Jan. 16, 1945. J. JANES 2,367,400

BOWLING ALLEY

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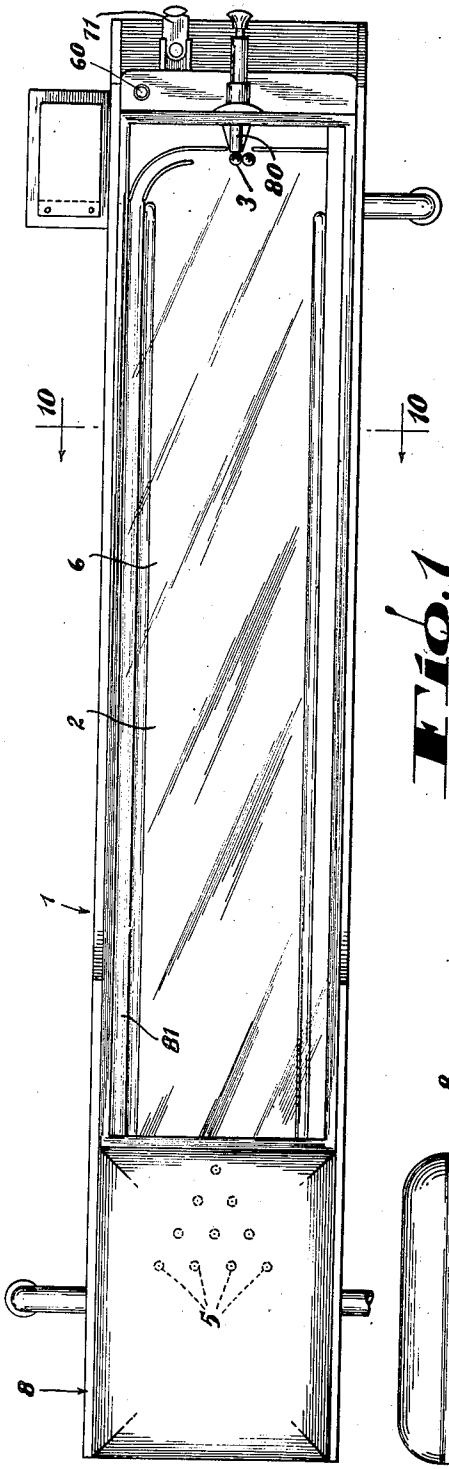


Fig. 1

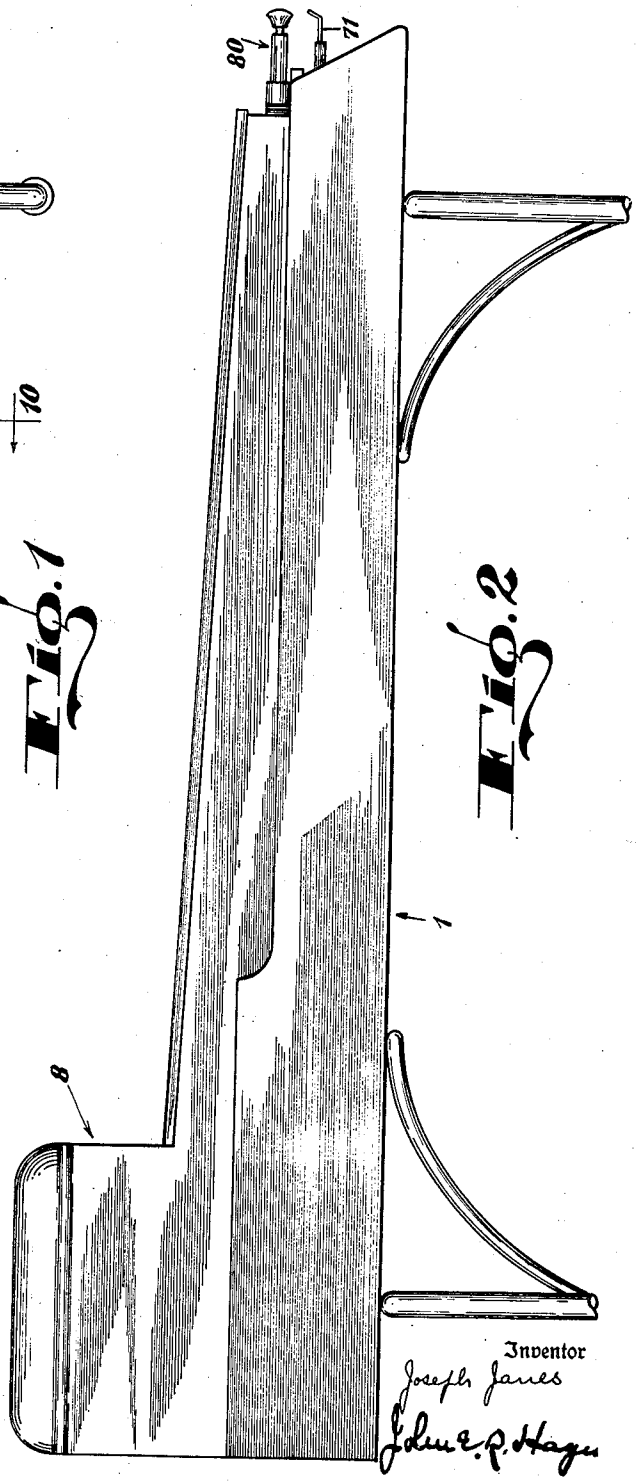


Fig. 2

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BOWLING ALLEY

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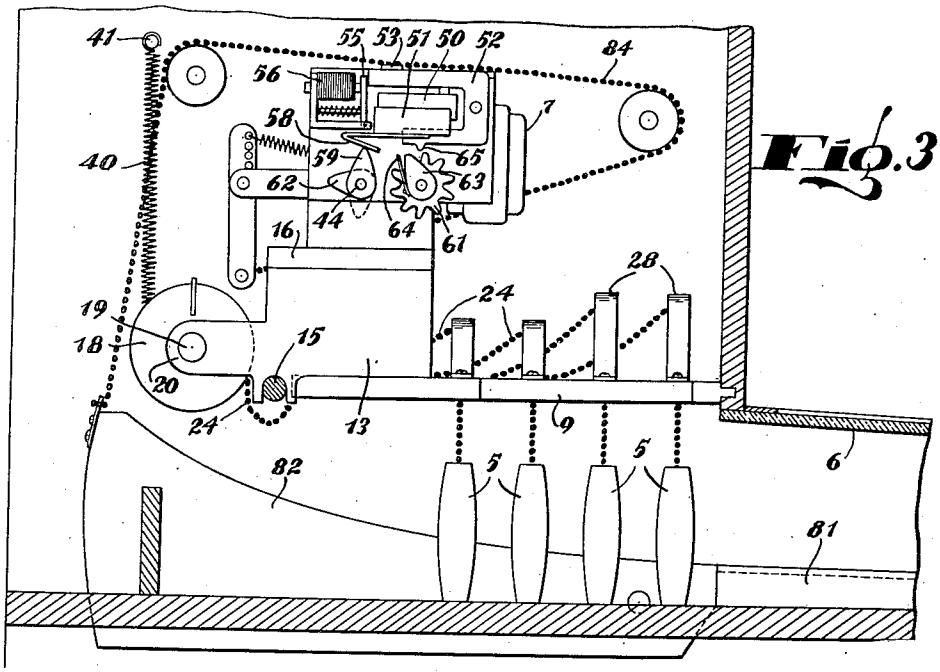


