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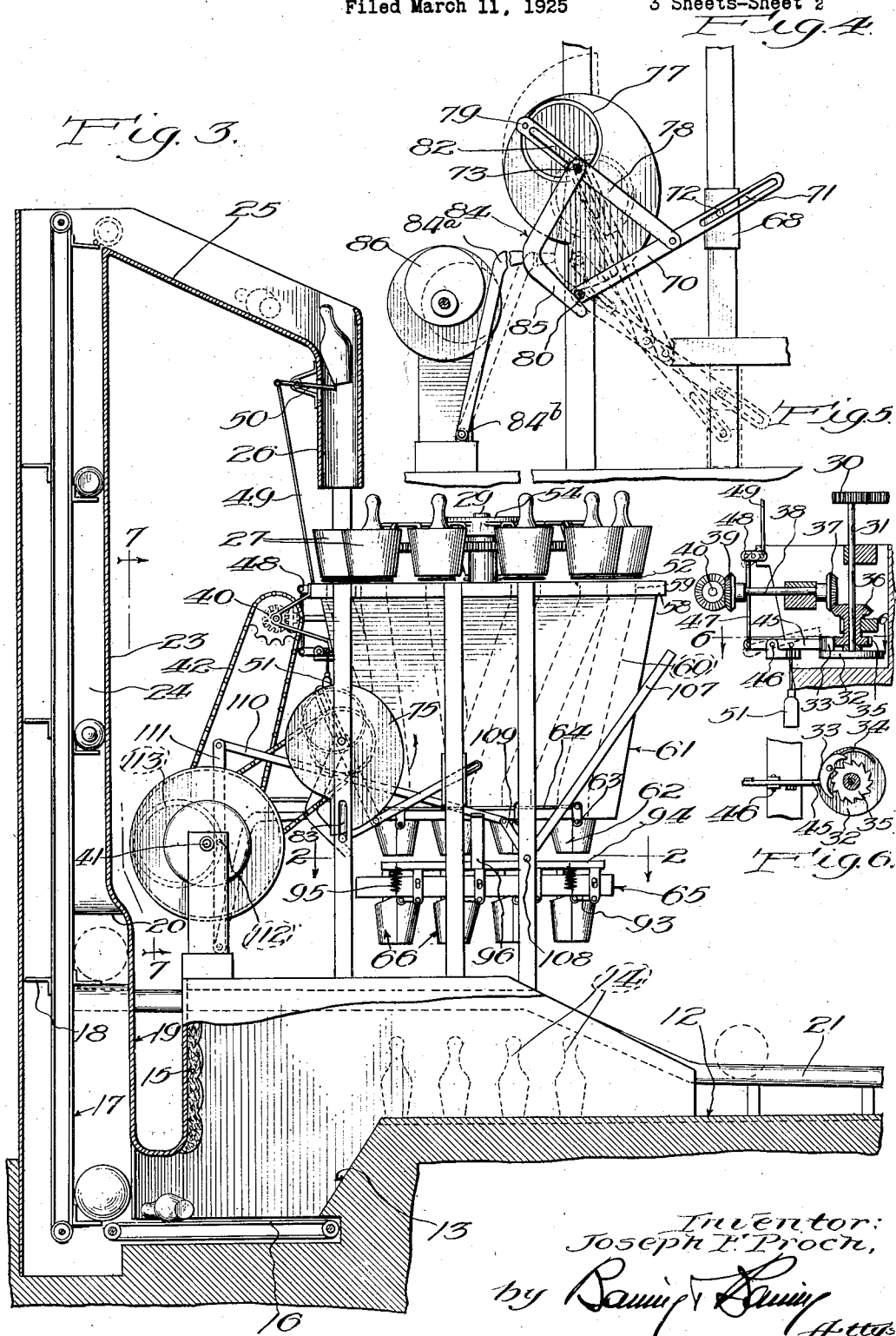
1,573,643

