Nov. 4, 1952 G. A. MONTOOTH 2,616,694

BOWLING PIN HANDLING APPARATUS

Filed June 6, 1947 8 Sheets-Sheet 1

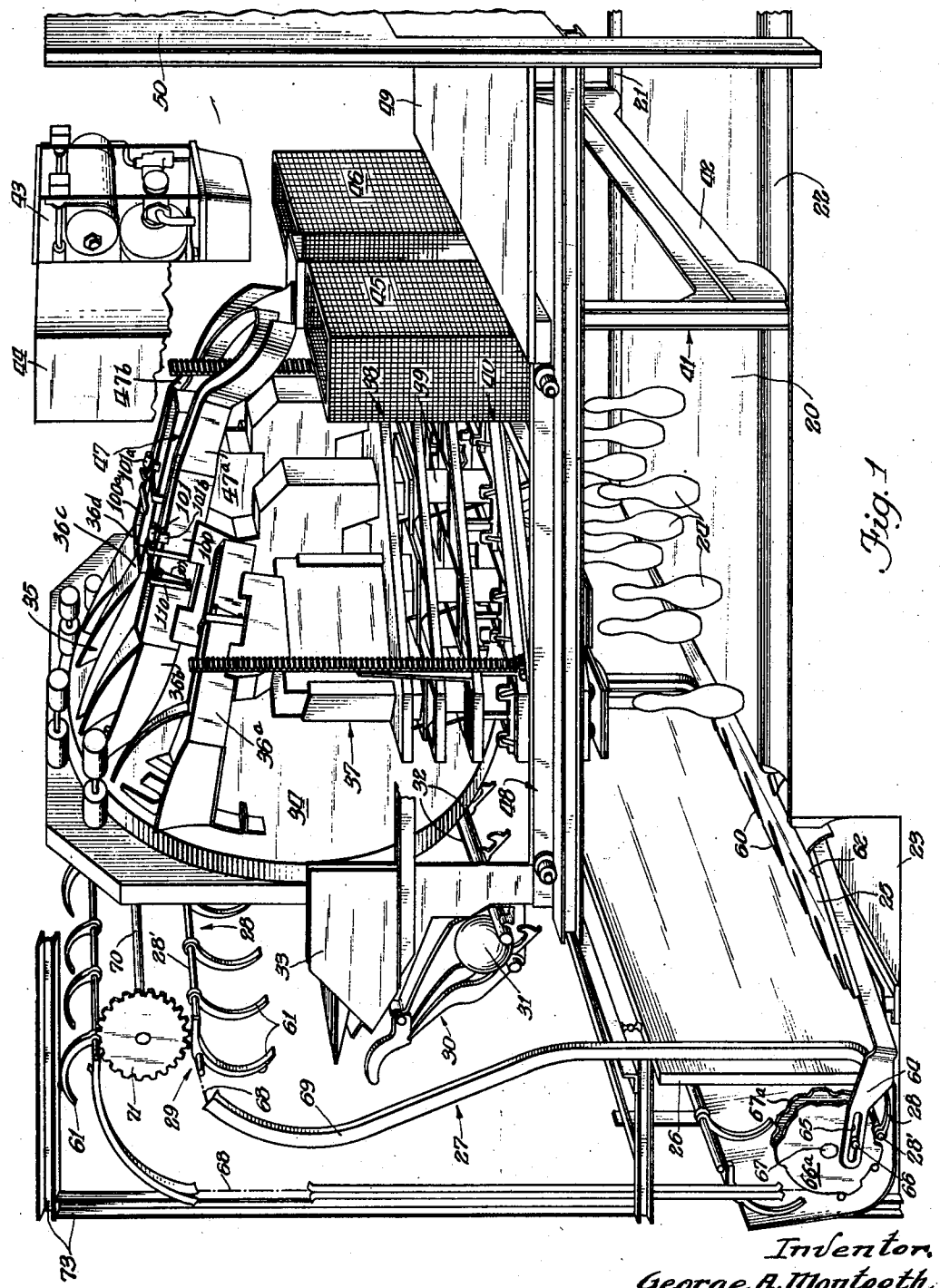


Fig. 1

Inventor.
George A. Montooth
By [illegible]
his Attorney.

