

June 22, 1926.

P. ROBLE

1,590,124

PIN SETTING APPARATUS

Filed May 23, 1925

6 Sheets-Sheet 1

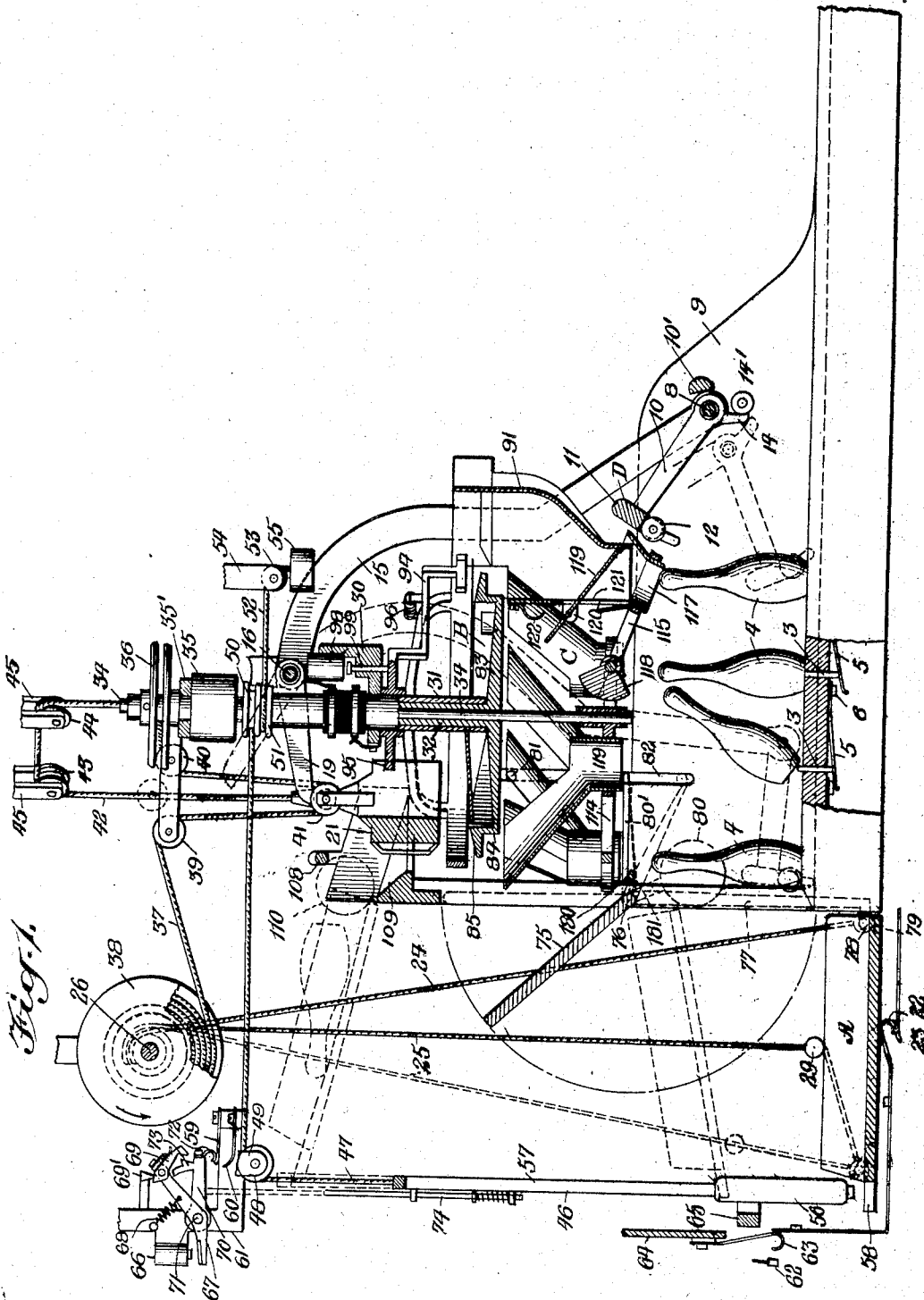


Fig. 1.

WITNESSES

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ATTORNEYS

June 22 , 1926.

1,590,124

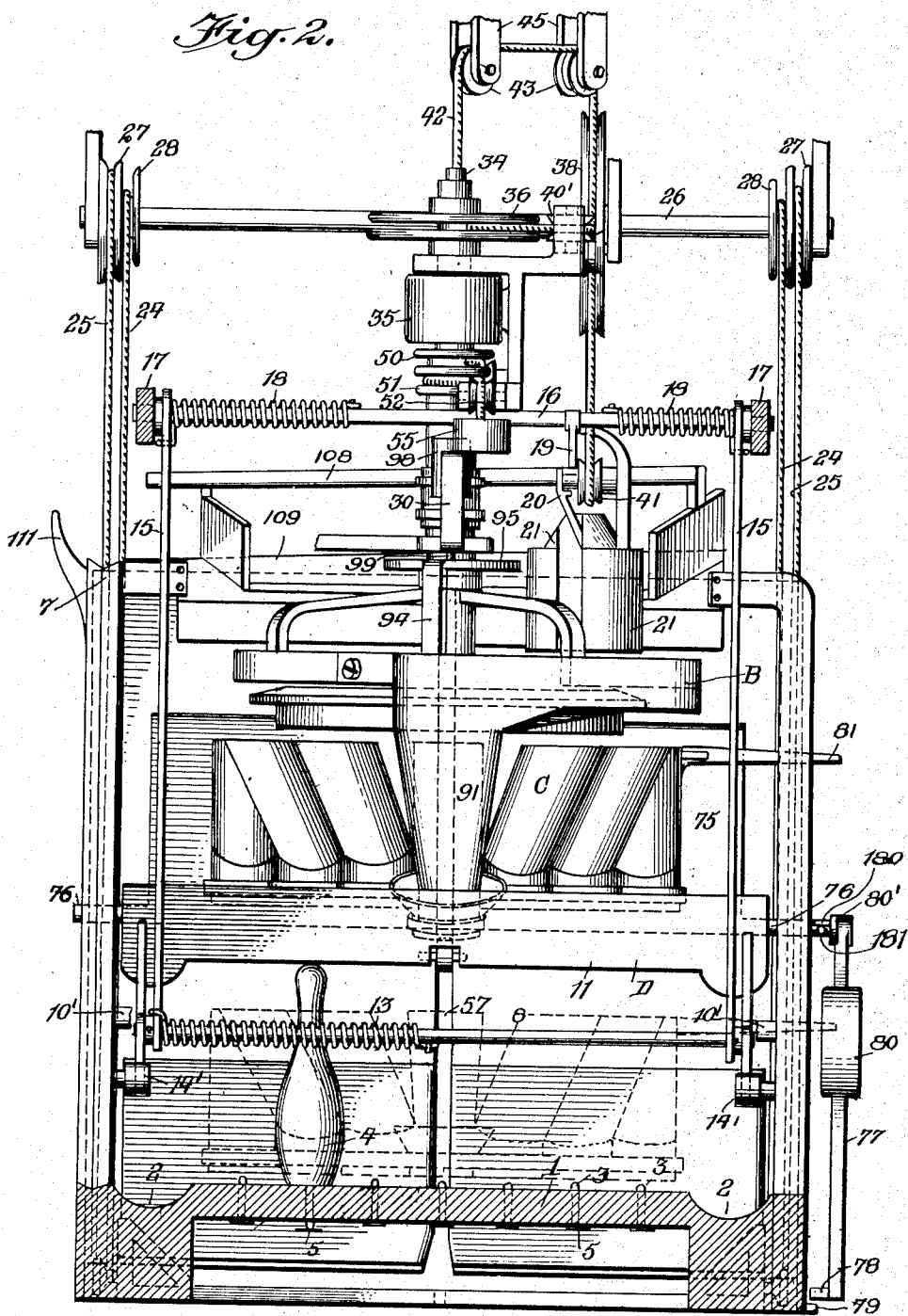
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PIN SETTING APPARATUS

Filed May 23, 1925

6 Sheets-Sheet 2

Fig. 2.