Fig. 3

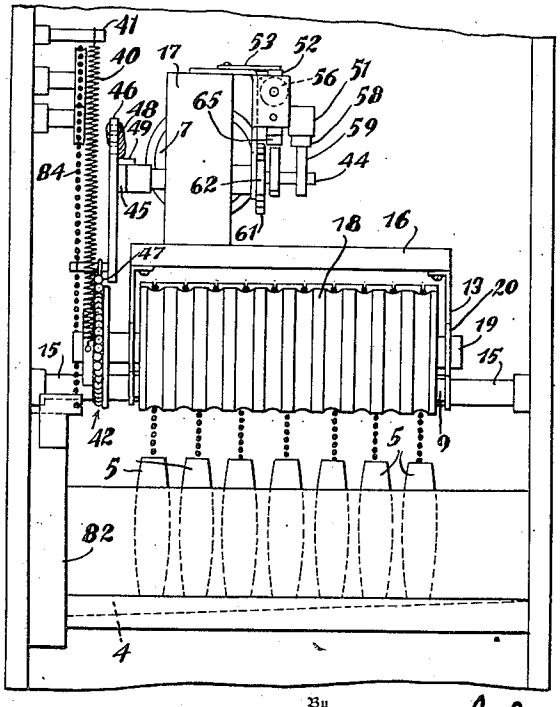


Fig. 4

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BOWLING ALLEY

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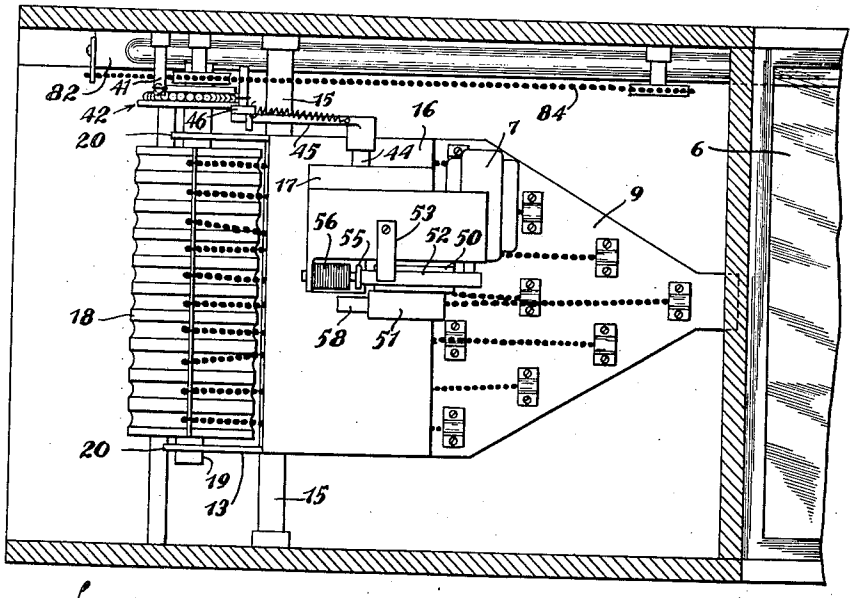


Fig. 5

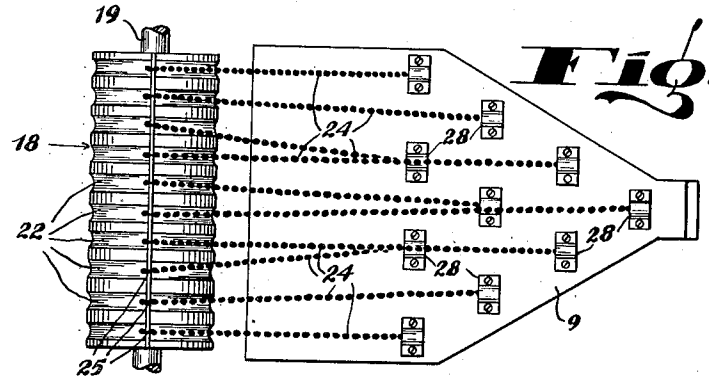


Fig. 8

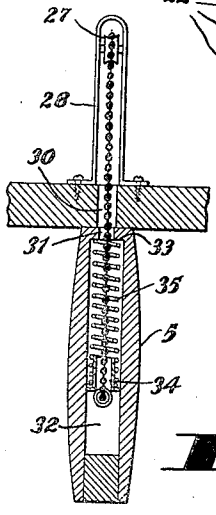


Fig. 9



Fig. 10

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BOWLING ALLEY

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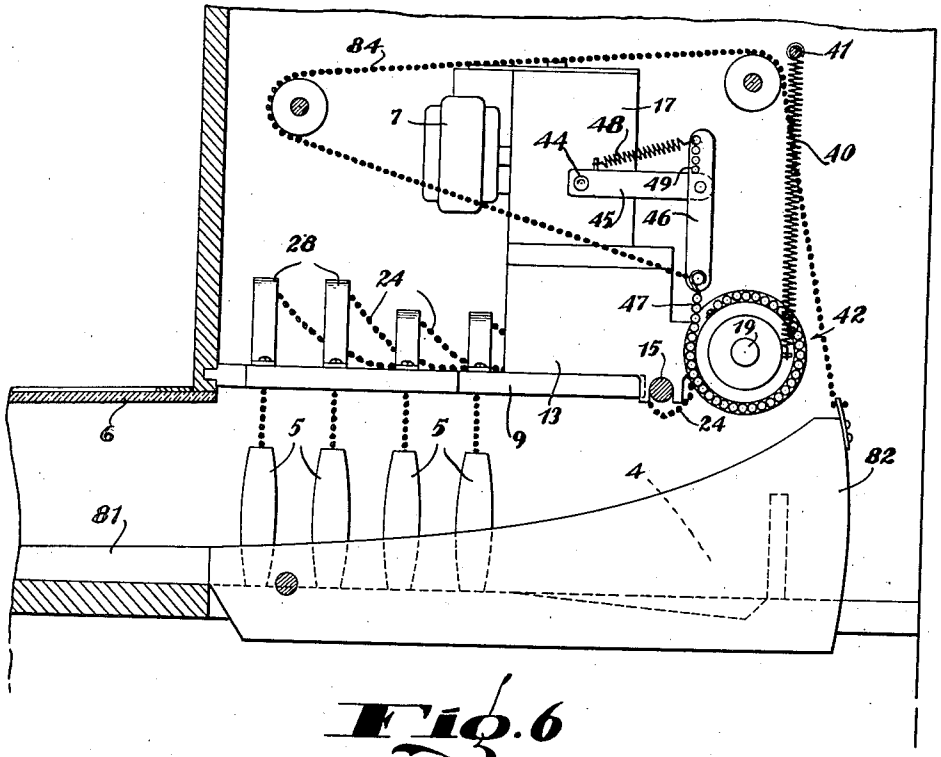