J. F. PROCH

BOWLING MACHINE

Filed March 11, 1925

3 Sheets-Sheet 2



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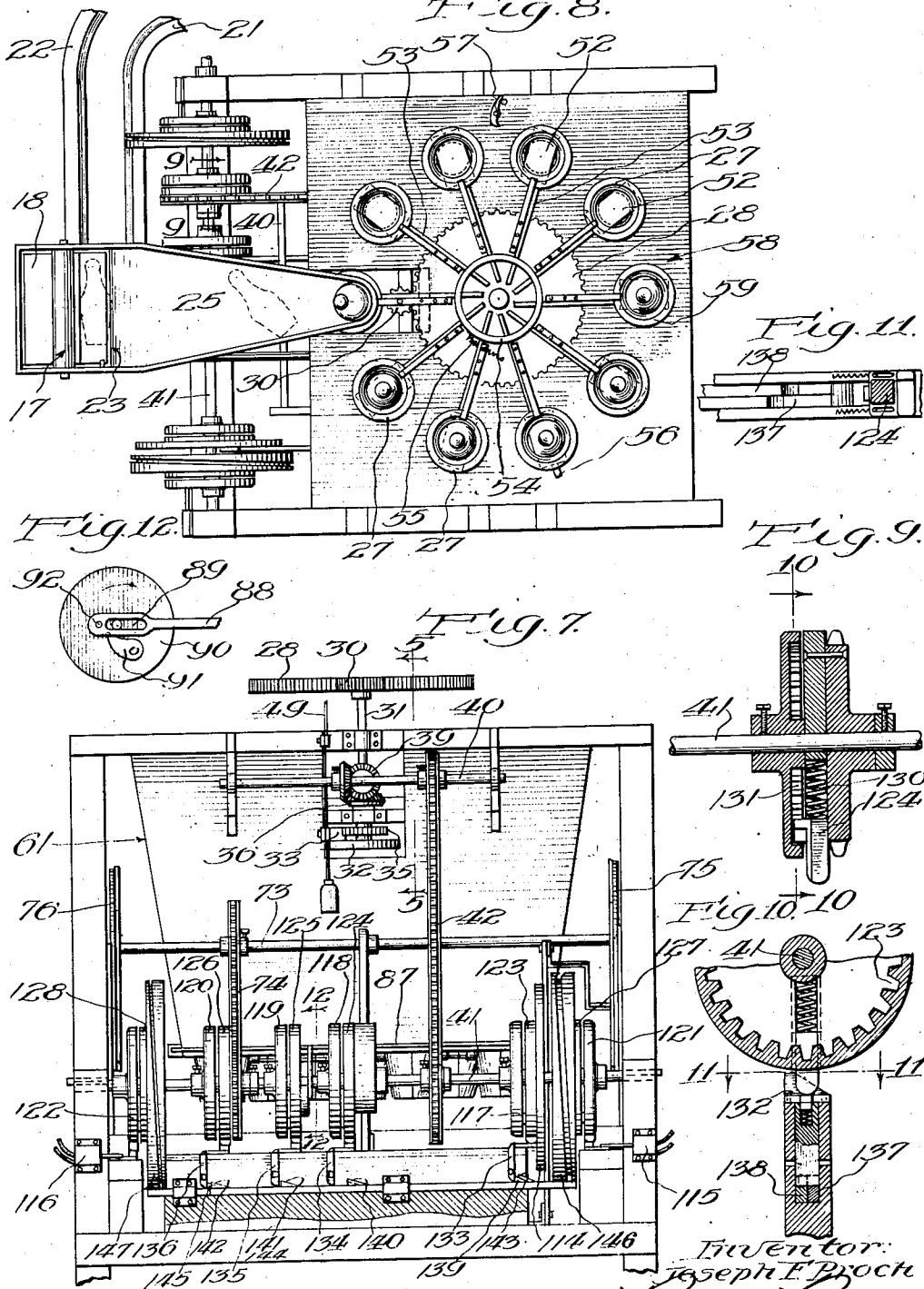
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J. F. PROCH
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3 Sheets-Sheet 3



Inventor:
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Patented Feb. 16, 1926.

1,573,643

UNITED STATES PATENT OFFICE.

JOSEPH F. PROCH, OF CHICAGO, ILLINOIS.

BOWLING MACHINE.

Application filed March 11, 1925. Serial No. 14,665.

To all whom it may concern:

Be it known that I, JOSEPH F. PROCH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Bowling Machines, of which the following is a specification.

This invention has to do with certain improvements in automatic machines for the operation of bowling alleys. The machine herein disclosed is so constructed that it will automatically remove the balls and pins from the pit of the alley and return the balls to the front end. It is also so arranged that the pins so removed from the pit may be automatically "framed." Mechanism is also provided whereby the device may be so operated as to reset the entire number of pins in a new "frame," as after a "strike," or may be so operated as to remove from the alley any down pins and reset the standing pins for another shot, as in the case of a "spare."

In connection with the above, it will be understood that in operating a bowling alley if the bowler knocks down all of the pins on the first ball this is known as a "strike;" whereas, if he knocks down only a portion of the pins leaving the other pins standing, so that he is entitled to roll another ball, this is known as a "spare." In the case of a strike it is necessary for the machine to remove all of the down pins and reset them in the proper fashion for a new frame, whereas in the case of a spare only the down pins are to be removed, the standing pins remaining in their respective positions or being returned to such positions preparatory to the second ball. The main object of the present invention is to provide means for accomplishing the results and operations above explained; and a further object is to accomplish said results selectively at the wish of the operator. This will make it possible for the operator to control the mechanism according to the conditions as they exist.

A further object of the invention is to provide an arrangement such that the various operations may be readily controlled from a distance, as, for example, from a position at the front end of the alley.