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1,590,124

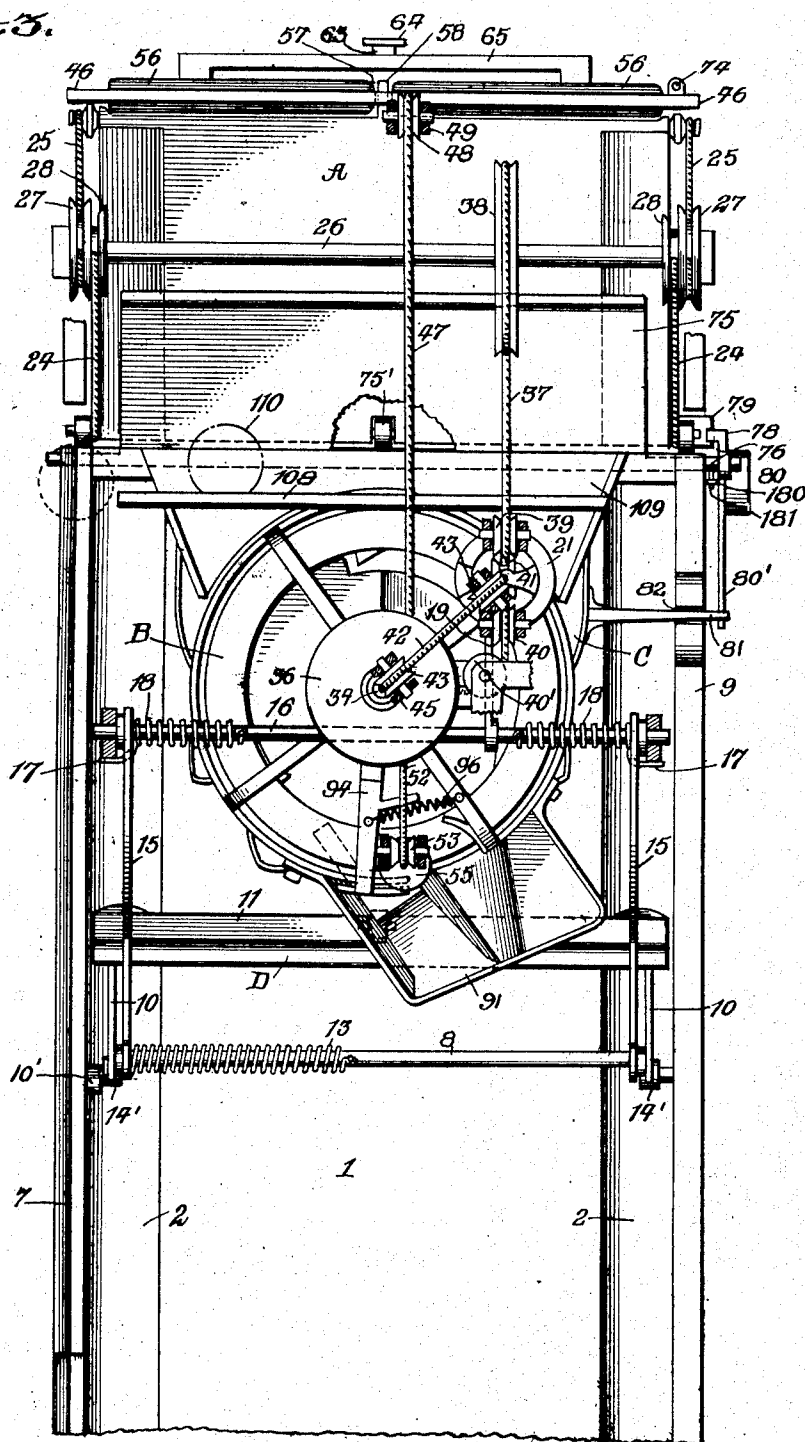
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PIN SETTING APPARATUS

Filed May 23, 1925

6 Sheets-Sheet 3

Fig. 3.



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1,590,124

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PIN SETTING APPARATUS

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6 Sheets-Sheet 4

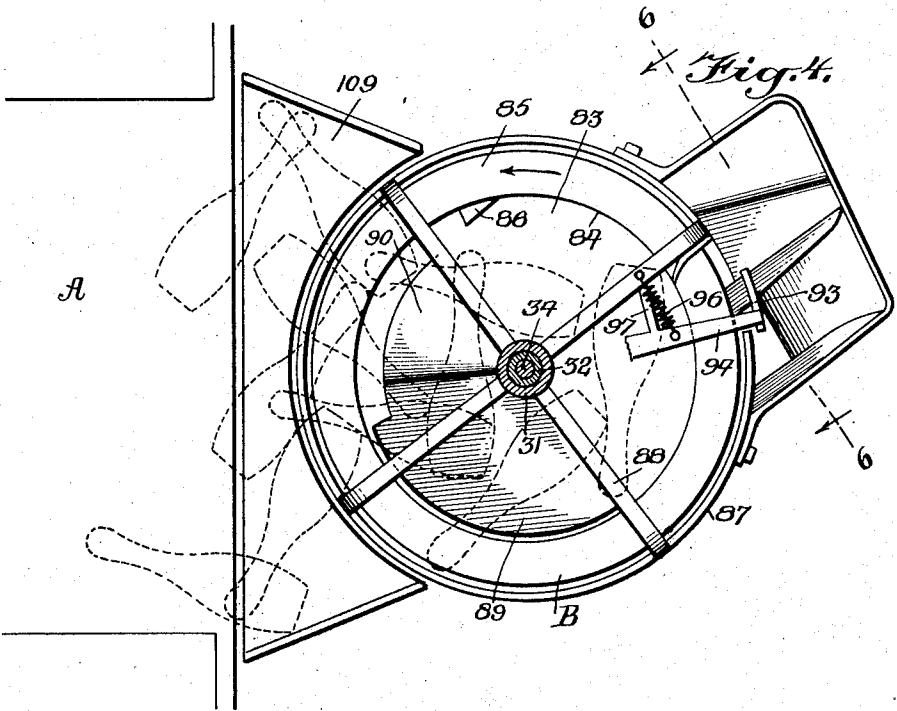


Fig. 5.