Fig. 6

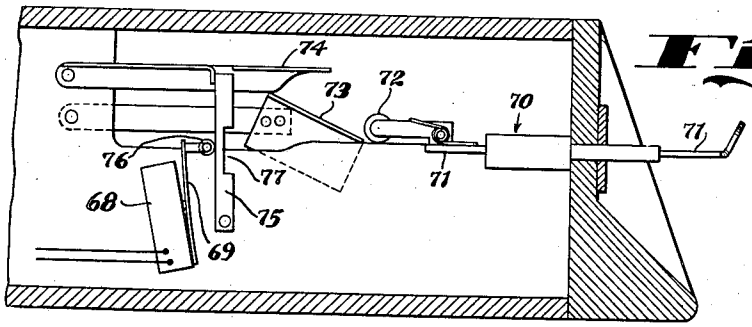


Fig. 11

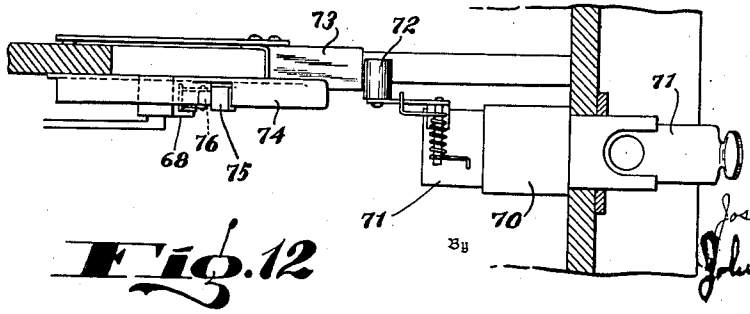


Fig. 12

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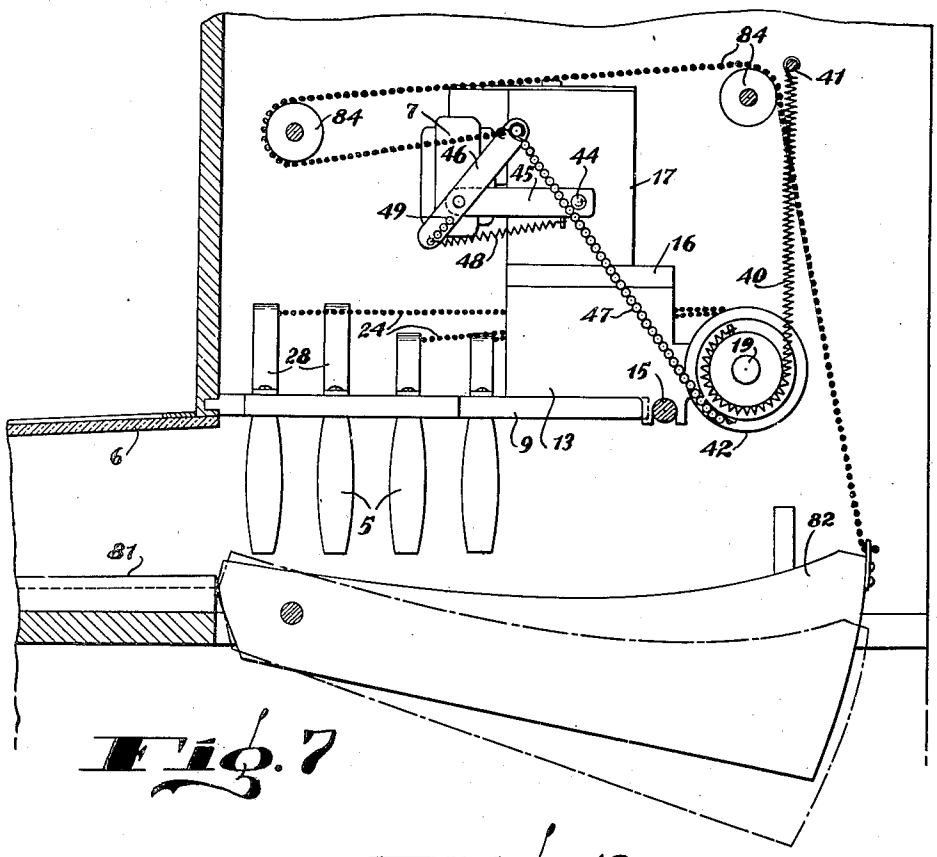
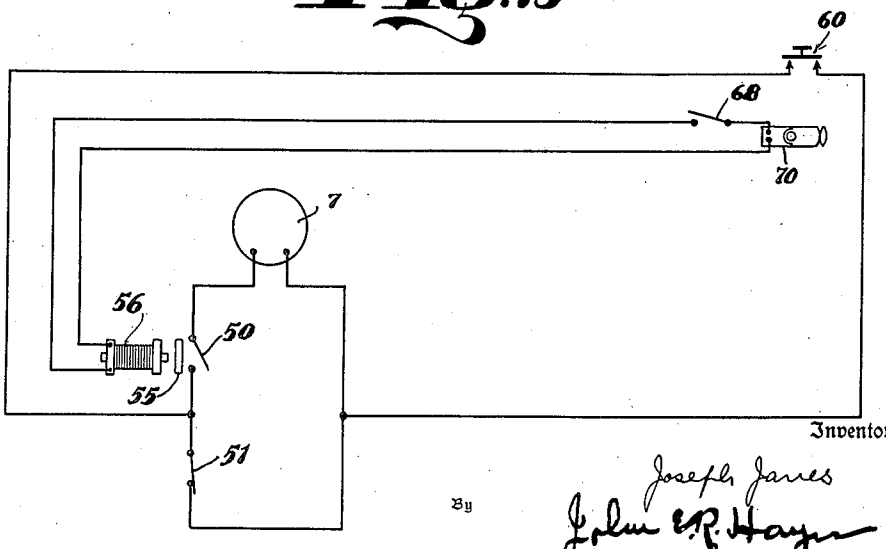