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BOWLING PIN HANDLING APPARATUS

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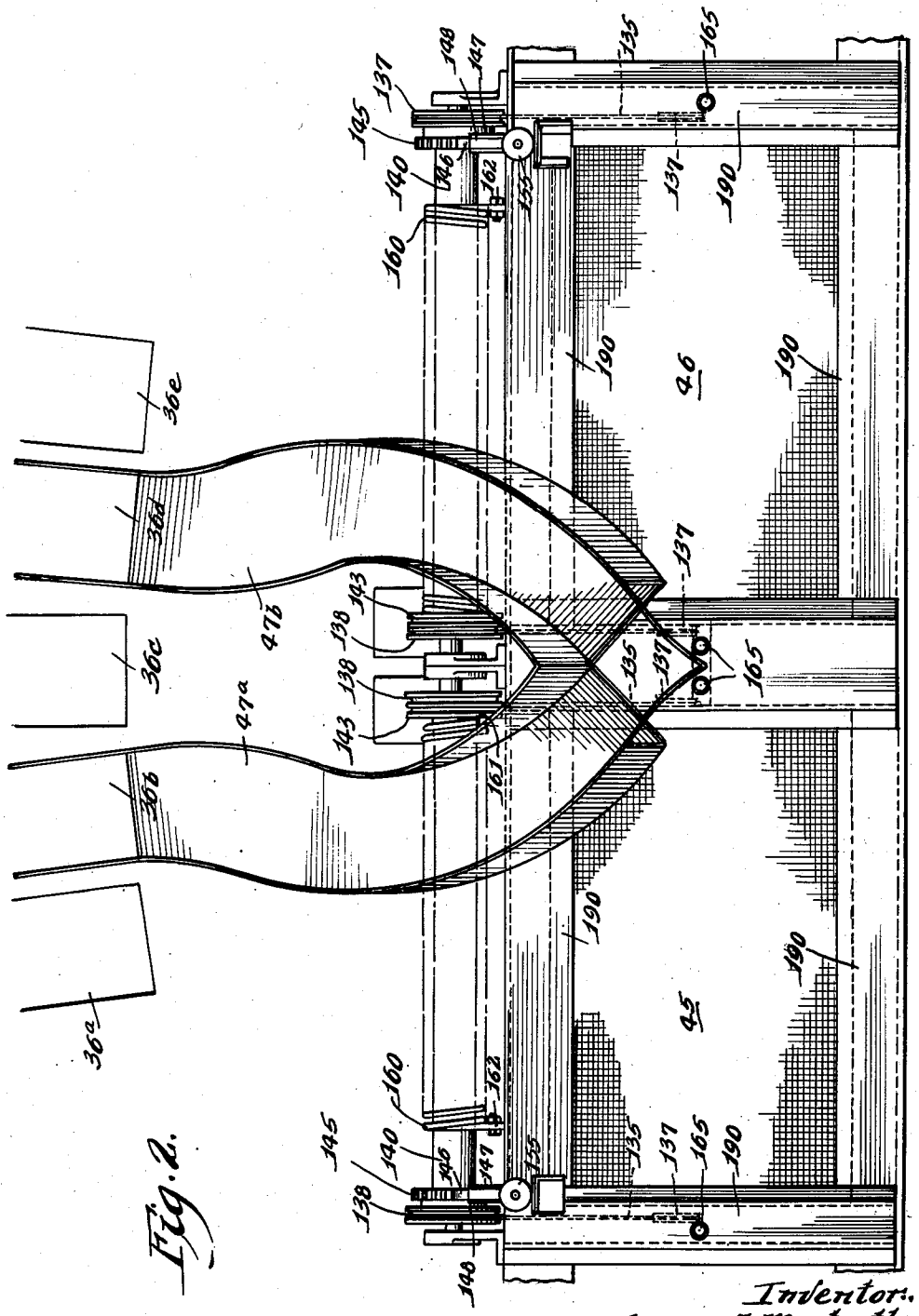


Fig. 2.

Inventor:
George A. Montooth.
By Clarence O'Brien
his Attorney.