A further object of the invention is to provide a mechanism which shall be relatively simple in construction and which can be cheaply built and installed. In connection

with the foregoing it is a further object to provide an arrangement of rugged type and which will not readily get out of order.

Other objects and uses of the invention will appear from a detailed description of the same, which consists in the features of construction and combinations of parts hereinafter described and claimed.

In the drawings:

Figure 1 shows a front elevation of a machine embodying the features of the present invention;

Fig. 2 shows a fragmentary horizontal section on the line 2—2 of Fig. 3, looking in the direction of the arrows;

Fig. 3 shows a side elevation corresponding to Fig. 1, a portion of the machine being shown in section;

Fig. 4 shows a fragmentary detail view of the selector mechanism whereby the movements of the frame are controlled, the same being on enlarged scale as compared to Figs. 1 and 2, and may also be considered a section on the line 4—4 of Fig. 1, looking in the direction of the arrows.

Fig. 5 shows a fragmentary detail view of the tripping mechanism for controlling the periodic advancements of the turn table and cups, on enlarged scale as compared to Figs. 1, 2 and 7, and may also be considered as a section on the line 5—5 of Fig. 7, looking in the direction of the arrows;

Fig. 6 shows a fragmentary view of the clutch pawl of the construction shown in Fig. 5, being a section on the line 6—6 of Fig. 5, looking in the direction of the arrows;

Fig. 7 shows a back view of the operating mechanism, being a fragmentary section on the line 7—7 of Fig. 3, looking in the direction of the arrows;

Fig. 8 shows a plan view corresponding to Figs. 1 and 3;

Fig. 9 shows a typical section through one of the operating clutches illustrated in Figs. 7 and 8, being a section on the line 9—9 of Fig. 8, looking in the direction of the arrows and on enlarged scale;

Fig. 10 shows a section on the line 10—10 of Fig. 9, looking in the direction of the arrows;

Fig. 11 is a fragmentary horizontal section on the line 11—11 of Fig. 10, looking in the direction of the arrows; and

Fig. 12 is a detail side face view of one of

the cams, being a section on the line 12—12 of Fig. 7, looking in the direction of the arrows.

The rear end of the bowling alley is shown at 12 in Figs. 1 and 3. The pit 13 is provided to receive the bowling pins 14 as they are swept or knocked rearwardly. A padded rear end 15 may be provided against which the pins and balls strike in the usual manner.

The floor of the pit is provided with a conveyor or the like 16, preferably in the form of a belt traveling over suitable rollers. The top side of this conveyor moves towards the rear, and any pins or balls resting thereon will be carried rearwardly.

At the rear end of the pit is a vertical conveyor 17 working over pulleys at its upper and lower ends. This vertical conveyor is provided with a series of outwardly reaching arms 18 which travel close to the rear end of the horizontal conveyor 16 as they swing around the lower vertical conveyor pulley. The balls and pins delivered at the rear end of the conveyor 16 to these arms 18 are carried up within a shaft established by a front wall 19. The lower portion of this shaft is of enlarged size to accommodate the balls, as indicated in Fig. 3.

Near the upper end of this enlarged portion there is a side delivery opening 20 through which the balls are delivered sideways onto the rails 21 and 22, said rails sloping downwardly towards the front end of the alley, so that the balls will run down to the front end by gravity.

The upper portion 23 of the wall 19 establishes a passage 24 of proper size to accommodate the pins lying on the arms 18, so that said pins will be carried up and delivered onto a chute 25 at the upper end of the device. The rear end of said chute is of sufficient width to accommodate the length of the pins as indicated in Fig. 8, but the chute tapers in size towards its front end, so that the pins will be straightened around as they roll down to the delivery opening at the front end of the chute. This will be easily understood from Figures 1, 3 and 8.

The front end of the chute terminates in a vertical slide 26 through which the pins are delivered. Provision is made for moving a series of cups 27 past the lower end of the slide 26. For this purpose said cups are carried by radial arms reaching outwardly from a central wheel 28 mounted on the spindle 29. Said wheel 28 is preferably a gear wheel and driven by a pinion 30 on the upper end of a drive shaft 31, as shown in Figs 5, 6, 7 and 8. The lower end of this drive shaft carries a disk 32 having a dog 33 pivoted thereon. The tooth of this dog is normally thrown inwardly by a spring 34 on the disk. When so moved it engages a ratchet wheel 35 on the lower end of a collar

surrounding the shaft 31, the upper end of said collar carrying a bevel gear 36. This gear meshes with another bevel gear 37 on a short horizontal shaft 38 which in turn is driven by a pair of bevel gears 39 from a jack shaft 40. This jack shaft in turn receives its power from the main drive shaft 41 by means of a chain 42 and suitable sprockets. The main drive shaft 41 is in turn driven by a motor 43 through the medium of a chain 44 and suitable sprockets.