Fig. 7

Fig. 13



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Fig. 14

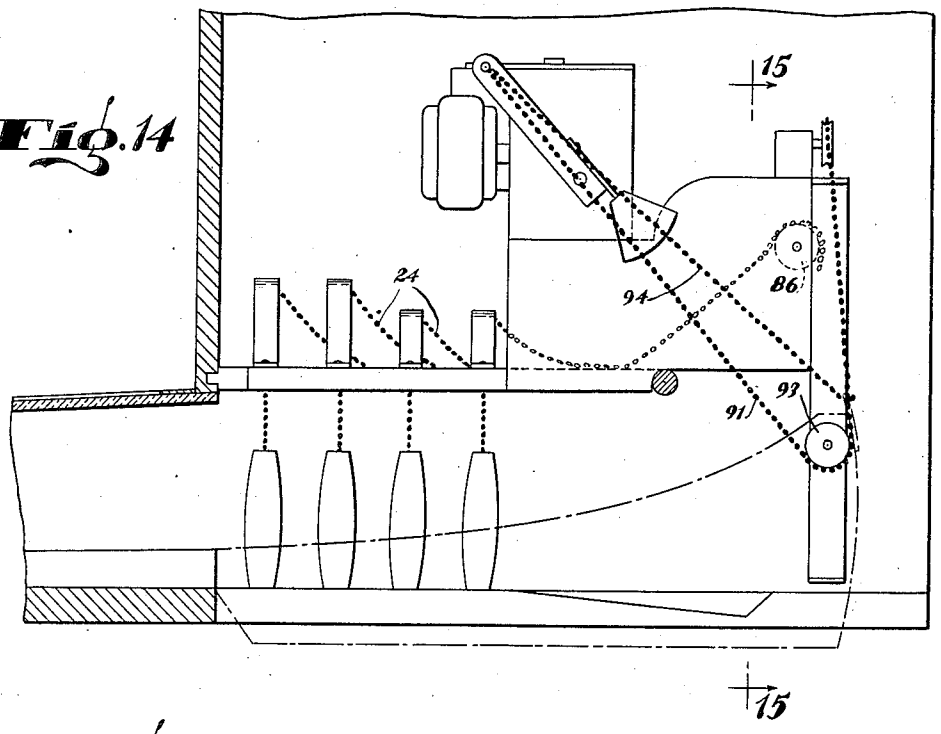


Fig. 15

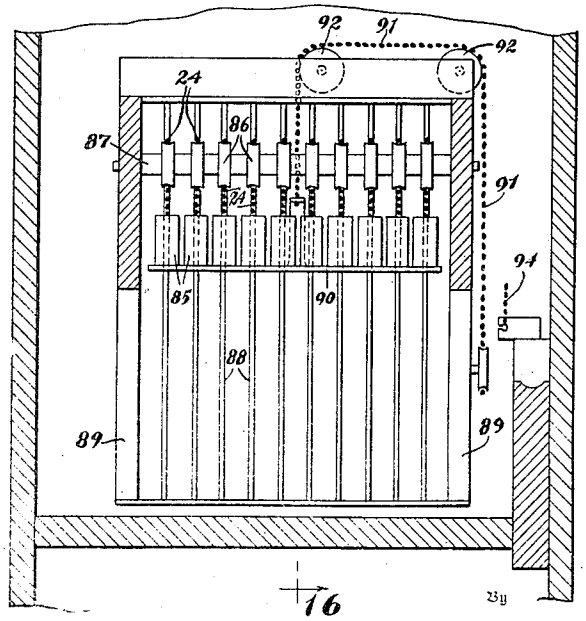
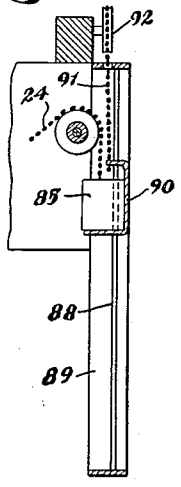


Fig. 16



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Patented Jan. 16, 1945 2,367,400

UNITED STATES PATENT OFFICE

2,367,400

BOWLING ALLEY

Joseph Janes, Somerville, Mass.

Application March 9, 1942, Serial No. 433,901

6 Claims. (Cl. 273—44)

The invention relates to improvements in bowling alleys, and essentially to an improved type of pin resetting mechanism, and to the control of such mechanism.

The object of the invention is to provide a pin setting mechanism possessing constancy in operation, one that may be controlled by the operation of an electric motor, and one that may be initially activated through the operation of a coin slot mechanism.

The invention can best be seen and understood by reference to the drawings in which—

Fig. 1 is a plan of the machine.

Fig. 2 is a side elevation of the machine.

Fig. 3 is a side elevation showing the position occupied by certain operative parts of the machine in one phase of its working.

Fig. 4 is a rear end elevation of the parts shown in Fig. 3.

Fig. 5 is a plan of the parts shown in Fig. 3.

Fig. 6 is a side elevation of the same parts as shown in Fig. 3, but in elevation looked at from the opposite side of the machine.

Fig. 7 is a side elevation of the same parts as shown in Fig. 6, but differently positioned in accordance with another phase in the operation of the machine.

Fig. 8 is a plan essentially of the drum, later to be referred to, and of the flexible connections leading to and connecting with the drum.

Fig. 9 is a vertical section essentially of one of the pins and of that portion of a flexible connection connecting therewith showing the manner in which the flexible connection is led down to tensionally connect with the pin.

Fig. 10 is a section on the line 10—10 of Fig. 1.

Fig. 11 is a side elevation of certain operative parts connected with the coin slot mechanism, to which special reference will hereinafter be made.

Fig. 12 is a plan of the same parts as shown in Fig. 11.

Fig. 13 is a diagrammatic plan of the electric circuit and switch connections employed in the control of the electric motor.

Fig. 14 is a side elevation of a modified structure showing the position occupied by certain operative parts of the machine in one phase of its working.

Fig. 15 is a vertical cross section on the line 15—15 of Fig. 14; and

Fig. 16 is a vertical cross section on the line 16—16 of Fig. 15.

In the drawings 1 represents an elongated cabinet within which is contained an alley floor 2 along which the balls 3 are projected. At the fore end of the elongated floor, aligned with it, is the pit 4 upon which the pins 5 are set. The top of the cabinet is preferably closed by a glass panel 6.

Reference will first be made to the mechanism by which the pins, after being knocked down, are reset by the operation of an electric motor 7.

Forming a part of the cabinet and located above the pit is a chambered superstructure 8 which contains much of the mechanism for controlling the pins, including the motor 7. Located within this superstructure is a positioning board 9. This plate lies horizontally disposed parallel with the face of the pit and spaced from it.

In the operation of the machine the pins are lifted vertically to have end engagement with the plate 9, by which their relative positions are secured preparatory to their dropping to have like relative upright or vertical positions resting upon the floor of the pit. The positioning board 9 is secured in any suitable manner, though preferably by fixing its rear end to the rear end of the cabinet, and its sides to metal spaced plates 13, 13, which are slotted to rest upon a rod 15 extending between the sides of the cabinet and secured to it in any suitable manner.

Mounted upon the plates 13, 13 and fixed to them in any suitable manner is a bed 16 on which rests, and to which is secured, a casing 17, which carries the electric motor 7. Located in the superstructure 8, beyond the end of the positioning board 9, is a drum 18 mounted on a shaft 19 which turns in bearings 20 borne by the plates 13, 13 and located at the fore ends of these plates. This drum is provided on its exterior surface with a plurality of annular grooves 22 which correspond with the number of the pins and within which run line connections or chains 24 which connect respectively with the respective pins. The chains 24 at their outer ends are fastened at points 25 to the drum, after being passed well around the drum, so that through the chains the pins may be raised or lowered as the drum is turned in reverse directions. For making their connection with the pins the chains extend from the drum over wheels 27 which are arranged to turn in raised frames 28 as shown in Fig. 9. These frames are fixed to the top side of the positioning board. These wheel carrying frames are so located upon the positioning board that the chains, extending from the drum and passing over the wheels borne by them, will extend down to connect with the pins by extension through openings 30 in the positioning board. These openings are

relatively small openings, admitting of a free passage of the chains but are much smaller than the ends of the pins, for when the pins are lifted their ends are brought to engage the positioning board around these openings which correspond in number with the number of pins and with the determinate arrangement of the pins when located on the floor of the pit. After passing through the openings in the positioning board the chains enter the pins. Each pin, as will be seen by reference to Fig. 9, is provided with longitudinally aligned central borings **31**, **32**, respectively. The boring **31** is located within the top end portion of the pin, and is an opening relatively short in extension and of small diameter, but sufficiently sized to admit of a free entry and passage of the chain. The boring **32** extending from the boring **31** through the pin to the bottom end of the pin is a boring diametrically much larger than the boring **31**. Thus an annular shoulder **33** is left within the top end of the pin. The chain passed down through the respective borings is provided on its inner end within the pin with an end piece **34** having slidable fit within the boring **32**, and between this end piece and the shoulder **33**, within the boring **32**, is located a coil spring **35**. The length of the chains in their relation to the drum around which the chains are rendering on or off, and to which the ends of the chains are fixed, is such that when the drum is turned for lifting the pins into engagement with the positioning board the pins will be brought into fairly hard engagement with this board, the springs **35** within the pins being then somewhat compressed.