Nov. 4, 1952 G. A. MONTOOTH 2,616,694

BOWLING PIN HANDLING APPARATUS

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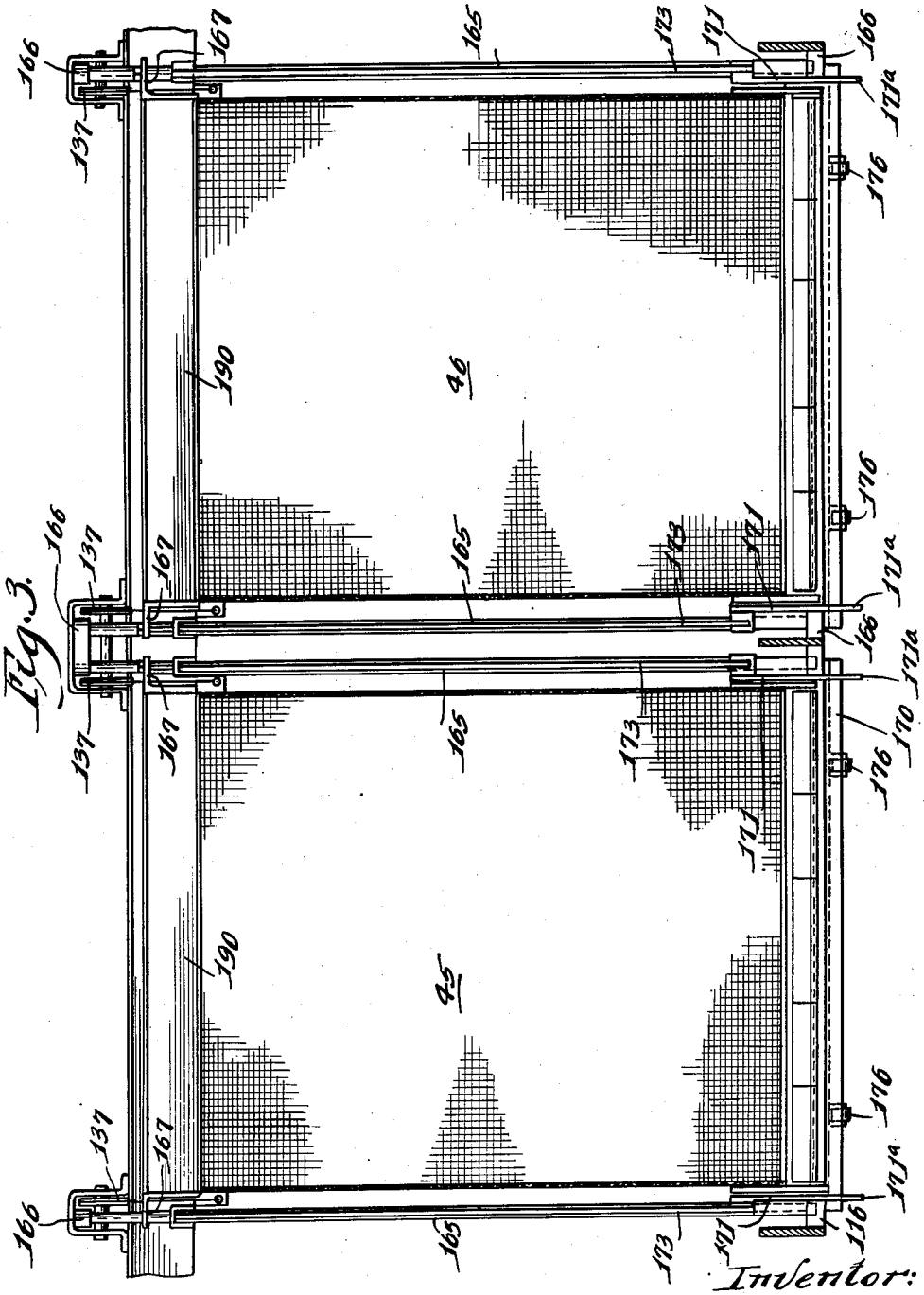


Fig. 3.

Inventor:
George A. Montooth.
By. Owen Gallagher
his Attorney.

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BOWLING PIN HANDLING APPARATUS

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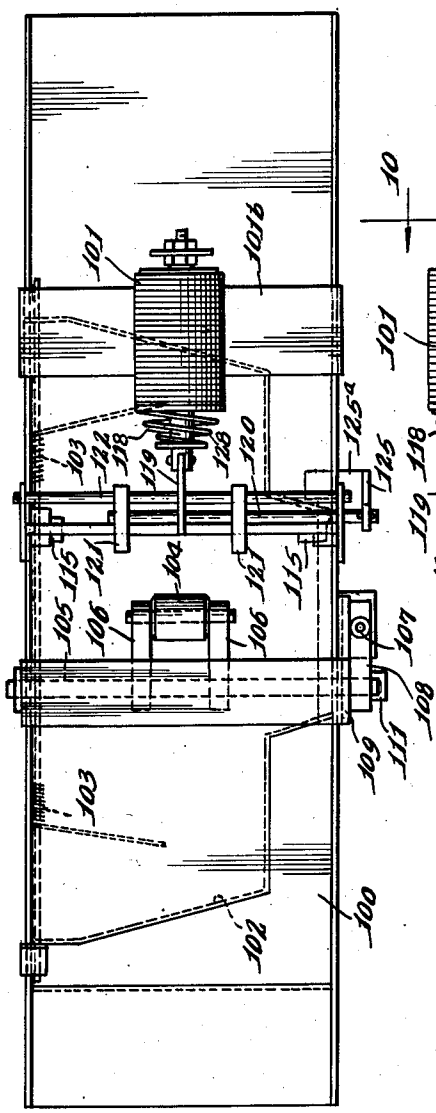


Fig. 4.