A finger 45 is pivoted to a stationary part at the point 46. The rear end of said finger is in turn connected by a link 47 with a short rock arm 48, the other end of said rock arm being connected by a link 49 with a plate 50 which is pivoted to a stationary part and reaches through a slot in the delivery slide 26 to a point where the inner end of said plate will be tripped each time a pin falls down through the delivery slide. A weight 51 on the link 47 tends to restore the finger 45 to the full line position, so that the plate 50 normally stands in the position indicated in Fig. 3. After the pin has passed, the plate will move back to the position in Fig. 3.

Upon the passage of a pin down through the slide the plate 50 is swung down so as to raise the link 49, thus turning the arm 48 into the dotted line position and raising the finger 45 into the dotted line position of Fig. 5. Immediately that this takes place the tooth of the pawl 33 will be swung over to engage the ratchet 35 and by reason of the continuous rotation of said ratchet, the pawl will be engaged and the disk 32 compelled to rotate. This will drive the shaft 31 and the gear 28 so as to move the turn table around and bring an empty cup into place beneath the lower end of the delivery slide 26.

The instant the pin passes the finger 50 the finger 45 will drop back into the full line position of Fig. 5, so that towards the completion of the revolution of the disk 32, the pawl 33 will be engaged and swung into the position of Fig. 6 so as to disengage from the ratchet wheel 35. Accordingly, the disk 32 will make only one revolution which is the proper amount to bring a new cup into place beneath the delivery slide 26.

Beneath each cup is a plate 52 by means of which the pin therein is normally sustained. These plates 52 are carried by radial arms 53 on a hub 54 which is above the gear wheel 28. A spring 55 connects the hub and gear wheel together and tends to turn the hub into such a position that the plates 52 stand beneath their respective cups. Upon retarding the plates and hub with respect to the gear wheel when the latter is turned, the lower ends of all of the cups will be uncovered, so that they can discharge their respective pins directly down.

For this purpose, one of the cups is provided with a lug 56 which normally engages a stop finger 57 at the completion of one complete turn of the gear wheel, namely, 5 ten pins.

Beneath the cups and associated mechanism is a table 58 having the openings 59 which are directly beneath the stopped positions of the cups. A series of chutes, shown 10 by dotted lines 60 in Figs. 1, 3 and 7, lead downwardly through a box-like structure 61 to a series of collars 62 at their lower ends. These collars 62 each comprise a fixed back semi-circular section and a swinging 15 front semi-circular companion section. The different collars are arranged in rows across the box-like structure 61 corresponding in position to the "frame" positions which the pins are intended to occupy 20 when set up. The chutes 60 are, therefore, correspondingly twisted or curved as they extend down through the box-like structure.

The front swinging sections of the collars 62 are carried by rock shafts 63 and 25 said rock shafts are in turn provided with cranks connected together by a link 64 reaching to the rear side of the box-like structure. Upon drawing this link 64 to the rear, the front sections of all of the 30 collars will be swung forward so as to release the pins and allow them to drop down into the frame.

In connection with the above it will be understood that the various collars are so 35 shaped and of such size that the various pins will be properly sustained within them when the collars are closed.

Beneath the positions of the collars there is a frame 65 which is so mounted that it 40 can be raised and lowered with respect to the collars 62 and the rear end of the alley. This frame is in turn provided with collars 66 corresponding in position to the collars 62 and the desired "frame" positions 45 of the pins. This frame is provided with a cross bar 67 (see Fig. 2) having the sleeves 68 which are slidably mounted on the guide posts 69. Said sleeves serve to keep the frame in a horizontal position as it moves 50 up and down.

The frame has three definite positions: A fully raised position, a partially lowered position and a fully lowered position. In the raised position the frame collars come 55 close beneath the fixed collars 62; in the fully lowered position the frame collars come close to the floor of the alley, so that the pins will be set in the proper manner; and in the partially lowered position the frame collars move down only far enough 60 to take hold of the upper neck portions of the standing pins. This condition is desired, for example, in the case of a "spare" where it is desired to lift the standing pins 65 away from the floor of the alley, so that

the fallen pins may be swept into the pit, the frame being afterwards lowered so as to restore the standing pins to their respective positions.

In order to secure the above possible 70 movements of the frame, I have provided suitable mechanism which I will now explain. For this purpose an arm 70 is provided for each of the sleeves 68. The outer 75 portion of said arm is slotted as at 71 to receive a pin 72 on the sleeve. A shaft 73 reaches across the machine at a position behind the box-like structure 61, said shaft being provided with a sprocket which can be driven by a chain 74. On the ends of 80 this shaft are located the cam blocks 75 and 76 adjacent to the arms 70. Each of these cam blocks has on its inner face a circular eccentrically placed slot 77. A link 78 has at its outer end a pin 79 engaging the slot 85 77, the inner end of said link being connected to the arm 70, already referred to. The back ends of the arms 70 are joined together by a rod 80, so that they work in harmony. Extending across the back part 90 of the machine above the position of the rod 80 is the shaft 73 which enters the slots 82 in the links 78 so as to guide said links in their movements. With the above arrangement the rotation of the cam blocks 75 95 and 76 will cause the links 78 to be projected down and then up so as to rock the arms 70 with a peculiar movement depending upon the position of the cross bar 80.