As will later be explained, mechanism is provided whereby any excessive strain brought upon the chains by the lifting of the pins into hard engagement with the positioning board is avoided by means supplemental to the compression of the springs within the pins, thereby avoiding any possibility of the chains breaking. The relative length of the chains is also such as will enable the pins to assume a knocked down position on the floor of the pit. As the pins are lowered by the unwinding of the drum to rest upon the floor of the pit the chains will render over the pulleys **27** only in amount sufficient to secure this end. The drum, however, will still continue to unwind, consequently considerable slack will be left in the chains between the drum and the wheels **27**, these slack portions of the chains then falling down to rest upon the top of the positioning board. It is this slack in the chains which permits falling of the pins onto the floor of the pit from the vertical positions in which they are initially resting, for when the pins drop further pull will be exerted upon the chains which takes up the slack in them.

As previously explained, the pins after they have been knocked down are lifted by the operation of the drum and connecting chains so that the top ends of the pins will be brought to bear against the positioning board for positively locating the pins in proper relative vertical position preliminary to letting them drop to rest upon the floor of the pit. This end cannot be successfully obtained unless the pins are brought to bear hard against the positioning board by operation of the drum and connecting chains. This, however, must be a tensional engagement for otherwise the chains might become broken in case of a slight over-run of the drum. The described means for connecting the chains to the pins meet these requirements for all ordinary working conditions. The pins are raised into a quick hard engagement into the positioning board by the turning of the drum which turns normally only so far, or through such arc of movement, as to compress the springs within the pins which by their yielding will permit of and compensate for any ordinary undue motion of the drum, or over-run thereof that might otherwise break the chains if unyieldingly fixed to the pins.

Referring now to the control of the drum for winding or permitting unwinding of the chains for raising and lowering the pins. The drum is under the influence of counteracting forces, one comprising a spring **40** one end of which is fastened to an arm **41**, fixed to the side of the cabinet, and the opposite end portion of the spring is wrapped around a grooved pulley **42** fixed to the shaft **19** of the drum. The tension of this spring tends to turn the drum in an unwinding direction for letting off the chains connecting with the pins, both for lowering the pins and rendering slack to the chains as previously explained. Opposing the forces thus exerted by the spring **40** are elements under the control of the electric motor for turning the drum in a winding direction for taking up the slack in the chains and lifting the pins; and, also, for maintaining the drum in any determinate turned position.

As previously explained, the electric motor is arranged upon the casing **17** and operates by mechanism (not shown) contained within the casing to turn a shaft **44** as the motor is operated. The motor operates at a relatively high speed, but the connections are such that the shaft **44** will turn at a relatively slow speed.

Connecting with the shaft **44** which extends through the casing, is a crank arm **45**. Pivotally connected to the end of this arm is a lever **46**. Secured to the end of the operating arm of this lever is a chain **47**, the outer end portion of which is passed around the grooved pulley **42**. Secured to the work arm of the lever **46** is a coil spring **48** with end fixed to the base end of the crank arm **45**. This spring acts to maintain the lever in normal contact with a stop **49** on the side of the crank arm. With the parts thus connected and arranged, as the crank arm rotates in the direction as indicated by the arrow on the end of the shaft **44**, as shown in Fig. 7, the drum will either be turned in a direction to wind the flexible connections thereon as the crank arm turns in a direction away from the drum, or, reversely, the drum will be allowed to be turned by the spring **40** in direction for the unwinding of the flexible connections from it as the crank arm turns towards the drum.

The initial position of the operating parts preparatory to starting the machine is as shown in Fig. 7 where it will be seen that the drum has been turned by the operation of the crank arm and associated parts, into a position where all slack in the chains has been taken up and the pins are in engagement with the positioning board. It will also be observed that when the drum is thus positioned the pull of the chain **47** on the lever **46** has operated to turn this lever away from the stop **49**, which operation is permitted by the spring **48** which is tensioned during such operation. In consequence the drum is thus indirectly under the control of the spring **48** acting through the lever **46** and chain **47** in counteraction to the spring **40** also under tension. Consequently the pins, when in engagement with the positioning board, are tensionally under the control not only of the springs **35** within them, but also the spring **48**. In consequence, if the

pins borne by the chains become more or less entangled so as not to rise properly against the positioning board, although the crank arm may continue to turn during the operation of the motor for lifting the pins, and although the springs within the pins may under such circumstances assist in avoiding breakage of the chains, yet further relief is provided by the permitted turning of the lever **46** by the spring **48** which normally holds the lever in contact with the stop **49**, but which, when occasion requires, will allow the lever **46** to turn away from the stop into a position affording considerable relief in the draft influence of the operating parts on the drum and pins.

The next phase of operation to which attention will be directed is the position of the parts when the pins have been lowered by the operation of the motor to rest upon the floor of the pit, or are occupying knock-down positions thereon in whole or in part. The position of the operating parts is then substantially as shown in Fig. 6 where the crank arm **45** has been turned to a position where the lever **46** and connecting chain **47** no longer exert a winding influence on the drum, and the drum has been brought under the control of the unwinding spring **43** and turned to where the pins have not only been lowered to rest upon the floor of the pit and slack rendered in the flexible connections or chains; or the pins may be occupying a knocked-down position resting on the floor of the pit and the slack in the chains has accordingly been taken up.

Thus the winding drum, through successive operations of the electric motor and turning of the shaft **44** and crank arm borne by it, will arrive at the stations referred to and maintain the drum in the position, or station, then existing when the motor is stopped. In certain phases of the operation of the machine, as will later be explained, the motor is so controlled as to turn the crank arm **45** through such phases of operation as will occasion lifting and positioning of the pins followed immediately by the lowering thereof to rest upon the floor of the pit. Reference, accordingly, will now be made to the way in which operation of the electric motor is controlled.

The control of the motor depends upon the different phases of operation desired to be attained in the operation of the machine. The machine is a coin actuated machine, that is, the machine is rendered active for bowling upon the insertion of a coin. In its normal inactive state, before the coin is inserted, it is desired that the pins shall be occupying a position in engagement with the positioning board and not resting upon the floor of the pit, the parts effecting the operation of the drum then occupying a position as shown in Fig. 7. Upon the insertion of a coin the resulting action is to operate the motor sufficiently to lower the pins to rest upon the floor of the pit, or, in other words, to move the crank arm **45** through a distance, or arc of movement, from its position as shown in Fig. 7 to its position as shown in Fig. 6. The pins now having been lowered to rest upon the floor of the pit the balls are projected, as will later be explained, and the pins knocked down as in ordinary bowling. A strike may be obtained, or a spare, or only a portion of the pins knocked down. As soon as the one frame has been played, whether by a single ball making a strike, or by two balls making a spare, or by three balls which may knock down all, or a portion, of the pins, thereupon the motor is controlled to move the crank arm through a substantially complete revolution, or such as will lift the pins into engagement with the positioning board followed immediately by a lowering of the pins to rest upon the floor of the pit preparatory to bowling the next frame. This continues until a determinate number of frames have been bowled, as for example, ten frames, and then the machine stops and cannot again be rendered active until by insertion of a fresh coin, the pins being left in engagement with the positioning board. These various phases of operation are obtained through control of the electric current which energizes the electric motor.