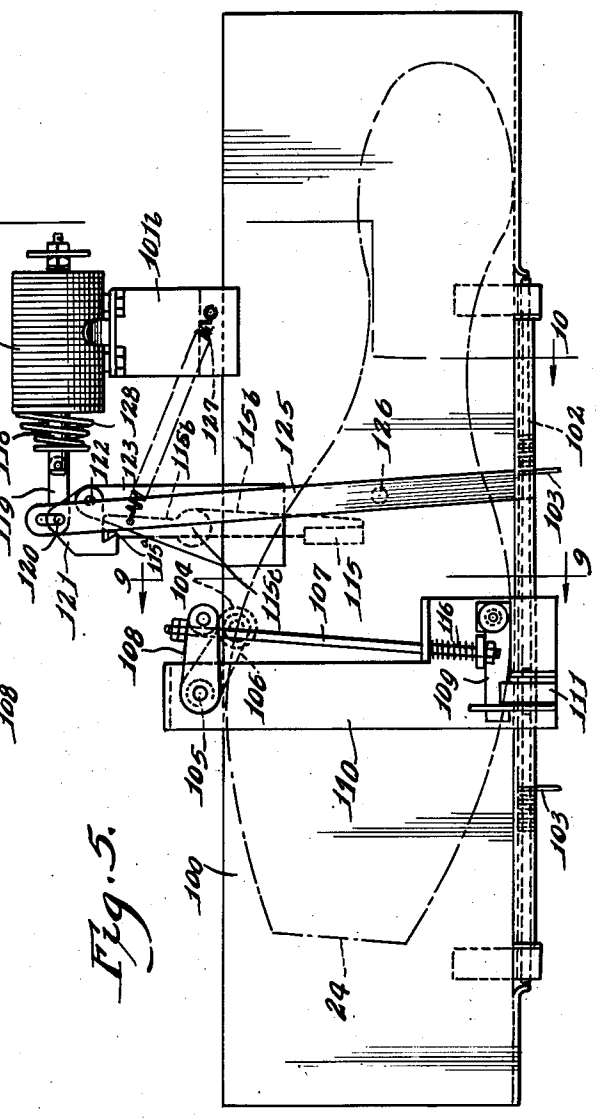


Fig. 5.

Inventor.
George A. Montooth.
By [illegible]
his Attorney.

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BOWLING PIN HANDLING APPARATUS

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Fig. 7.