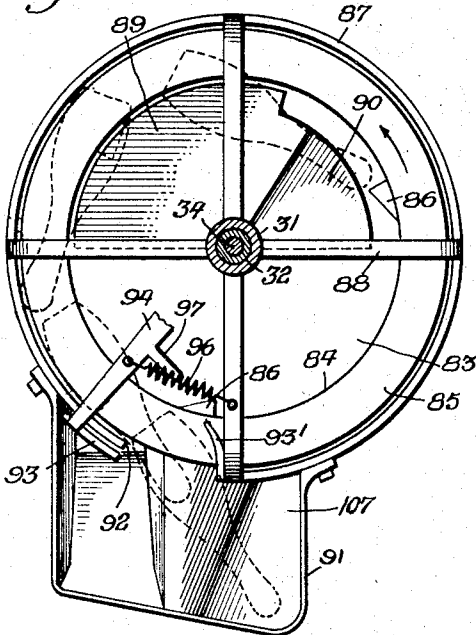
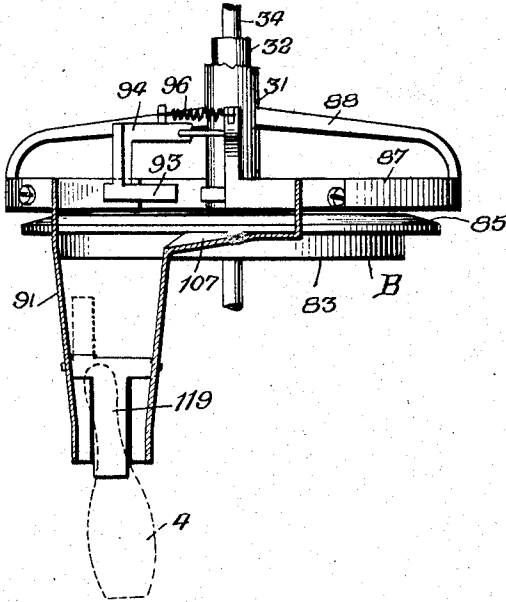


Fig. 6.



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1,590,124

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PIN SETTING APPARATUS

Filed May 23, 1925

6 Sheets-Sheet 5

Fig. 7.

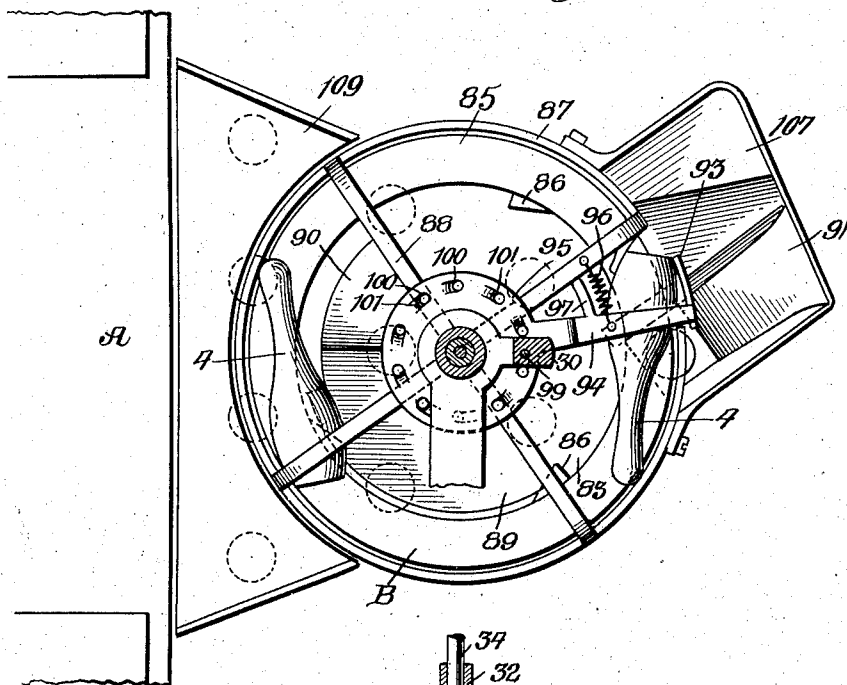
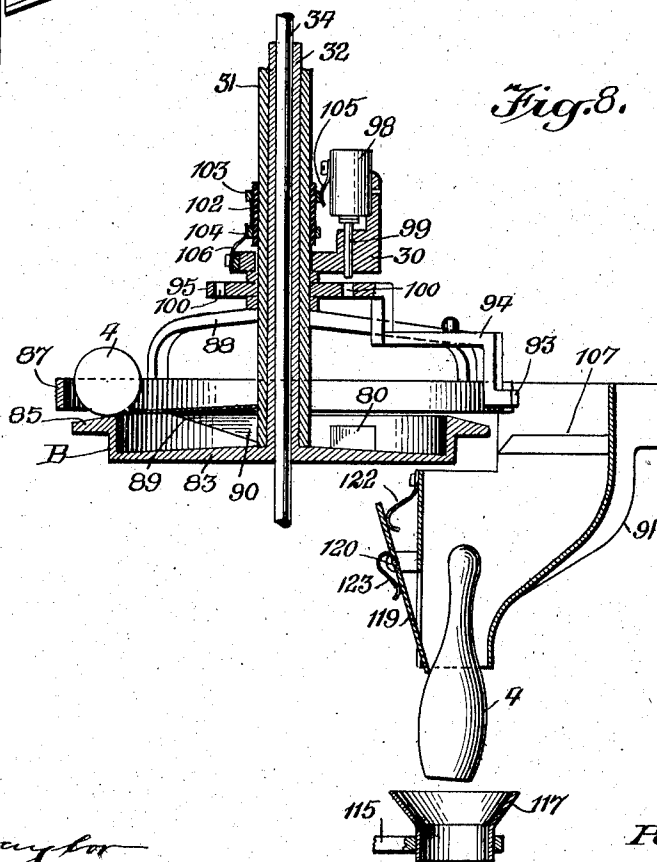


Fig. 8.



WITNESSES

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June 22 , 1926.