Fixed in any suitable manner to the casing **17** which bears the electric motor, and lying within the electric circuit which, when closed, actuates the motor, is a primary switch **50**, and with it is associated a second switch **51**. The primary switch is controlled by a pivoted U-shaped member **52** which is under the control of a spring **53** that normally acts to turn the member **52** and close the primary switch. The switch member **52** is maintained in an inactive position, so breaking the circuit through it, by means of an interposed spring pressed bar **55** against which the switch member **52** has bearing. This bar is under the control of a magnet **56** which, when energized, withdraws the bar **55** permitting the switch member **52** to turn under the influence of the spring **53** thereby closing the circuit through the primary switch.

The electric current passing through the primary switch passes also through the switch **51** associated with it. This second switch is one normally closed and is opened for breaking the circuit through it by a spring member **58** with which a cam **59** on the end of the shaft **44** has wiping engagement during the turning of this shaft. Accordingly as long as the cam **59** is in engagement with the switch member **58** the second switch will be open, and the circuit controlling the operation of the motor will be open even though the primary switch is closed.

There is also provided in the electric circuit which controls the motor a bypass by which the electric circuit for controlling the motor will be complete when the primary switch is closed but the second switch open. This bypass has within it a normally open push button **60** which is closed, so completing the circuit through the bypass, by one operating the machine.

Further provision is made whereby after a determinate number of turnings of the shaft **44** the U-shaped switch member, which controls the primary switch, will be turned against its retaining spring **53** and moved into a position where the spring pressed bar **55** will enter beneath it, thus breaking the circuit through the primary switch and maintaining it broken until the bar **55** has been released by again energizing the magnet **56**. This operation is obtained by means of a pivoted star wheel or gear **61** which is turned periodically by a cam **62** on the shaft **44** as this shaft is turned. The star wheel **61** bears a cam **63** having associated with it a spring finger **64**. When the star wheel has been turned through a complete revolution by determinate number of turnings of the shaft **44** then the spring finger on the star wheel will engage a projection **65** on the under side of the U-shaped member, raising this member against its retaining spring **53** and allowing the spring pressed bar **55** to enter beneath the member, thus breaking the circuit through the primary switch as aforesaid.

The electric circuit which energizes the mag-

net 56 has within it a switch 68 which includes a spring element 69 occupying normally an open position, so leaving open the circuit controlling the magnet. The spring element 69 is moved momentarily into a closed position, thus completing the circuit which energizes the magnet for withdrawing the bar 55 for opening the primary switch, by the operation of a coin actuated mechanism 70. This coin actuated mechanism includes a push bar 71 which may be pushed forward upon the interposition of a proper coin. Pivotally connected to the push bar at the fore end thereof is a striker 72. Arranged forward of the striker in the path thereof is a pivoted upwardly inclined slide 73. On the top of this slide rests a pivoted guard 74 through which extends a pivoted bar 75 against which bears an arm 76 on the spring element 69. The guard 74 prevents the bar 75 being moved forward for closing the switch 68 until the guard is raised. As the push bar is moved forward the striker 72 will ride up upon the slide 73 raising the guard 74 and releasing the bar 75. When the push bar has arrived at the limit of its forward movement it will pass the end of the slide and drop. As it drops it will strike the bar 75 displacing it, and, through the arm 76, closing the switch 68 and thus completing the circuit for momentarily energizing the magnet 56, after which on dropping of the striker it will enter a slot 77 in the bar 75 enabling it to resume its normal position of retention by the guard 74 and breaking the circuit. On the withdrawal of the push bar 71 and striker the striker will pass beneath the pivoted slide 73.

The balls 3 which are projected along the alley for knocking down the pins are projected by means of a manually actuated plunger 80 of common type.

Associated with the alley is a runway 81 by which the balls are returned to assemble on the runway in front of the plunger. This runway has at its forward end a pivoted rocker extension or chute 82. This extension is so fashioned that when occupying an elevated position balls located upon it will be projected by gravity to run along the body of the runway to the fore end thereof and position themselves in front of the plunger. In its lowered position the rocker extension will be turned to lie, at least in part, below the floor of the pit. The floor of the pit is slightly inclined so that the balls lying upon it will roll from the pit and deposit themselves on the rocker extension. Interposed between the rocker extension to the runway and the end of the lever 46 on the crank arm 45 is a connection 84 whereby the rocker extension, after the balls have been deposited upon it upon the completion of any frame, will be raised by the operation of the crank arm 45 as the arm turns to lower the pins from their engagement with the positioning board on to the floor of the pit, which is an operation initial to the bowling of any frame. In other words, at substantially the same time that the pins have been deposited upon the floor of the pit the balls will have been returned in position for projection. As the crank arm turns for lifting the pins the extension will be lowered to a position where it will lie in part below the floor of the pit whereby the balls will deposit thereon as aforesaid.

The general operation is as follows: Preparatory to activating the machine for bowling, and before the insertion of a coin into the coin slot mechanism, the pins will have been drawn up into engagement with the positioning board. The crank arm 45, which constitutes one of the chief actuating mechanisms for turning the drum, will then be occupying a position as shown in Fig. 7. The electric circuit through the primary switch 50 will be open due to the interposition of the bar 55 beneath the end of the U-shaped switch member 52. The circuit through the second switch 52 will be closed by reason of the fact that the cam 59 on the shaft 44, which has wiping engagement with the spring member 58 for opening this switch, will have been moved into a position substantially as shown in dotted lines in Fig. 3, and requiring substantially a half turn of the shaft 44 before engaging with the spring member 58 for opening the circuit through the second switch. The bypass passage through the second switch which is controlled by the push button 60 is then open. This bypass passage is the one by which the electric circuit which operates the motor may be closed when the circuit through the primary switch is closed but the circuit through the second switch is open. The rocker extension 82 at the end of the runway will then be occupying a position where the balls projected during the playing of the last frame will have rolled out of the pit to lie upon it.

Upon the insertion of a coin into the slot mechanism the push bar 71 is then moved forward closing the electric circuit which energizes the magnet 56 whereupon the bar 55 will be withdrawn from the U-shaped switch member 52 which accordingly is moved by the spring 53 controlling it to close the electric circuit through the primary switch 50, the circuit through the second switch 51 then being closed. The circuit is then complete for operating the motor with the effect of turning the shaft 44 through substantially a one-half turn. During such movement the crank arm 45 will be turned from the position as shown in Fig. 7 to the position as shown in Fig. 6 where the drum will have been turned sufficiently to deposit the pins on the floor of the pit and impart slack to the chains. On completion of this movement the cam 59 will have been moved up into a position to engage the spring member 58, as shown in the full lines of Fig. 3, opening the circuit through the second switch and stopping the motor. At the same time, as an incident to this operation, the rocker end extension 82 of the runway will have been lifted by the operation of the crank arm 45, and the balls thereon will be precipitated to run along the runway and collect in front of the ball projector 80 in readiness for projection.