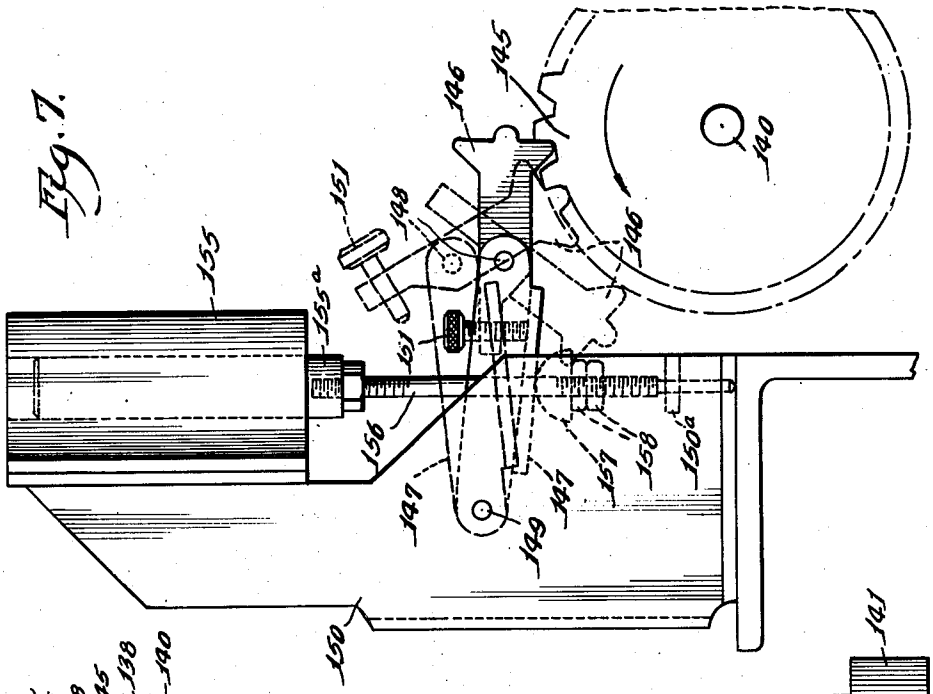
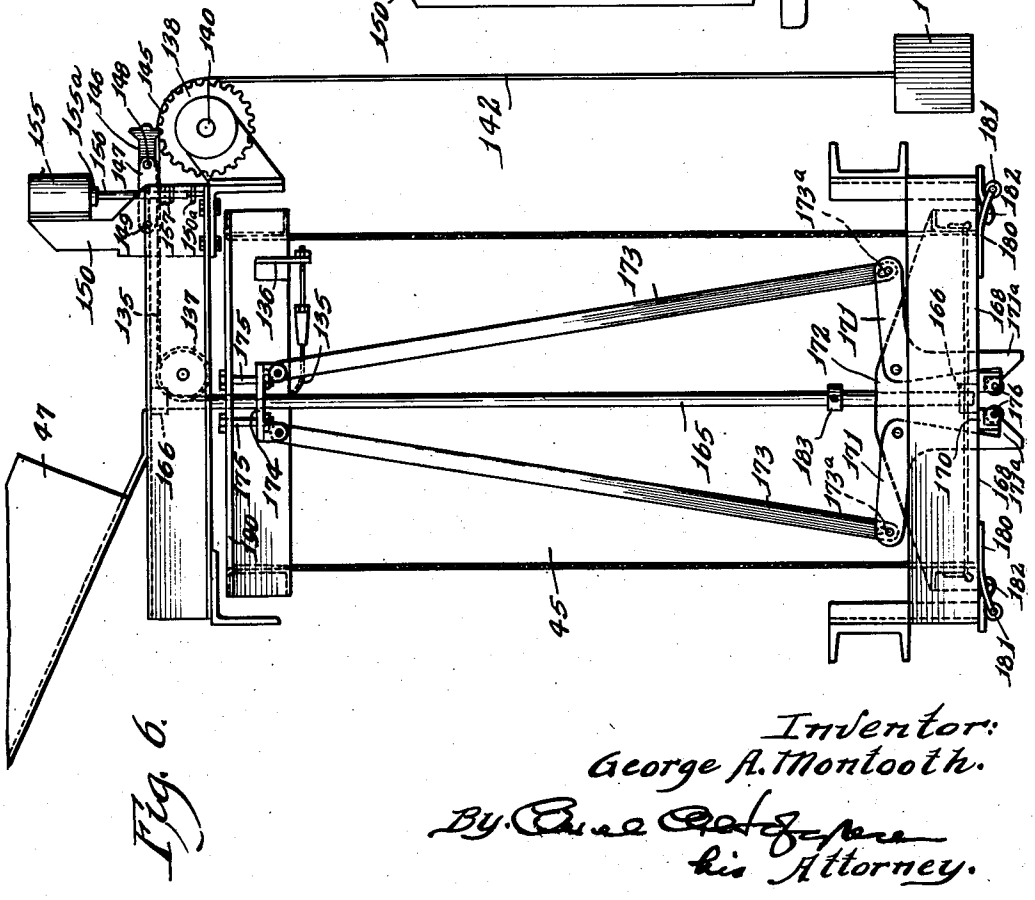


Fig. 6.



Inventor:
George A. Montooth.
By [illegible]
his Attorney.

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BOWLING PIN HANDLING APPARATUS