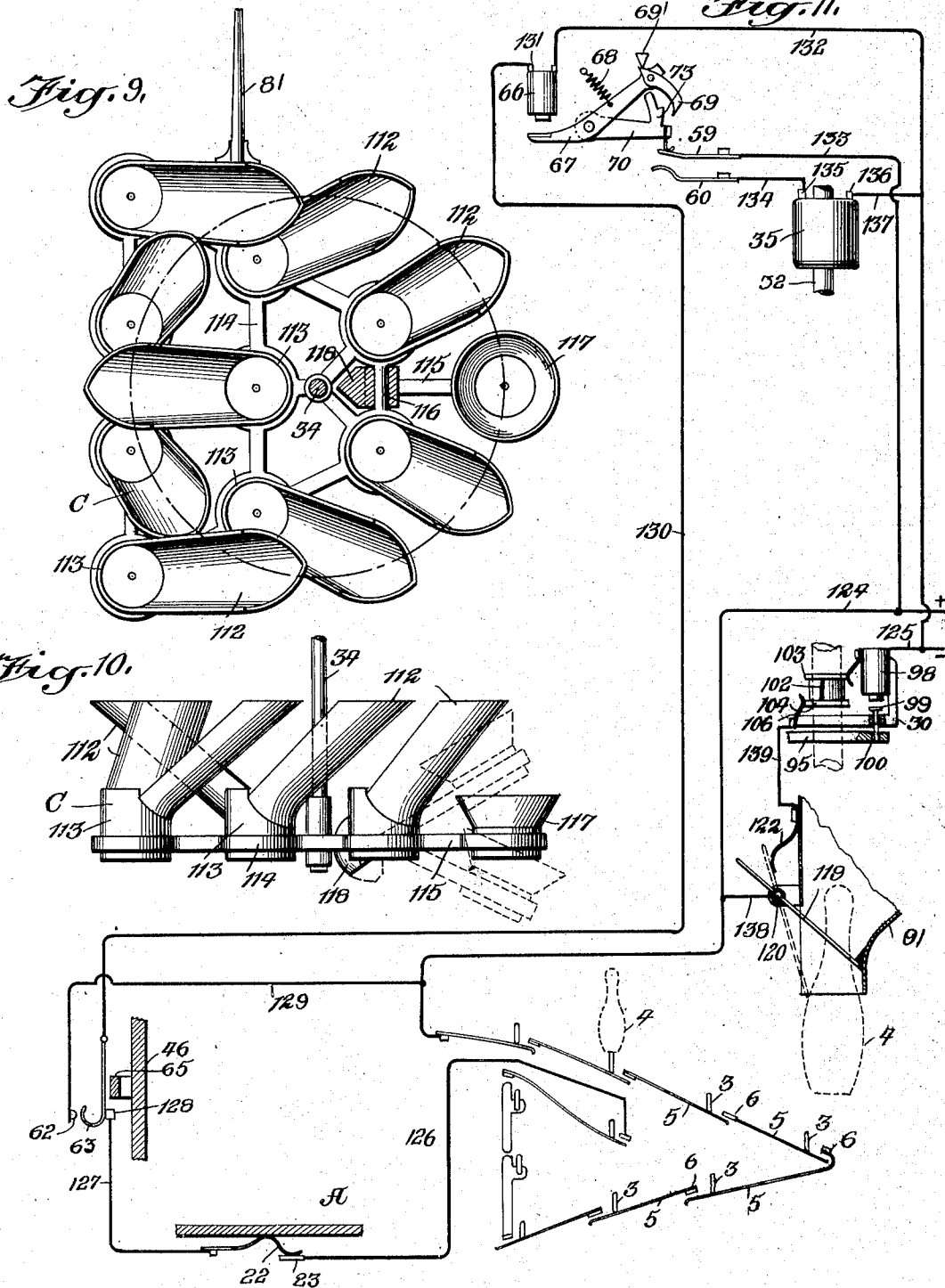
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PIN SETTING APPARATUS

Filed May 23, 1925

6 Sheets-Sheet 6



WITNESSES

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UNITED STATES PATENT OFFICE.

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PIN-SETTING APPARATUS.

Application filed May 23, 1925. Serial No. 32,476.

This invention relates to pin setting apparatus, an object of the invention being to provide an apparatus which will automatically set the pins of bowling alleys and the like, and I would have it understood that in the employment of the terms "pins" and "bowling alleys" I use these terms in their broadest possible sense to include large pins, duck pins, tenpins and other analogous devices.

A further object is to provide an apparatus which not only automatically and perfectly sets the pins but it returns the balls to the player, and in which the entire operation is automatically and electrically controlled.

A further object is to provide an apparatus of this character which will not interfere in any way with bowling or the playing of the game, which can be manufactured and sold at a reasonably low price and which will most perfectly perform the functions for which it is intended.

A further object is to provide an apparatus of this character which is entirely automatic and which dispenses altogether with the necessity for a boy to set up the pins and which reduces labor cost to a minimum.

With these and other objects in view, the invention consists in certain novel features of construction and combinations and arrangements of parts which will be more fully hereinafter described and pointed out in the claims.

In the accompanying drawings—

Figure 1 is a view mainly in longitudinal vertical section through the center of the apparatus, showing parts in elevation and parts broken away for the purpose of clearness;

Figure 2 is a view in front elevation, the bowling alley being shown in transverse section;

Figure 3 is a top plan view;

Figure 4 is a detail sectional plan view looking down upon the rotary pin receiving and delivering hopper;

Figure 5 is a view similar to Figure 4, showing the parts in different positions;

Figure 6 is a view in sectional elevation, taken on the line 6—6 of Figure 4;

Figure 7 is a view similar to Figure 4, the section being taken in a slightly higher plane and the parts being illustrated in a different position;

Figure 8 is a view in vertical longitudinal section, taken through the center of the hopper and adjacent parts;

Figure 9 is a sectional plan view of the pin guide ensemble C;

Figure 10 is a side elevation of Figure 9;

Figure 11 is a diagrammatic view illustrating the electric circuit and co-operating parts.

This invention embodies a series of co-operating and co-ordinating features which will be described in the following sequence: First, the general construction, then the wiping mechanism which clears the bowling alley of pins, and then the elevator which lifts the pins and balls, then the distributor, and then the pin guide ensemble, and afterwards a description of the circuits and electric control whereby the apparatus is rendered automatic.

In general.

Reference is had particularly to Figures 1 and 2 and 3 of the drawings. 1 represents a bowling alley having gutters 2 at the sides thereof. In this alley 1 vertically movable plungers 3 are provided which are adapted to be depressed by the weight of the tenpins 4 thereon, and are so positioned that when the tenpins are properly located on the alley all of these plungers 3 will be depressed. These plungers 3 project but slightly from the surface of the alley and are forced upwardly by spring contact members 5, which are arranged in series as indicated in Figure 11, so that when the pins have fallen or are removed these spring contacts 5 will engage fixed contacts 6 and close an electric circuit to be hereinafter described.

At the rear end of the alley 1 and in a plane below the upper surface of the alley my improved elevator A is located and receives the balls and pins as they are forced from the end of the alley. This elevator A is caused to move upwardly at the proper time and directs the pins onto my improved

distributor B, the rod 108 serving to direct the balls onto a return track 7 and the pins through a pin guide ensemble C above the alley. Any pins which remain on the alley after a play is ended are moved rearwardly off the alley by my improved wiping device D.

Wiping mechanism.

A shaft 8 is mounted in relatively long crank arms 15 located in advance of the pin spots, and on this shaft 8 a pair of relatively short crank arms 10 are loosely mounted and carry at their free ends a crossbar 11. Fixed stops 10' limit the forward and upward swinging movement of the free ends of the arms 10.

The bar 11 is adapted to wipe or move the pins from the alley 1 and also from the gutters 2 and is provided with a roller 12 which runs upon the alley and holds the edge of the bar 11 slightly above the surface of the alley so as to prevent injuring any of the plungers 3.

The shaft 8 above referred to has a coil spring 13 thereon which is secured at one end to the shaft and to at least one of the arms 10. The spring 13 is to partially counterbalance the weight of bar 10 and cushion its drop. This bar is held in its highest position, as indicated in Figure 1, by reason of the fact that fingers 14 are formed on the arms adjacent their pivots, and these fingers engage fixed stops 14' on the sides 9 of the alley.

The long crank arms 15 above referred to, at their upper ends are fixedly mounted on the shaft 16, and said shaft is supported in suitable fixed bearings 17. On this shaft 16 a pair of coil springs 18 is located and are secured at one end to the shaft and at their other ends connected to the bearings 17 in such a manner as to exert a forward swinging movement to the free ends of said arms and to hold the wiping mechanism in its set position, as indicated in Figure 1.