After the bowling of the ensuing frame, irrespective of whether one, two, or three balls are projected, thereupon the operator, through the push button 60, will close the circuit through the bypass. The circuit through the second switch will then be open owing to the engagement of the cam 59 with the spring member 58 which opens this circuit. The closing of the bypass then completes the circuit to the motor as the circuit through the primary switch still remains closed. Thereupon the motor will be operated as long as the bypass circuit is held closed by the push button. The use of the bypass circuit for operating the motor is only momentary, or such as will allow the cam 59 to turn away from the spring contact 58, whereupon the circuit through the second switch will be closed and the motor will continue to operate. The operation of the motor will continue until the crank arm 45 has been turned through substantially a complete revolu-

tion or until the cam 59 on the shaft 44 is again brought into engagement with the spring member 58 which opens the circuit through the second switch, whereupon the motor will stop. During this movement the pins will have been brought into engagement with the positioning board and immediately dropped on to the floor of the pit in readiness for the bowling of the next frame. The balls will, also, have been returned and positioned to be acted upon by the plunger during the bowling of the next frame.

These operations last referred to continue until a determined number of frames have been bowled, for example, ten frames. Thereupon the star wheel or gear 61 which is turned by the cam 62 on the shaft 44 will have been turned to a position where the spring finger 64 thereon will have engaged the projection 65 on the U-shaped switch member 52 turning it and thereby breaking the circuit through the primary switch and allowing the spring pressed bar 55 to again enter beneath the end of the U-shaped switch member for maintaining it in its disengaging position until the bar 55 has again been released by the operation of the magnet following the insertion of a fresh coin into the coin slot mechanism.

The pin setting mechanism and appertaining parts thus far referred to is perhaps more essentially adapted to a miniature type of bowling alley, although it might be used with a full size bowling alley.

In Figs. 14, 15 and 16 there is shown a modified structure of pin setting mechanism which is especially adapted to a bowling alley of full size. It relates to a modified way of lifting and lowering the pins in which weights are employed, to which are attached the flexible connections which connect with the pins, and in which gravity assists in the operation of these weights for imparting pull upon the flexible connections, in place of a spring controlled cylinder heretofore employed. 85 represents these weights to which are connected the flexible connections 24 which connect with the pins after first passing over pulleys 86 arranged upon a common bar 87. The pulleys 86 are arranged above the weights which are drawn up and allowed to fall by gravity, the motion thereof thus obtained controlling the setting and positioning of the pins as previously explained. During their up and down movement the weights are arranged to slide upon guides 88 arranged in a suitable frame 89. The weights are borne by a common support 90. Connecting with this support is a flexible connection, or chain 91, which renders over pulleys 92 on the head of the frame 89, thence downwardly around a pulley 93 on the side of this frame and thence extends to connect with the outer end of the crank arm 45. As this arm is turned under the controlled action of the electric motor the weights 85 will be lifted and allowed to fall in proper sequence of operation, thus enabling the setting and positioning of the pins as previously explained.

Connecting also with the crank arm 45 is a chain 94 which connects with the rocker extension or chute 82, which, as the crank arm is turned, will lift and lower this chute whereby it will operate in substantially the manner heretofore described.

I claim:

1. In a machine for setting and re-setting pins upon the floor to the pit of a bowling alley, the combination comprising a set of pins, flexible connections secured, respectively, to the pins, a stationary positioning board arranged above the floor of the pit through which the flexible connections are arranged to extend by way of openings therein, draft and release mechanism including an element movable in reverse directions whereby said mechanism will either exert pull upon said flexible connections for lifting the pins into engagement with said positioning board or the pins when raised against the positioning board will be allowed to drop and rest upon the floor of the pit, a rotary shaft, an electric motor for rotating said shaft, means whereby as the shaft is rotated by the electric motor said element will be moved in reverse directions or rest in a determinate moved position dependent upon the turned position of the rotary shaft and the amount of its turning, and mechanism for controlling the operation of the electric motor whereby it will by the operation thereof, or cessation of operation, control the turned position of the rotary shaft and the amount of its turning, said motor controlling mechanism including an electric circuit, means for initially completing said circuit when the pins are in engagement with the positioning board whereby the motor will be operated for turning said shaft with a partial revolution commensurate with the dropping of the pins to a set position of rest on the floor of the pit with afforded slack in the flexible connections, means for then breaking the circuit and stopping the motor, means for afterwards completing said circuit whereby the motor will be operated to turn said shaft through a substantially complete cycle of rotation commensurate with the raising of the pins from off the floor of the pit into engagement with the positioning board and positioning thereby followed by an immediate dropping of the pins to resume their set position of rest on the floor of the pit with afforded slack in the flexible connections when the circuit will again be broken and the motor stopped by the operation of the second named means of said motor controlling mechanism.

2. In a machine for setting and re-setting pins upon the floor to the pit of a bowling alley, the combination comprising a set of pins, flexible connections secured, respectively, to the pins, a positioning board arranged above the floor of the pit through which the flexible connections are arranged to extend by way of openings therein, draft and release mechanism including an element movable in reverse directions whereby said mechanism will either exert pull upon said flexible connections for lifting the pins into engagement with said positioning board or the pins when raised against the positioning board will be allowed to drop and rest upon the floor of the pit, a rotary shaft, an electric motor for rotating said shaft, means whereby as the shaft is rotated by the electric motor said element will be moved in reverse directions or rest in a determinate moved position dependent upon the turned position of the rotary shaft and the amount of its turning, and mechanism for controlling the operation of the electric motor whereby it will by the operation thereof, or cessation of operation, control the turned position of the rotary shaft and the amount of its turning, said motor controlling mechanism including an electric circuit, means for initially completing said circuit when the pins are in engagement with the positioning board whereby the motor will be operating for turning said shaft with a partial revolution commensurate with the dropping of the pins to a set position of rest on the floor of the pit with afforded slack in the flexible connections, means for then

breaking the circuit and stopping the motor, means for afterwards completing said circuit whereby the motor will be operated to turn said shaft through a substantially complete cycle of rotation commensurate with the raising of the pins from off the floor of the pit into engagement with the positioning board and positioning thereby followed by an immediate dropping of the pins to resume their set position of rest on the floor of the pit with afforded slack in the flexible connections when the circuit will again be broken and the motor stopped by the operation of the second named means of said motor controlling mechanism, and means whereby the circuit will be broken and operation of the motor cease after the motor has been operated to turn the rotary shaft through a series of complete cycles as aforesaid.

3. In a machine for setting and re-setting pins upon the floor to the pit of a bowling alley, the combination comprising a set of pins, flexible connections secured, respectively, to the pins, a stationary positioning board arranged above the floor of the pit through which the flexible connections are arranged to extend by way of openings therein, draft and release mechanism including an element movable in reverse directions whereby said mechanism will either exert pull upon the flexible connections for lifting the pins into engagement with the positioning board or the pins when raised against the positioning board will be allowed to drop and set upon the floor of the pit, a rotary shaft, an electric motor for rotating said shaft, means whereby as the shaft is rotated by the electric motor said element will be moved in reverse directions or rest in a determinate moved position dependent upon the turned position of the rotary shaft and the amount of its turning, and mechanism for controlling the operation of the electric motor whereby it will by the operation thereof, or cessation of operation, control the turned position of the rotary shaft and the amount of its turning, said motor controlling mechanism including an electric circuit having in it a normally open primary switch, a normally closed secondary switch, and a bypass for closing the circuit when the primary switch is closed and the secondary switch is open, means for initially closing the primary switch and completing said circuit when the pins are in engagement with the positioning board whereby the motor will be operated for turning said shaft with a partial revolution commensurate with the dropping of the pins to a set position of rest on the floor of the pit with afforded slack in the flexible connections, means operated by the rotary shaft for effecting the opening of the secondary switch and thereby breaking the circuit after any setting of the pins on the floor of the pit whereby the pins will continue to set thereon until displaced, means for completing the circuit through said bypass when said primary switch is closed and said secondary switch is open whereby a partial turning of said shaft through operation of the motor will effect the closure of said secondary switch when the completed circuit will operate said motor to turn said shaft through substantially a complete cycle of rotation commensurate with the raising of the pins from off the floor of the pit into engagement with the positioning board and positioning thereby followed by an immediate dropping of the pins to resume their set position of rest on the floor of the pit when said means operated by the rotary shaft for effecting the opening of the secondary switch will break the circuit and stop the motor.