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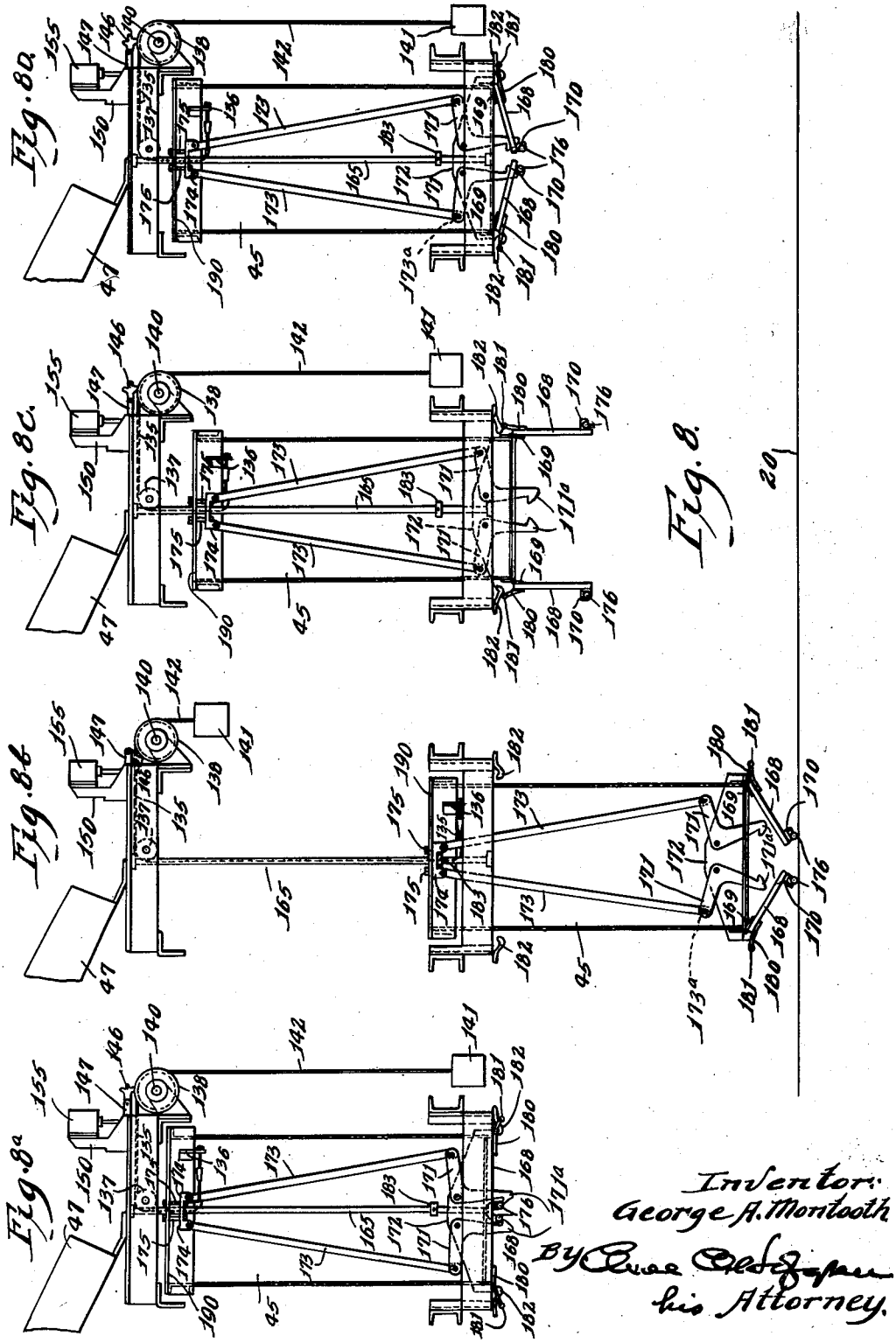


Fig. 8a

Fig. 8b

Fig. 8c

Fig. 8

Inventor:
George A. Montooth
By Rose Gesfaper
his Attorney.

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Fig. 9.

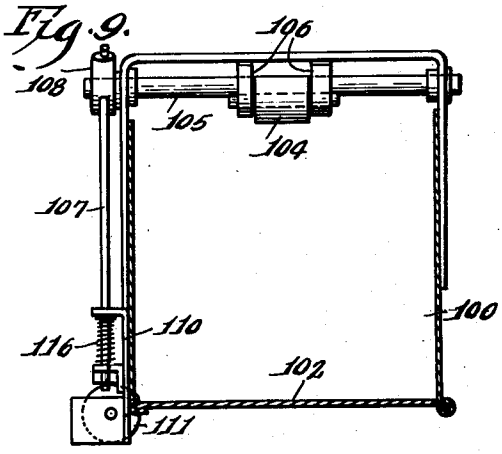


Fig. 10.

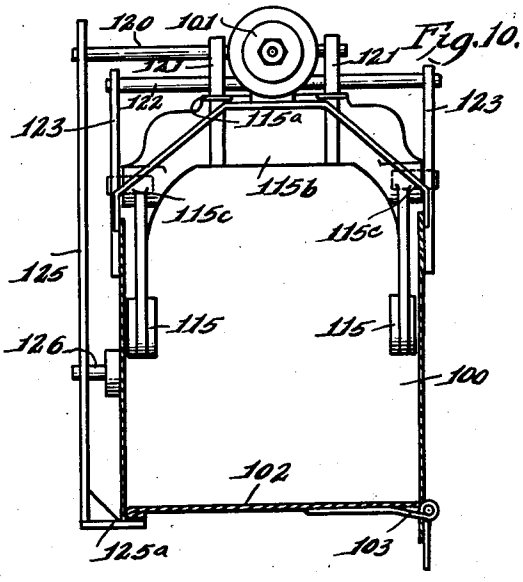


Fig. 11.

