will again be locked until another coin is inserted and the mechanism once more made ready for play, and whereby during the period of rotation of the wheel 101 from one slot 100 to the next succeeding slot beneath the pin 99, the ratchet 119 will have been rotated in an amount corresponding to ten of its teeth, each of which teeth correspond to the playing of a single ball effecting the playing of ten balls for each coin inserted into the machine.

The mechanism 111 already referred to as the gun or ball propelling mechanism, see Fig. 11, comprises a base portion 140 anchored to the frame, as shown, upon which is mounted a ball rest 141 having its outer contours so formed as to receive a ball 110 in alignment with firing rod 142. The base portion 140 is bored to take fixed stub shaft 143 about which the gun carriage 144 is mounted for swivel action by reason of the integrally formed bearing portion 145 being mounted for oscillation about the fixed stub shaft 143. The lock screw 146, the collar 147, and lock screw 148 maintain the fixed shaft 143 in position to permit the oscillation of the gun carriage 144 thereabout, whereby the firing rod 142 may be so aimed relative to the ball 110, the alley 18 and the pins 15, whereby the ball 110 may be propelled or shot down the alley toward any of the pins in a manner similar or corresponding to that of a bowler on a full size regulation alley who directs the rolling of his ball in a direction toward any of the pins still standing and at a desired angle thereto. Mounted upon the gun carriage 144, and in fixed relation thereto, is a member 149 which acts as a bearing for the rear portion 150 of the firing rod 142. This member 149 has a portion 151 which extends from bearing relation with the end 150 of the firing rod 142 through a curved upper portion 152 of the gun carriage 144 and which extension is generally cylindrically arranged on its interior whereby it acts as a housing for firing spring 153. Arranged between the element 149 and the gun carriage 144, and in fixed relation to both, is the member 154, which houses the gun return spring 155. As the gun handle 113 is moved toward the ball, the horizontal pin 170, secured to the upper portion of the element 112, engages spring pressed rocker lock element 171, pivotally secured at 172, which acts to release the firing pin 142 which moves forward at relatively great velocity energized by spring 153, to effect motion of the ball to be played. The training of the gun or the directing of the firing angle thereof is effected by manual rotation of knurled knob 156 which is mounted on one end of shaft 157 in bearing relation to the main frame and to which is secured the rotatable arm 158. The arcuate link 159 is pivotally secured at one end to the arm 158 and at its other end to bracket 160 bolted or otherwise secured to the gun carriage 144. With this arrangement, the gun may be accurately set and securely held for firing by the operator.

Upon insertion of coin into the coil slot 79 and manual operation of the slide 78, and depression of the member 122, see Fig. 6, the electrical circuit including switch 169, not shown but previously referred to, will be closed to energize the relay 161, see Fig. 10, pulling the armature 162 downwardly and the weighted arm 163 carrying weight 164 generally to the left whereby frictional engagement of the motor pulley 164' and the large pulley 165, mounted on flexible shaft 166, is effected. Rotation of pulley 165 drives shaft 75 through worm 167 and gear 168 whereby the pin setting and ball returning mechanism described will be operated until the electric circuit is again opened by switch 169.

A player or operator of the apparatus upon unlocking of same for play by insertion of a coin or otherwise, may have made available to him a number of balls, for example ten balls. For each two pin set ups, one of the available ten balls will be made ready for propulsion by the apparatus so that the game may be divided into five frames of two balls per frame. Though the operator or player may effect as many pin set ups as desired, one pin set up per frame is all that is necessary. Upon completion of five frames during which the ten balls have been propelled down the alley the apparatus automatically locks itself until another coin is inserted or the machine otherwise unlocked for play. The number of balls made available to the player may be modified and also the number of frames to the game may be varied without departing from the invention. For example the apparatus may be readily redesigned to offer 30 balls to the player and the game comprise ten frames of three balls per frame to be played with one set up per frame.

What I claim is:

1. In a game apparatus including a bowling alley floor, a plurality of pins adapted to be vertically arranged on the floor adjacent one end of the alley, and ball propelling means at the opposite end of the alley, means arranged above the pins on the alley floor for individually raising the pins

upwardly from the alley when moved out of vertical position by a ball from said propelling means, and pin resetting means including pin engaging means normally positioned below the alley floor and each of the pins thereof, said pin engaging means being movable upwardly through the alley floor for collectively engaging and aligning each of the pins with said means while in raised position above the floor and for lowering and guiding the pins to predetermined reset positions upon the alley floor.

2. In a game apparatus including a bowling alley floor, a plurality of pins adapted to be vertically arranged on the floor adjacent one end of the alley, and ball propelling means at the opposite end of the alley, flexible means suspended from points above the alley and connecting said pins for individually raising the pins upwardly from the alley when moved out of vertical position by a ball from said propelling means, and pin resetting means comprising a plurality of rods supported below the alley floor and each of the pins thereon, said rods being vertically movable through the alley floor for engaging and aligning each of the pins therewith while in raised position above the floor and for lowering and guiding the pins to predetermined reset positions upon the alley floor.

3. The structure defined in claim 1, together with means associated with said resetting means for cushioning the lowering and guiding movements thereof to the predetermined reset position of the pins on the alley.

4. The structure defined in claim 1, together with dash-pot means connected with said resetting means for controlling the cushioning and lowering and guiding movements thereof to the predetermined reset position of the pins on the alley.

5. In a game apparatus including a bowling alley floor, a plurality of pins adapted to be vertically arranged on the floor adjacent one end of the alley, and ball propelling means at the opposite end of the alley, flexible means suspended from points above the alley and connecting said pins for individually raising the pins upwardly from the alley when moved out of vertical position by a ball from said propelling means, latching means for preventing the raising of the pins by the flexible means, said latching means being under the control of the flexible means in response to movement of the pins out of vertical position on the alley, pin resetting means comprising a plurality of rods supported below the alley floor and each of the pins thereon, said rods being vertically movable through the alley floor for engaging and aligning each of the pins therewith while in raised position above the floor and for lowering and guiding the pins to predetermined reset positions upon the alley floor, and means connected with said resetting means for cushioning the lowering and guiding movements of the pins to the predetermined reset vertical positions on the alley.

6. The structure defined in claim 5, in which the cushioning means comprises dash-pot means connected with said resetting means for controlling and cushioning the lowering and guiding movements of the pins to the predetermined reset vertical positions on the alley.

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