A crank arm 19 is secured to the shaft 16 and projects in a rearward direction in the path of movement of a bracket 20 on a weight 21 so that when this weight 21 is elevated it will move the crank arm 19 to the dotted line position shown in Figure 1, and will swing the lower ends of the crank arms 15 to the left of Figure 1, and as soon as these crank arms 15 move slightly to the left of Figure 1 the fingers 14 will be freed from contact with the stops 14' and the wiper bar 11 can drop to the dotted line position shown in Figure 1, and a continued rearward movement imparted to said bar will wipe all of the pins which may lie on the alley or in the gutters off of the end of the alley and onto the elevator A. The

springs 18 above described will return the wiper to its normal position, and the stops 14' will compel the wiper bar 11 to elevate as shown.

Elevator.

The elevator A when in lowered position normally maintains a spring contact member 22 in engagement with a fixed contact 23 by reason of the weight of the elevator on said movable contact 22. The elevator is lifted by four cables, two cables being located at each side of the elevator, the forward cables of each pair being given the reference numeral 24 and the rear cables the reference numeral 25.

I have referred to the cables 24 as "forward cables" because they are connected to the sides of the elevator A at its forward end, while the other cables 25 are connected to the sides of the elevator at its rear end.

A shaft 26 is supported at a suitable elevation above the elevator and on this shaft pulleys 27 and 28 are secured. The pulleys 27 have larger hubs and are of larger diameter than the pulleys 28, so that the pulleys 27 which receive and wind the rear cables 25 thereon are designed to impart a movement to the platform which will tilt the same. These cables 25, however, have weights 29 thereon which cause a slack in the cables.

Located above the alley and the space where the pins are to be set I provide a suitable fixed support or framework 30 in which an outer tubular shaft 31, an inner tubular shaft 32, and an inner rod 34 are mounted in nested formation, as illustrated clearly in Figure 1. The inner tubular shaft 32 constitutes a motorshaft which is driven by an electric motor 35, and on this motor shaft 32 a horizontally disposed pulley 36 is fixed. The motor 35 and the several shafts are supported in a fixed frame 35'.

A cable 37, which is wound at one end upon a relatively large pulley or drum 38 on shaft 26, is at its other end secured to and wound upon the pulley 36. This cable 37 between its ends is passed over a pair of idle pulleys 39 and 40, and between said pulleys 39 and 40 is looped downwardly and passed under a pulley 41 on the weight 21 above referred to. This weight 21 is also connected by a cable 42 with the upper end of rod 34 and is passed over a pair of idle pulleys 43 and 44 which have fixed mounting in suitable supports 45.

At the rear of the apparatus and especially in the rear of the elevator, a bumper board 46 is provided and constitutes a relatively heavy weight suspended from a cable 47 which runs over an idle pulley 48 mounted in a fixed support 49, and this

cable 47 then extends forwardly and horizontally and is secured to and adapted to be wound around a pulley 50 which is fixed to the outer tubular shaft 31.

5 A second pulley 51 is also secured to the tubular shaft 31 and has a cable 52 secured thereto and adapted to be wound thereon. This cable 52 extends forwardly over an idle pulley 53 mounted in a fixed support 54 and has a weight 55 thereon which tends to move downwardly and turn the shaft 31 in one direction and take up slack in the cable 47 when this bumper board 46 is elevated as will hereinafter appear.

15 A cushion 56 is located at the lower end of the bumper board to cushion the impact of the balls, and said bumper board is made with a longitudinal slot 57 in which a finger 58 on the elevator A rides during a portion of the upward movement of the elevator. When this finger 58 reaches the upper end of the slot 57 it will carry with it the bumper board for a purpose which will be hereinafter described.

25 The electric motor 35 is included in circuit with a pair of contacts 59 and 60 which are supported in a frame 61 located in a plane above the bumper board 46. The circuit between the motor 35 and the contacts 59, 60 also includes a pair of contacts 62 and 63, the last-named contact being a spring contact secured to a fixed mounting 64 and normally spaced from the contact 62. The contact 63 is in the path of movement of a projection 65 on the lower portion of bumper board 46 so that when a ball is thrown down the alley and falls onto the elevator A it will roll to the rear and force the lower end of the bumper board 46 rearwardly and cause contact 63 to engage contact 62.

40 An electromagnet 66 is included in the circuit with the contacts 62 and 63, and this electromagnet is supported on the frame 61 and operates to attract the shorter end of a lever 67. This lever 67 is held in normal position by a coil spring 68 and carries on its longer end a spring-pressed pawl 69 which is adapted to engage a pivoted arm 70 which is mounted on a short shaft 71. When the pawl is in its elevated position it engages a fixed stop 69' which causes its lower free end to swing outwardly as shown in Figures 1 and 11.

55 The shaft 71 also serves as a pivot for the lever 67 and it is to be understood that the arm 70 will have sufficient frictional engagement at its pivot point so that it will set in any position to which it is moved and must be forcibly moved from one position to another.

60 This arm 70 has a spring finger 72 which engages contact 59, but it is to be understood is insulated from the arm, or it may constitute an insulated member. A ratchet lug 73 is fixed on arm 70, and the pawl 69

functions at one operation of the lever 67 to move the arm 70 the desired distance but not far enough to bring the contacts 59 and 60 together.

70 Upon the second operation of the lever 67 the pawl 69 will engage the ratchet lug 73 and move said arm 70 a distance sufficient to bring the contacts 59 and 60 together to close the circuit to the motor and cause the elevator to be lifted. As the elevator rises 75 to the highest position a finger 58 on the elevator carries with it the bumper board 46 and on this bumper board a cushioned plunger 74 is mounted and this plunger engages the arm 70 and lifts it to its normal position, allowing contacts 59, 60 to separate, thus stopping the motor. Hence as it is necessary in most cases to use two balls, it requires two movements of the bumper board 46 and hence causes at least two energizings of the magnet 66 to bring the contacts 59 and 60 together. Should all of the pins 4 be knocked off of the alley by a single stroke in the making of a "strike" the contacts 5 will all spring upwardly, engaging the contacts 6 and also closing the circuit to the motor, as shown in the diagram of Figure 11, as will be hereinafter explained.

95 The elevator A is held normally in its lowered position and prevented from upward movement by means of a shutter 75 which has trunnions 76 thereon mounted in the framework of the apparatus. These trunnions 76 are at the lower portion of the shutter and the shutter is normally projected rearwardly, as shown in Figure 1, between the elevator space or shaft and the distributing and setting mechanism.

100 On one of the trunnions 76 an arm 77 is fixed and has an angularly shaped finger 78 at its free end which is normally positioned over a finger 79 on the elevator A to prevent the latter from upward movement. A weight 80 is provided on the arm 77 so as to properly counterbalance the weight of the shutter 75. This shutter 75 is also provided with a crank arm 80' which is loose on trunnion 76 and located in the path of movement of a finger 81 fixed to the pin guide ensemble C. The crank arm 80' has a lug 180 projecting at right angles thereof and normally positioned above a lug 181 projecting at right angles from the trunnion 76 so that when the arm 80' is swung downwardly the engagement of the lug 180 with lug 181 will cause the shutter to turn upwardly and toward the right; in Figure 1, and on the upward movement of the arm 81, the arm 80' is free to swing upwardly without turning the trunnion 76 by reason of the lug coupling connection 180 from 181. When said ensemble C is lowered the finger 81 will move through slot 82 in the side wall 9 of alley 1 and engage this crank 130

and move it and the arm 77 sufficiently to move the finger 78 out of the path of the finger 79 and allow the elevator to begin its upward movement. As this finger 81 continues to move downwardly it will ride off the end of the arm 80' and will not interfere with the further movement of the shutter 75. The engagement of the finger 81 with arm 80' stops the downward movement of the ensemble C long enough to allow the wiper to swing forwardly out of the way by the inertia of the whole shutter 75 and weight 80.