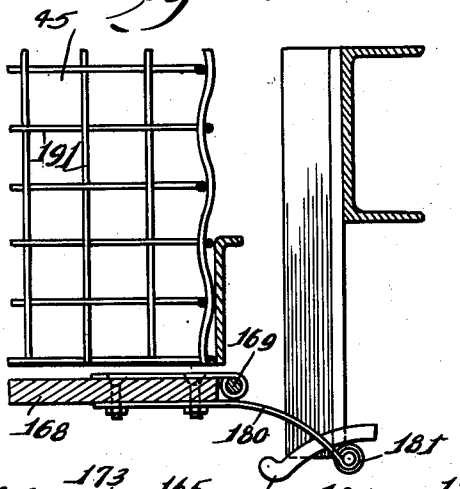
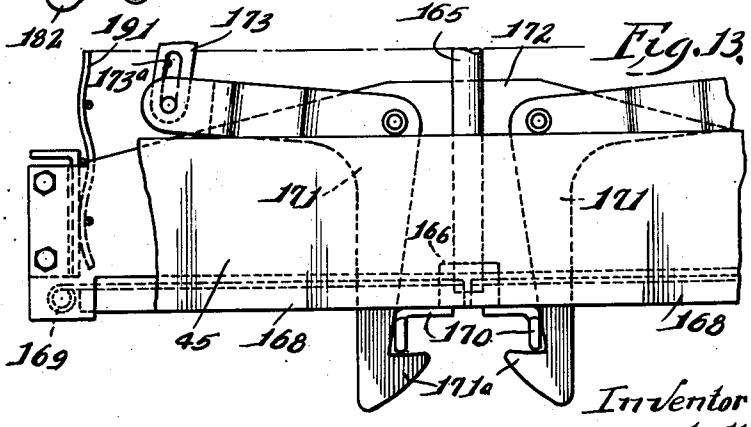


Fig. 13.



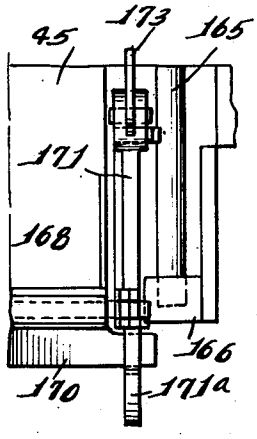


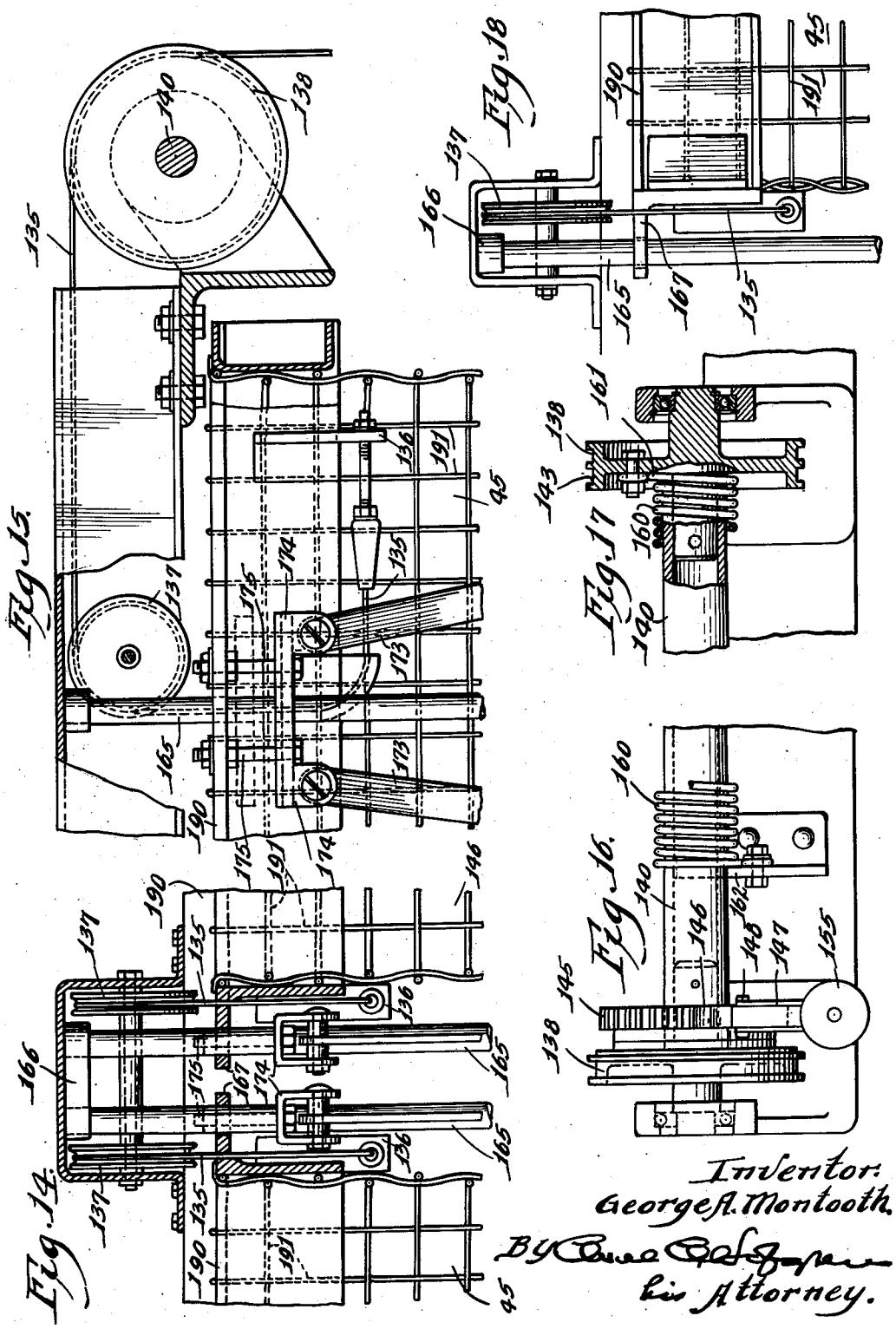
Fig. 12.