Furthermore, the extent of the lowering 100 movement of the sleeves 68 thus brought about will depend upon the elevation of the bar 80, the sleeves being projected lower down when the cross bar 80 is raised into 105 the dotted line position of Fig. 4. The ends of said cross bar 80 travel in slots 83 of upright frame members, as indicated in Fig. 3. Furthermore, the cam blocks 75 and 76 are peculiarly shaped and their edges 110 work against the bar 80 so as to either hold it in the lowermost position, illustrated in Figs. 3 and 4, or to allow it to rise to the top ends of the slots 83 as will be evident from the shape of the cam blocks. This 115 construction will insure holding the bar 80 at its lowermost position when desired.

An arm 84 is swung on the shaft 73 at a point such that its lower portion 85 may engage the bar 80 so as to raise and sustain 120 the same in the dotted line position of Fig. 4 when the arm 84 is forced forwardly. Behind the arm 84 is a cam block 86 located on the shaft 41. An arm 84^a is located between the cam block 86 and the arm 84, being pivoted at the point 86^b. When the cam block 86 is moved around into the dotted line position of Fig. 4 it will compel 125 the arm 84^a and therefore the arm 84 to swing forward and raise the bar 80.

From the above it is evident that when 130

the cam blocks 75 and 76 are turned over the frame will be either fully or partially lowered towards the floor of the alley depending entirely upon the position of the cam 86. In this way by properly co-relating these parts, the frame will either be fully lowered so as to set up a new "frame" of pins, or will be partially lowered so as to either pick up or reset the standing pins after a "spare".

The bar 64 which operates the opening and closing of the movable sections of the collars 62, has a cross extension 87 behind the box-like structure 61, and an arm 88 reaches rearwardly from said extension 87. The rear end of the arm 88 is slotted at 89 to receive the shaft 41, and a disk 90 journaled on said shaft carries a cam block 91 which will ride behind a pin 92 on the end of the arm 88 when the cam block 90 is turned over in the direction of the arrows in Fig. 12. From this it follows that by turning over said cam block the collars 62 will be opened to discharge their pins into the frame 65.

The collars 66 carried by the frame 65 also include front swinging sections operated by short cranks 93. These are all connected together and are also connected with a movable rack 94 carried by the frame 65, said movable rack being normally retained in position to close the collars by reason of the springs 95.

At the sides of the movable rack there are a pair of upstanding arms such as 96 having outwardly reaching hooks at their upper ends in position to engage the top edges of the sills 97 and 98 as the frame approaches the bottom limit of its movement. In this way the movable section 94 is arrested and the collars 66 are opened shortly before the pins reach the floor of the alley, so that the pins will drop down and stand on the floor.

In order to cause a premature opening of the collars 66 when the machine is being operated for a spare, I have provided the following mechanism:

A cross bar 99 is provided at the back side of the rack 94, the end portions thereof passing through cam blocks 100 and 101 which are so arranged that when the cross bar is pulled rearwardly the bars 94 are raised. A link 102 extends from the center of the cross bar 99 to a bell crank 103 pivoted to a stationary part. A link 104 reaches from said bell crank to a slot 105 in a disk 106 which is journaled upon the shaft 41, already referred to. Therefore, by turning the disk 106, the parts will be operated to open the collars before the frame reaches the fully lowered position to bring about normal operation by the arms 96.

In order to sweep the down pins from

the floor of the alley into the pit 13, the following mechanism is provided:

A U-shaped member 107 has its arms pivoted to upright frame members at the points 108. One of said arms is also provided with a bell crank extension 109, and a link 110 reaches therefrom rearwardly and is connected to the upper end of a swinging arm 111. The lower end of said swinging arm is pivoted to a stationary part, said arm being provided with a pin 112 working in a cam slot 113 of the operating disk 114. By rotating said disk the U-shaped member will be swept downwardly and then rearwardly so as to sweep all of the pins into the pit, any standing pins of a spare having been previously lifted out of the way.

It remains to show how the various cams 114, 86 and 90 and the shaft 73 are driven in proper co-ordinated and timed relationship under control of the operator. For this purpose I have indicated a pair of control magnets 115 and 116 at the sides of the back of the machine (see Fig. 7). As already explained, the shaft 41 is continuously driven by the chain 44 from the motor 43. Said shaft carries the disks 117, 118, 119 and 120 for the four movements just referred to, as well as other disks 121 and 122. Each of these disks is secured to the shaft and is provided around its periphery with an internal toothed periphery 123 as typically shown in Figs. 9 and 10. The teeth of these flanges therefore rotate continuously with the shaft 41.