4. In a machine for setting and re-setting pins upon the floor to the pit of a bowling alley, the combination comprising a set of pins, flexible connections secured, respectively, to the pins, a stationary positioning board arranged above the floor of the pit through which the flexible connections are arranged to extend by way of openings therein, draft and release mechanism including an element movable in reverse directions whereby said mechanism will either exert pull upon the flexible connections for lifting the pins into engagement with the positioning board or the pins when raised against the positioning board will be allowed to drop and set upon the floor of the pit, a rotary shaft, an electric motor for rotating said shaft, means whereby as the shaft is rotated by the electric motor said element will be moved in reverse directions or rest in a determinate moved position dependent upon the turned position of the rotary shaft and the amount of its turning, and mechanism for controlling the operation of the electric motor whereby it will by the operation thereof, or cessation of operation, control the turned position of the rotary shaft and the amount of its turning, said motor controlling mechanism including an electric circuit having in it a normally open primary switch, a normally closed secondary switch, and a bypass for closing the circuit when the secondary switch is open, means for initially closing said primary switch and completing the circuit when the pins are in engagement with the positioning board and the secondary switch is closed whereby the then completed circuit will actuate the motor to turn the rotary shaft in an amount sufficient to set the pins on the floor of the pit, means operated by the rotary shaft to then open the secondary switch whereby the circuit is broken and the pins left set on the floor of the pit, means whereby the circuit may be momentarily completed through the bypass for actuating the motor and thereby turning the rotary shaft in an amount sufficient to effect the closure of the secondary switch when the completed circuit through the primary and secondary switches then closed will actuate the motor to turn the shaft through a substantially complete revolution whereby the pins will be raised from off the floor of the pit into engagement with the positioning board and immediately drop to become reset upon the floor of the pit, and means whereby the primary switch will be opened and the motor stopped after a determinate number of complete turnings of said rotary shaft.

5. In a machine for setting and re-setting pins upon the floor to the pit of a bowling alley, the combination comprising a set of pins, flexible connections secured, respectively, to the pins, a stationary positioning board arranged above the floor of the pit through which the flexible connections are arranged to extend by way of openings therein, draft and release mechanism including an element movable in reverse directions whereby said mechanism will either exert pull upon the flexible connections for lifting the pins into engagement with the positioning board or the pins when raised against the positioning board will be allowed to drop and set upon the floor of the pit, a rotary shaft, an electric motor for rotating said shaft, means whereby as the shaft is rotated by the electric motor said element will be moved in reverse directions or rest in a determinate moved position dependent upon the turned position of the rotary shaft and the amount of

its turning, mechanism for controlling the operation of the electric motor whereby it will by the operation thereof, or cessation of operation, control the turned position of the rotary shaft and the amount of its turning, said motor controlling mechanism including an electric circuit having in it a normally open primary switch, a normally closed secondary switch, and a bypass for closing the circuit when the secondary switch is open, means for initially closing said primary switch when the pins are in engagement with the positioning board and the secondary switch is closed whereby the then completed circuit will actuate the motor to turn the rotary shaft in an amount sufficient to set the pins on the floor of the pit, means operated by the rotary shaft to then open the secondary switch whereby the circuit is broken and the pins left set on the floor of the pit, means whereby the circuit may be momentarily completed through the bypass for actuating the motor and thereby turning the rotary shaft in an amount sufficient to effect the closure of the secondary switch when the completed circuit through the primary and secondary switches then closed will actuate the motor to turn the shaft through a substantially complete revolution whereby the pins will be raised from off the floor of the pit into engagement with the positioning board and immediately drop to become reset upon the floor of the pit, a runway for the return of balls after projection to the pit of the alley, a movable extension to the runway adaptable to be lowered to lie in part below the floor of the pit whereby balls within the pit will roll and become deposited upon said extension, said movable extension being adaptable also to be raised whereby balls deposited thereon as aforesaid will gravitate therefrom onto the body of the runway, means for pivotally supporting said extension, and means interposed between said rotary shaft and said extension whereby the extension will be raised when by the turning of the rotary shaft the pins are dropped and set upon the floor of the pit, and the extension will be lowered when by the turning of the rotary shaft the pins are lifted into engagement with the positioning board, and means whereby the primary switch will be opened and the motor stopped after a determinate number of complete turnings of said rotary shaft.

6. In a machine for setting and re-setting pins upon the floor to the pit of a bowling alley, the combination comprising a set of pins, flexible connections secured, respectively, to the pins, a stationary positioning board arranged above the floor of the pit through which the flexible connections are arranged to extend by way of openings therein, draft and release mechanism including an element movable in reverse directions whereby said mechanism will either exert pull upon said flexible connections for lifting the pins into engagement with said positioning board or the pins when raised against the positioning board will be allowed to drop and rest upon the floor of the pit, a rotary shaft, an electric motor for rotating said shaft, means whereby as the shaft is rotated by the electric motor said element will be moved in reverse directions or rest in a determinate moved position dependent upon the turned position of the rotary shaft and the amount of its turning, and mechanism for controlling the operation of the electric motor whereby it will by the operation thereof, or cessation of operation, control the turned position of the rotary shaft and the amount of its turning, said motor controlling mechanism including an electric circuit, means for initially completing said circuit when the pins are in engagement with the positioning board whereby the motor will be operated for turning said shaft with a partial revolution commensurate with the dropping of the pins to a set position of rest on the floor of the pit with afforded slack in the flexible connections, means for then breaking the circuit and stopping the motor, means for afterwards completing said circuit whereby the motor will be operated to turn said shaft through a substantially complete cycle of rotation commensurate with the raising of the pins from off the floor of the pit into engagement with the positioning board and positioning thereby followed by an immediate dropping of the pins to resume their set position of rest on the floor of the pit with afforded slack in the flexible connections when the circuit will again be broken and the motor stopped by the operation of the second named means of said motor controlling mechanism, a runway for the return of balls after projection to the pit of the alley, a movable extension to the runway adaptable to be raised and lowered, said extension when lowered lying in part below the floor of the pit whereby balls within the pit will roll and become deposited upon said extension when raised occupying an inclined position whereby balls deposited thereon as aforesaid will gravitate therefrom onto the body of the runway and be returned, and means interposed between said rotary shaft and said extension whereby the extension will be raised when by the turning of the rotary shaft the pins are dropped and set upon the floor of the pit and the extension will be lowered when by the turning of the rotary shaft the pins are lifted into engagement with the positioning board.

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