The operation of lifting the elevator is as follows:

The motor 35 imparts rotary motion to the pulley 36, winding the cable 37 thereon. As the cable winds on the pulley 36 it will first lift the weight 21 to operate the wiping mechanism above explained, and permit ensemble C to lower and cause the pulley 38 and shaft 26 to turn as the cable 37 is unwound from the pulley 38. This rotary motion imparted to the shaft 26 will turn the pulleys 27 and 28, exerting an upward pull on the cables 24 and 25. As the weights 29 cause a certain amount of slack in the cables 25, the forward end of the elevator A will be given an upward tip causing the pins and balls to roll to the rear of the elevator, this position being indicated by the dotted lines in Figure 1. When the slack is taken out of the cables 25 the pulleys 27 will cause these cables 25 to wind more rapidly than the cables 24, and as the elevator reaches its highest position it will be given an opposite tilt or angle, also illustrated in Figure 1, so that the pins will roll forwardly onto the distributor B. As the elevator moves to the highest position it will through the medium of the plunger 74 move the arm 70 and open the electric circuit to the motor so that the elevator can descend and during its descent will by reason of its weight cause the shaft 26 to turn, winding the cable 37 thereon and transmitting rotary motion to the motor shaft 32 in the opposite direction to which motion was imparted thereto by the motor. At the same time the bumper board 46 will lower of its own weight and cable 47 will impart rotary motion to the pulley 50 and to the tubular shaft 31, so that while shafts 32 and 31 are both turned in the same direction it will be understood that the shaft 32 is turned at a much higher speed than is the shaft 31, all for a purpose which will now be explained.

Distributor.

Particular reference is made to Figures 1, 2, 3, 4, 5, 6, 7 and 8. This distributor B includes a horizontally disposed circular hopper 83 having an annular flange 84 which supports at its upper edge an outwardly

and downwardly inclined flange 85. Fixed blocks 86 are located at the inner face of the flange 84 and function to engage the pins and compel them to move in the direction of the arrow indicated in Figures 4 and 5.

A ring 87 of larger diameter than the hopper is located in a plane slightly above the upper edge of the hopper and has a spider 88 connecting the same to the outer tubular shaft 31, and fixed to this outer shaft 31 is a platform 89 which is in substantially the same plane as the upper edge of the hopper, and has a downwardly tapering or sloping cam portion 90 at one end which permits the pins 4 to be forced onto said platform by the rotary movement of the hopper which has the blocks 86 thereon, and off of said platform into position to be discharged into a downwardly projecting chute 91 which is fixed to and carried by the ring 87, the latter having an opening or cut-out portion 92 through which the pins can move into the chute.

The passage of the pins through the opening 92 is controlled by a door 93 which is fixed to an arm 94, and this arm 94 is fixed to a disk 95 mounted to turn freely on the outer tubular shaft 31, as shown more clearly in Figures 7 and 8. A deflector 93' is located at one side of the opening 92 so as to properly guide the pins 4 into the chute 91.

The arm 94 is connected to one member of the spider 88 by a coil spring 96 tending to draw the arm toward said spider member, and a lug 97 on the arm 94 limits the movement in that direction, so that when the arm 94 is nearest to the spider arm to which it is connected, the opening 92 will be sufficiently closed to prevent any escape of the pin 4.

98 represents an electromagnet which is supported on the framework of the apparatus and which functions to attract a locking pin 99 which when released by the magnet drops by gravity into engagement with the disk 95. This disk 95 has a circular series of openings 100 to receive the pin 99 therein so as to lock the disk against movement, and it will be noted particularly by reference to Figure 7 that one wall of each opening 100 is beveled or tapered as shown at 101 so as to permit a ratchet connection between the locking pin 99 and the disk for a purpose which will more fully hereinafter appear.

A sleeve 102 is located on the outer tubular shaft 31 and carries a pair of electric contact rings 103 and 104, respectively. A brush 105 connects the magnet 98 with the ring 103, and a brush 106 connects the ring 104 with the frame of the machine. The electric circuit controlling this magnet will be explained later.

The chute 91 above referred to has a platform 107 at one side thereof, so that in the event the smaller, lighter ends of the pins 4 are presented to the chute, they will engage this platform 107 so that the weighted ends of the pins will be in the main portion of the chute and will fall downwardly in the right position. If the heavier ends of the pins are presented to the chute 91 they will fall directly down the main portion of the chute and will not engage the platform 107.

Above the distributor and secured to the fixed part of the frame of the apparatus is an inclined transverse rod 108 which is located above an inclined chute 109 down which the pins and balls are directed by elevator A when the latter is in its highest position. This rod 108 is at such an elevation that it will allow the pins to move under the same onto the distributor but is low enough to stop the balls, and as this chute 109 is inclined transversely of the apparatus, the balls indicated by the reference numeral 110 with roll transversely of the apparatus onto the return rail or guide 7, a bumper 111 being provided to stop the momentum of the balls laterally in the machine.

Pin guide ensemble.

Attention is particularly directed to Figures 1, 2, 8, 9 and 10. This pin guide ensemble C as a whole is secured to the lower end of the rod 34 above referred to and is lowered and raised by the cable 42 which is connected to the upper end of the rod 34 and to the weight 21. Hence, when the weight is elevated the ensemble C will be lowered and when the weight is lowered said ensemble will be elevated. When this ensemble is in operative position it is of course lowered, as indicated in dotted lines in Figure 2.

This pin guide ensemble comprises a series of pin guides 112 which carry at their lower ends guide rings 113 fixed thereto, and these parts are secured to a frame 114 which in turn is secured to the rod 34. An arm 115 is pivotally connected to a shaft 116 at the forward end of frame 114, and this arm carries at its forward end a guide ring 117 to guide the head pin in place.

The arm 115 in the rear of its pivot is made with a counterweight 118 which balances the weight of the ring 117 so as to maintain the arm normally horizontal but allow it to swing freely in order to permit a proper positioning of the parts.

It is of course to be understood that the several rings 113 are in vertical alinement with the pin spots indicated by the contact plungers 3 of alley 1, and that the ring 117 is adapted to guide the head pin into proper place. Furthermore, it is to be noted

that the lower end of the chute 91 turns in a path indicated by the dot and dash line in Figure 9 so that it drops one pin at a time into the respective chutes 112 and into the ring 117. The dropping of the pins is controlled by the door 93 and this door opens at exactly the time that the lower end of the chute 91 is above one of the chutes 112 or the ring 117. A pin is dropped at each of the ten stations in succession.

As above explained, the hopper 83 is operatively turned by the cable 37 due to the downward movement of the elevator A, while the ring 87 and the disk 95 which carries the door supporting arm 94 are caused to turn by the cable 47 due to the downward movement of the weighted bumper board 46, as this cable causes a turning movement of the pulley 50 on the outer tubular shaft 31.

Furthermore, the hopper 83 is directly driven by the downward movement of the elevator A so that this motion of the hopper is more or less continuous and is appreciably of greater speed than the turning movement of the ring 87 and disk 95.