Adjacent to these disks 117, 118, 119, 120, 121 and 122 are the other disks 123, 124, 125, 126, 127 and 128, all of which are loose on the shaft 41. Each of these loose disks has a finger 129 slidably mounted within a slot 130 in its face, and normally projected outwards by a spring 131 (see Figs. 9 and 10). When these fingers are thus projected outwards the full extent they engage the teeth of the adjacent rotating flanges so as to lock or clutch the parts together. This is the normal condition, and results in a driving connection. The flanges 123, 124, 125 and 126 are connected to the cam plates 114, 86 and 90 and to the sprocket which drives the chain 74 for the shaft 73, respectively.

Beneath each of the aforesaid loose disks and its finger 129 is a lug such as 132 (see Fig. 10), and each of these lugs has a slanting face looking in the direction of approach of the corresponding finger 129. When such lug stands in the interfering position the finger will ride up onto it as the disk completes its revolution, thus forcing the finger inwards against its spring 131 and causing disengagement of the clutch. This is clearly evident from examination of Fig. 10.

The lugs 132 for the four clutches are

respectively connected to the upper ends of short rock arms 133, 134, 135 and 136 respectively (see Fig. 7). Across the back of the machine there extend a pair of slide bars 137 and 138, respectively. These bars are respectively operated for a "strike" and for a "spare." The bar 137 has lugs 139, 140, 141 and 142 respectively in position to engage the fingers 133, 134 and 135 in such sequence as to first operate the sweep arm 107, then the cam 90 to operate the collars 62 and allow the pins to drop into the frame, then the chain 74 to rotate the shaft 73 for moving the frame down, and then the cam 86 for insuring a full downward movement of the frame so as to set the pins in place.

The bar 138 for a spare carries the lugs 143, 144 (behind 141) and 145 so placed as to first cause operation of the chain 74 to drive the shaft 73 in order to commence downward movement of the frame, then operation of the cam block 90 to cause the cups of the frame to open and receive the heads of the standing pins, and then close said cups and raise the frame, thus lifting the standing pins in order, then to cause the arms 107 to sweep the down pins into the pit, and then to allow the chain 74 to make a second turn of the shaft 73 so as to again partially lower the frame, and cause the cups to be again opened so as to set the pins which they carry into the same positions which they formerly occupied, after which the frame is again raised to its uppermost position.

In order to operate the bars 137 and 138 I have provided the cam blocks 146 and 147 adjacent to the clutch plates 127 and 128, respectively. These cam blocks are provided with peripheral grooves, as indicated in Fig. 7, which engage pins on the adjacent ends of the bars 137 and 138, respectively. Upon exciting the magnet 115 its lug 132 will be withdrawn allowing the clutch 121—127 to operate and causing the cam disk 146 to make a complete revolution for a strike. On the other hand by energizing the magnet 116 its lug 132 will be withdrawn allowing the clutch 122—128 to operate and rotate the cam disk 147 a revolution for a spare.

The magnets 115 and 116 may be energized from a distance by suitable switches and electric wiring the arrangement of which will be well understood in view of the state of the art relating to such devices.

While I have herein shown and described only a single embodiment of the features of my present invention, still I do not intend to limit myself to the same, except as I may do so in the claims.

I claim:

1. The combination with the rear end of a bowling alley having a pin stand and a pit

immediately behind the same, and the rails downwardly sloping towards the front end of the alley for the return of balls thereto, of a horizontal conveyor reaching rearwardly from the back end of the pit, a vertical conveyor adjacent to the rear end of the horizontal conveyor and having a series of outwardly reaching carriers traveling close to the rear end of the horizontal conveyor to raise the pins and balls delivered thereby through a vertical chute, the lower portion of said chute being of enlarged size for the accommodation of the balls, a side delivery opening from said enlarged chute portion to the rear raised end of the ball rails, a forwardly and downwardly reaching pin chute at the upper end of the vertical conveyor, a pin delivery slide at the front end thereof, a series of cups radially mounted with respect to a common spindle for rotation thereabout and movement beneath the lower delivery end of the slide aforesaid, a series of radially mounted plates also mounted for rotation about the spindle aforesaid movable with respect to the cups aforesaid, spring means normally causing the plates and cups to travel in harmony, means for momentarily arresting the movement of the plates with respect to the cups at the completion of one complete revolution to uncover the lower ends of the cups for the delivery of pins therefrom, a series of guide chutes beneath the uncovered cup positions to receive the pins so delivered, means in conjunction with the cups and the pin slide aforesaid operable to advance the series of cups the distance of one cup each time a pin is delivered through the slide, a series of collars at the lower ends of the guide chutes corresponding in position to the "frame" positions of the pins, each of said collars including a movable part normally retained in position to retain a pin therein, a vertically movable frame beneath said collars, a series of frame collars therein corresponding in position to the positions of the first mentioned collars, each of said frame collars including a movable part normally retained in position to retain a pin therein, a sweep arm, a horizontal pivotal mounting therefor about which it may be swept to remove pins from the rear end of the alley into the pit, means operable to release the pins from the first mentioned cups, means operable to move the movable parts of the frame cups, means for moving the frame vertically towards and from the floor of the alley, means for swinging the sweep arm back and forth, and means under control of the operator for actuating said parts selectively, substantially as described.

2. The combination with the rear end of a bowling alley having a pin stand and a pit immediately behind the same, and the rails downwardly sloping towards the front

end of the alley for the return of balls thereto, of a horizontal conveyor reaching rearwardly from the back end of the pit, a vertical conveyor adjacent to the rear end of the horizontal conveyor and having a series of outwardly reaching carriers traveling close to the rear end of the horizontal conveyor to raise the pins and balls delivered thereby through a vertical chute, a side delivery opening from said chute portion to the rear raised end of the ball rails, a forwardly and downwardly reaching pin chute at the upper end of the vertical conveyor, a pin delivery slide at the front end thereof, a series of cups radially mounted with respect to a common spindle for rotation thereabout and movement beneath the lower delivery end of the slide aforesaid, a series of radially mounted plates also mounted for rotation about the spindle aforesaid movable with respect to the cups aforesaid, spring means normally causing the plates and cups to travel in harmony, means for momentarily arresting the movement of the plates with respect to the cups at the completion of one complete revolution to uncover the lower ends of the cups for the delivery of pins therefrom, a series of guide chutes beneath the uncovered cup positions to receive the pins so delivered, means in conjunction with the cups and the pin slide aforesaid operable to advance the series of cups the distance of one cup each time a pin is delivered through the slide, a series of collars at the lower ends of the guide chutes corresponding in position to the "frame" positions of the pins, each of said collars including a movable part normally retained in position to retain a pin therein, a vertically movable frame beneath said collar, a series of frame collars therein corresponding in position to the positions of the first mentioned collars, each of said frame collars including a movable part normally retained in position to retain a pin therein, a sweep arm, a horizontal pivotal mounting therefor about which it may be swept to remove pins from the rear end of the alley into the pit, means operable to release the pins from the first mentioned cups, means operable to move the movable parts of the frame cups, means for moving the frame vertically towards and from the floor of the alley, means for swinging the sweep arm back and forth, and means under control of the operator for actuating said parts selectively, substantially as described.

3. The combination with the rear end of a bowling alley having a pin stand and a pit immediately behind the same, and the rails downwardly sloping towards the front end of the alley for the return of balls thereto, of a horizontal conveyor reaching rearwardly from the back end of the pit, a vertical conveyor adjacent to the rear end of the horizontal conveyor and having a series of outwardly reaching carriers traveling close to the rear end of the horizontal conveyor to raise the pins and balls delivered thereby through a vertical chute, a side delivery opening from said chute to the rear raised end of the ball rails, a forwardly and downwardly reaching pin chute at the upper end of the vertical conveyor, a pin delivery slide at the front end thereof, a series of cups radially mounted with respect to a common spindle for rotation thereabout and movement beneath the lower delivery end of the slide aforesaid, a series of guide chutes beneath the cup positions to receive the pins delivered therefrom, means in conjunction with the cups and the pin slide aforesaid operable to advance the series of cups the distance of one cup each time a pin is delivered through the slide, a series of collars at the lower ends of the guide chutes corresponding in position to the "frame" positions of the pins, each of said collars including a movable part normally retained in position to retain a pin therein, a vertically movable frame beneath said collar, a series of frame collars therein corresponding in position to the positions of the first mentioned collars, each of said frame collars including a movable part normally retained in position to retain a pin therein, a sweep arm, a horizontal pivotal mounting therefor about which it may be swept to remove pins from the rear end of the alley into the pit, means operable to release the pins from the first mentioned cups, means operable to move the movable parts of the frame cups, means for moving the frame vertically towards and from the floor of the alley, means for swinging the sweep arm back and forth, and means under control of the operator for actuating said parts selectively, substantially as described.