Eleven pins are used as the blocks 86 cannot push a pin to the outlet but must have a pin ahead to be pushed by the pin behind. As the hopper revolves and brings a pin into position for dropping, the door 93 being open as shown in Figure 5, a pin is dropped through one of the guides 112 into place, and at this time the locking pin 99 is in one of the openings 100 in disk 95 so that the door is momentarily held open while the other parts are moving, thus permitting a wide opening for the escape of the pin.

As the pin falls through the chute 91 it engages a pivoted contact member 119 which is pivotally mounted between its ends on a bracket 120 on the outside of chute 91 and extends through a slot 121 in the wall of the chute so that it is in the path of movement of the dropping pins, and as each pin drops through the chute it causes this contact 119 to move into engagement with a fixed contact 122 on the wall of the chute and close an electric circuit to the magnet 98.

The magnet instantly attracts the locking pin 99, lifting it out of the opening 100 of disk 95, and spring 96 moves the door 93 to closed position. The magnet is instantly de-energized as the contact 119 is returned to its open circuited position by means of a spring 123, as shown in Figures 1 and 11.

The pin falls onto the disk 95 between two of the openings 100, as indicated in Figure 7, so that the disk turns with the other parts for a short distance, and then the pin drops into one of the openings 100 and holds the arm 94 while the ring moves forwardly and then again opens the door to allow a pin to drop into the next pin guide 112, and so on

until a pin is dropped down each of the pin guides 112 and through the ring 117, so that all the pins are properly set in the alley.

Circuits and electric control.

Attention is particularly directed to Figure 11. 124 and 125 represent the plus and minus conductors connected with any desired source of electricity. The conductor 124 is connected in series with the contacts 5, 6 controlled by the plungers 3 in the alley 1, and these plungers are moved downwardly when a pin 4 is thereon so as to open the circuit and allow the circuit to close when the weight of the pins is removed.

This series of contacts 5 and 6 are connected by a conductor 126 with contact 23. Contact 22 which is controlled by the movement of elevator A is connected by a conductor 127 with a fixed contact 128 with which the contact 63 is normally in engagement, and opens when the elevator rises so as to save electric current. The contact 63 is moved by the bumper board 46 into engagement with the fixed contact 62, and this contact 62 is connected by conductor 129 with conductor 124. The contact 63 is connected by a conductor 130 with one pole 131 of electromagnet 66. The other pole of the electromagnet 66 is connected by a conductor 132 with conductor 125. The contact 59 is connected by a conductor 133 with conductor 124. Conductor 134 connects contact 60 with one pole 135 of electric motor 35. The other pole 136 of said electric motor is connected by a conductor 137 with conductor 132.

The operation is as follows:

Assuming the pins to be properly set on the alley 1, the player throws a ball 110, and if this ball knocks down all of the pins, making what is known as a "strike" all of the contacts 5 and 6 will close a circuit as follows: from conductor 124, through the series of contacts 5 and 6, through conductor 126, contacts 23 and 22, conductor 127, contacts 128, conductor 63, conductor 130, to energize electromagnet 66, but just previous to this the ball, due to its speed, will strike the bumper board 46 and close the circuit between contacts 63 and 62, momentarily to energize magnet 66, so that the arm 67 will be given two quick movements, as above explained, to bring the contacts 59 and 60 together to start the motor 35. If the first ball does not knock down all of the pins the contact of the ball with the bumper board 46 will close contact 63 and energize magnet 66 to give the arm 67 one movement which is not sufficient to close the contacts 59 and 60, a second movement being required to complete the operation. When a strike is made the closing of the contacts 5 and 6 gives the necessary second impulse to magnet 66.

The circuit including the contact 63 is first broken, then closed, so that two impulses are given the magnet.

The electromagnet 98 which controls the movement of the locking pin 99, as above explained, is operated by the dropping of a pin 4 from the chute 91 which causes the contact 119 to engage contact 122 and closes a circuit which includes a conductor 138 connected to conductor 124, with a conductor 139 connecting contact 122 with contact 106.

When the circuit is closed to motor 35, as above explained, pulley 36 begins to turn and, due to the slack in cable 37, the first operation is to elevate the weight 21. The weight moves the arm 19 and the entire wiping mechanism, as above explained, to push any pins from the alley onto the elevator A before the latter begins to rise. As the weight is hung on the loose cable it can ride past the arm 19 as it moves downwardly and assume its normal position under the arm. By the time all of the pins are on the elevator, the latter will begin to move upwardly due to the fact that the cable 37 is wound on the pulley 36.

The elevator first assumes a tilt to throw the pins rearwardly, and as it reaches its uppermost position will have an opposite incline to throw the pins and balls forwardly, as above explained, and deposit the pins on the distributor, the balls being deflected laterally by the rod 108. As the weight 21 moves upwardly to permit the pin guide ensemble to lower to the dotted line position shown in Figure 2, and as above explained, the bumper board 46 is carried upwardly with the elevator, the weight 55 exerting a counterbalancing action and taking up any slack which may exist in the cable and give the reverse movement to the ring frame 87.

The downward movement of the elevator controls the operation of distributing the pins, and the downward movement of the bumper board 46 controls the movement of the door 93, so that each pin is dropped at the proper time into one of the guides 112 or 117 so that the pins will fall and remain upright directly above the plungers 3, and by reason of their weight will move the plungers downwardly to open the circuit.

As the elevator moves upwardly, a roller 75' on the elevator engages the shutter 75 to swing the same forwardly out of the way. The downward movement of the elevator will throw this shutter 75 downwardly in an arc of a circle, indicated by the dot and dash line in Figure 1, so that it will be out of the way of the movement of the distributor chute 91, and will return to the normal position shown in Figure 1 after the elevator has passed due to the weight 80.

While I have used the term "cables" I

would have it understood that I employ this term in its broadest sense possible to include any flexible connecting device which may be utilized for the purpose.

5 Various slight changes and alterations might be made in the general form of the parts described without departing from my invention, and hence I do not limit myself to the precise details set forth but consider
10 myself at liberty to make such slight changes and alterations as fairly fall within the spirit and scope of the appended claims.

I claim:

1. An automatic pin setting apparatus of
15 the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, and an electric motor for lifting the elevator included in the circuit which is controlled by
20 the position of the pins.

2. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, and an
25 electric motor for lifting the elevator, the circuit to said motor being controlled by the action of the balls thrown by the player.

3. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a movable
30 bumper board in the rear of the elevator, a motor for lifting the elevator, and electric contacts included in a motor circuit closed by the movement of the board.

4. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a movable
40 bumper board in the rear of the elevator, and means compelling the bumper board and the elevator to move together for a predetermined distance.

5. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a motor for lifting the elevator, an electromagnet included in circuit with the motor, a bumper
50 board controlling the closing of said circuit, and a circuit closing means in said motor circuit requiring two operations of the magnet to close the circuit to the motor.

6. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, and means causing the elevator to tilt in opposite directions during its upward travel.

7. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, and a cable
65 operated by the motor to lift the elevator,

said cable being operated by the weight of the elevator in its descent to transmit motion to the distributor.

8. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a vertically movable pin guide ensemble below the distributor, and a cable operated by the motor to
70 lift the elevator, said cable being operated by the weight of the elevator in its descent to transmit motion to the distributor.

9. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, an electric motor for lifting the elevator included in the circuit which is controlled by the position of the pins, and a cable operated by the motor to lift the elevator said cable being
80 operated by the weight of the elevator in its descent to transmit motion to the distributor.

10. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, an electric motor for lifting the elevator, the circuit to said motor being controlled by the action of the balls thrown by the player, and a cable operated by the motor to lift the elevator said cable being operated by the weight of the elevator in its descent to
85 transmit motion to the distributor.

11. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pin on the distributor, a vertically movable pin guide ensemble below the distributor raised and lowered during the movements of the elevator, and a cable operated by the motor to lift the elevator said cable being operated by the weight of the elevator in its descent to transmit motion to the distributor.

12. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a wiper adapted to force the pins onto the elevator, and a cable operated by the motor to lift the elevator, said cable being operated by the weight of the elevator in its descent to transmit motion to the distributor.

13. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a movable bumper in the rear of the elevator, a motor for lifting the elevator, electric contacts included in the motor circuit closed by the movement of the board, and a cable
130

operated by the motor to lift the elevator, said cable being operated by the weight of the elevator in its descent to transmit motion to the distributor.

14. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a movable bumper board in the rear of the elevator, means compelling the bumper board and the elevator to move together for a predetermined distance, and a cable operated by the motor to lift the elevator, said cable being operated by the weight of the elevator in its descent to transmit motion to the distributor.

15. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a motor for lifting the elevator, an electromagnet included in circuit with the motor, a bumper board controlling the operation of said contacts, a circuit closing means in said motor circuit requiring two operations of the magnet to close the circuit to the motor, and a cable operated by the motor to lift the elevator, said cable being operated by the weight of the elevator in its descent to transmit motion to the distributor.

16. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, means causing the elevator to tilt in opposite directions during its upward travel, and a cable operated by the motor to lift the elevator, and said cable being operated by the weight of the elevator in its descent to transmit motion to the distributor.

17. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

18. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a vertically movable pin guide ensemble below the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

19. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, an electric motor for lifting the elevator included in the circuit which is controlled by the po-

sition of the pins, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

20. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, an electric motor for lifting the elevator, the circuit to said motor being controlled by the action of the balls thrown by the player, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

21. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a vertically movable guide pin ensemble below the distributor raised and lowered during the movements of the elevator, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

22. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a wiper adapted to force the pins onto the elevator, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

23. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a movable bumper in the rear of the elevator, a motor for lifting the elevator, electric contacts included in the motor circuit closed by the movement of the board, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

24. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a movable bumper board in the rear of the elevator, means compelling the bumper board and the elevator to move together for a predetermined distance, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

25. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a motor for lifting the elevator, an electromagnet included in circuit with the motor, a bumper board controlling the closing of said circuit, a circuit closing means in said motor

circuit requiring two operations of the magnet to close the circuit to the motor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

26. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, means causing the elevator to tilt in opposite directions during its upward travel, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

27. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in its descent to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

28. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a vertically movable pin guide ensemble below the distributor, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control the operation of the door.

29. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, an electric motor for lifting the elevator included in the circuit which is controlled by the position of the pins, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of a pin to control operation of the door.

30. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, an electric motor for lifting the elevator, the circuit to said motor being controlled by the action of the balls thrown by the player, a cable operated by the motor to lift the elevator, said

cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of the pin to control the operation of the door.

31. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a vertically movable pin guide ensemble below the distributor raised and lowered during the movements of the elevator, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of the pin to control the operation of the door.

32. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a wiper adapted to force the pins onto the elevator, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of the pin to control the operation of the door.

33. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a movable bumper in the rear of the elevator, a motor for lifting the elevator, electric contacts included in the motor circuit closed by the movement of the board, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of the pin to control the operation of the door.

34. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a movable bumper board in the rear of the elevator, means compelling the bumper board and the elevator to move together for a predetermined distance, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a

pin from the distributor, and electrical means controlled by the dropping of the pin to control the operation of the door.

35. An automatic pin setting apparatus of the character described, including a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a motor for lifting the elevator, an electromagnet included in circuit with the motor, a bumper board controlling the closing of said circuit, a circuit closing means in said motor circuit requiring two operations of the magnet to close the circuit to the motor, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of the pin to control the operation of the door.

36. An automatic pin setting apparatus of the character described, including a pin distributor, a motor operating the pin distributor, an elevator adapted to lift and deposit the pins on the distributor, means causing the elevator to tilt in opposite directions during its upward travel, a cable operated by the motor to lift the elevator, said cable operating by the weight of the elevator in the descent of the latter to transmit rotary motion to the distributor, a door controlling the exit of a pin from the distributor, and electrical means controlled by the dropping of the pin to control the operation of the door.

37. An apparatus of the character described, comprising a pin guide ensemble having a guide above each pin spot of the alley, a rotary distributor above the pin guide ensemble, a chute on the distributor adapted to drop a pin in each guide, an automatically operated door controlling the outlet of pins from the distributor, and means in the chute compelling all pins to fall with their heavy ends downward.

38. An apparatus of the character described, comprising a pin guide ensemble having a guide above each pin spot of the alley, a rotary distributor above the pin guide ensemble, a chute on the distributor adapted to drop a pin in each guide, an automatically operated door controlling the outlet of the pins from the distributor, means in the chute compelling all pins to fall with their heavy ends downward, an elevator adapted to receive the pins and balls, an electric motor for lifting the elevator, a chute onto which the elevator deposits the

pins and balls, the pins falling onto the distributor, and a rod deflecting the balls laterally onto their return drive.

39. An apparatus of the character described, comprising a pin guide ensemble having a guide above each pin spot of the alley, a rotary distributor above the pin guide ensemble, a chute on the distributor adapted to drop a pin in each guide, an automatically operated door controlling the outlet of pins from the distributor, means in the chute compelling the pins to fall with their heavy ends downward, an elevator adapted to receive the pins and balls, an electric motor for lifting the elevator, a chute onto which the elevator deposits the pins and balls, the pins falling onto the distributor, a rod deflecting the balls laterally onto their return drive, and vertically movable plungers in the alley representing pin spots and controlling a circuit to the motor, said plungers normally disposed by the weight of the pins thereon.

40. An automatic pin setting apparatus of the character described, comprising a pin distributor, an elevator adapted to lift and deposit the pins on the distributor, a cable operatively connecting the elevator and the distributor whereby the downward movement of the elevator through the medium of the cable imparts rotary movement to the distributor, a ring frame having a pin outlet therein, a gate adapted to control said outlet, a bumper board movable vertically by the elevator, and a cable operatively connecting the bumper board and the ring frame whereby the downward movement of the bumper board imparts turning movement to the ring frame.

41. An automatic pin setting apparatus of the character described, comprising a pin distributor, an elevator adapted to lift and deposit pins on the distributor, a cable operatively connecting the elevator and the distributor whereby downward movement of the elevator through the medium of the cable imparts rotary movement to the distributor, a ring frame having a pin outlet therein, a gate adapted to control said outlet, a bumper board movable vertically by the elevator, a cable operatively connecting the bumper board and the ring frame whereby the downward movement of the bumper board imparts turning movement to the ring frame, a weight, and a cable operatively connected to the ring frame whereby the downward movement of the weight imparts a reverse movement to the ring frame.

PEDRO ROBLE.