4. The combination with the rear end of a bowling alley having a pin stand and a pit immediately behind the same, and the rails downwardly sloping towards the front end of the alley for the return of balls thereto, of means adjacent to the pit for raising the balls to the rear raised end of the ball rails and for raising the pins, a forwardly and downwardly reaching pin chute to which the pins are delivered, a pin delivery slide at the front end of said chute, a series of cups mounted for movement about a common spindle and beneath the lower delivery end of the slide, aforesaid, means for retaining the pins within their cups until a complete movement of the cups has been accomplished, a series of guide chutes beneath the cup positions to receive the pins delivered therefrom, means in conjunction with the cups and the pin slide aforesaid operable to advance the series of cups the distance of one cup each time a pin is delivered to the slide,

a series of collars at the lower ends of the guide chutes corresponding in position to the frame positions of the pin, means for releasing the pins from the collars, a vertically movable frame beneath said collars, means for releasing the pins from the frame collars, a sweep arm, a horizontal pivotal mounting therefor about which it may be swept to remove the pins from the rear end of the alley into the pit, means for operating the pin releasing means of the chute cups, means for operating the releasing means of the frame cups, means for moving the frame vertically towards and from the floor of the alley, means for sweeping the sweep arm back and forth, and means under control of the operator for actuating said parts selectively, substantially as described.

5. The combination with the rear end of a bowling alley having a pin stand and a pit immediately behind the same, of a pin delivery slide above the position of the pit, means for removing pins from the pit and for delivering them to the slide aforesaid, a series of cups mounted for movement about a common spindle and beneath the lower delivery end of the slide aforesaid, a series of guide chutes beneath the cup positions to receive the pins delivered therefrom, means in conjunction with the cups and the pin slide aforesaid operable to advance the series of cups the distance of one cup each time a pin is delivered to the slide, a series of collars at the lower ends of the guide chutes corresponding in position to the frame positions of the pins, means for releasing the pins from said collars, a vertically movable frame for said collars, a series of frame collars therein corresponding in position to the positions of the first mentioned collars, means for releasing the pins from the frame collars, means for sweeping the pins from the rear end of the alley into the pit, means for operating the first mentioned pin releasing means, means for operating the pin releasing means of the frame collars, means for moving the sweeping means, means for moving the frame vertically towards and from the floor of the alley, and means under control of the operator for actuating said parts selectively, substantially as described.

6. The combination with the rear end of a bowling alley having a pin stand and a pit immediately behind the same, of a pin delivery slide above said parts, means for moving pins from the pit and delivering the same to said slide, a series of cups mounted for movement about a common spindle and beneath the lower delivery end of the slide aforesaid, a series of guide chutes beneath the cup positions to receive the pins delivered therefrom, means for bringing the cups successively into position to receive pins delivered from the lower end

of the slide, a series of collars at the lower ends of the guide chutes corresponding in position to the frame positions of the pins, means for releasing the pins from said collars, a vertically movable frame beneath said collars, a series of frame collars therein corresponding in position to the positions of the first mentioned collars, means for releasing the pins from the frame collars, means for sweeping pins from the rear end of the alley into the pit, means for operating the first mentioned pin releasing means, means for operating the frame pin releasing means, means for moving the frame vertically towards and from the floor of the alley, and means under the control of the operator for actuating said parts selectively, substantially as described.

7. The combination with the rear end of a bowling alley having a pin stand and a pit immediately behind the same, of a pin delivery slide above said parts, a series of cups mounted for movement past said slide, means for bringing said cups successively into position to receive pins delivered from the slide, a series of collars corresponding in position to the frame positions of the pins, means for delivering the pins from the cups to said collars, means for releasing the pins from the collars, a vertically movable frame beneath said collars, a series of frame collars therein corresponding in position to the positions of the first mentioned collars, means for releasing the pins from the frame collars, means for sweeping the pins from the alley into the pit, means for operating the first mentioned collar releasing means, means for moving the frame vertically towards and from the floor of the alley, means for operating the frame collar releasing means, and means under the control of the operator for actuating said parts selectively, substantially as described.

8. The combination with the rear end of a bowling alley having a pin stand and a pit immediately behind the same, of a series of cups above the position of said parts, means for raising the pins from the pit and delivering them to the cups, a series of collars beneath the cups corresponding in position to the frame positions of the pins, means for delivering pins from the cups to said collars, means for releasing the pins from the collars, a vertically movable frame beneath the position of said collars, a series of collars in said frame, means for releasing pins from the frame collars, means for sweeping the pins from the alley into the pit, means for operating the first mentioned collar releasing means, means for operating the frame collar releasing means, and means under the control of the operator for actuating all of said parts selectively, substantially as described.

9. The combination with the rear end of

a bowling alley having a pin stand and a pit immediately behind the same; of a series of cups above the position of said parts, means for raising the pins from the pit and deliver them to the cups, a series of collars beneath the cups corresponding in position to the frame positions of the pins, a series of vertically movable cups corresponding to the cups aforesaid, means for releasing pins from the first mentioned cups, 10 means for releasing pins from the second mentioned cups, means for sweeping the pins into a pit, and means under the control of the operator for actuating all of said parts, substantially as described.

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