Inventor
George A. Montooth
By Bruce Calvert
his Attorney.

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BOWLING PIN HANDLING APPARATUS

Filed June 6, 1947 8 Sheets-Sheet 8



Patented Nov. 4, 1952 2,616,694

UNITED STATES PATENT OFFICE

2,616,694

BOWLING PIN HANDLING APPARATUS

George A. Montooth, Long Beach, Calif., assignor to The Brunswick-Balke-Collender Company, Chicago, Ill., a corporation of Delaware

Application June 6, 1947, Serial No. 752,898

12 Claims. (Cl. 273—43)

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This invention relates to bowling pin handling apparatus, and more particularly to apparatus for changing the pins in a bowling machine.

One object of this invention is to provide, in a bowling machine, improved mechanism for changing the entire complement of pins in the machine.

Another object of this invention is to provide, in a bowling machine, improved pin diverting apparatus, including a diversion chute and a novel pin switch operable to divert pins from their normal channel of distribution in said machine and direct them into said diversion chute.

Another object of this invention is to provide, in a bowling machine, improved pin changing apparatus comprising means for diverting pins from their normal channel in said machine and removing such pins from said machine, a vertically movable pin container holding different pins, and means for operating said pin container to discharge the different pins therefrom.

Still another object of this invention is to provide a pin changing mechanism which is easily accessible and may be loaded with a different set of pins without interrupting play on the bowling alley with which it is associated.

Other objects and advantages of my invention will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

Fig. 1 is a fragmentary perspective view of a bowling pin setting machine embodying a preferred form of the invention;

Fig. 2 is a plan view of the pin containers and diversion chutes shown generally in Fig. 1;

Fig. 3 is a front view of the pin containers, looking from the players' end of the alley;

Fig. 4 is a plan view of a portion of one of the pin distributing chutes in the machine of Fig. 1, showing the pin diverting apparatus;

Fig. 5 is a side elevation of the apparatus shown in Fig. 4;

Fig. 6 is a side elevation of one of the pin containers shown generally in Fig. 1;

Fig. 7 is an enlarged view of the actuating mechanism for the pin container shown in Fig. 6;

Fig. 8, comprising the portions 8*a*–*d*, is a fragmentary view of a pin container in various positions as it complete a pin discharging operation, showing the door opening and closing mechanism in various positions throughout the cycle;

Fig. 9 is a vertical section along the line 9—9 of Fig. 5;

Fig. 10 is a vertical section along the line 10—10 of Fig. 5;

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Fig. 11 is an enlarged fragmentary section of a portion of one of the pin containers, showing the apparatus for closing the pin container doors;

Fig. 12 is an enlarged fragmentary section of a portion of one of the pin containers, showing the door release mechanism;

Fig. 13 is an enlarged fragmentary section, looking from the left in Fig. 12;

Fig. 14 is an enlarged fragmentary section of a portion of the pin containers shown in Fig. 3, looking from the front and showing the connection of the counterweight cable mechanism;

Fig. 15 is an enlarged fragmentary view, partly in section, of a portion of the apparatus shown in Fig. 6, and looking from the right in Fig. 14;

Fig. 16 is an enlarged fragmentary elevation of a portion of the pin container actuating mechanism shown in Fig. 2;

Fig. 17 is an enlarged view, partly in section, of another portion of the pin container actuating mechanism shown in Fig. 2; and

Fig. 18 is an enlarged view of a portion of the pin container actuating mechanism shown generally in Fig. 3.

While I have illustrated in the drawings and shall herein describe in detail a preferred form of the invention, it is to be understood that the invention is not limited to the particular arrangement shown, it being contemplated that various changes may be made by those skilled in the art without departing from the spirit and scope of the invention as expressed in the appended claims.

As illustrated in the drawings, and with particular reference to Fig. 1, a bowling machine including the preferred form of the invention may be installed at the rear end of a bowling alley 20 equipped with the customary gutters 21 and 22 and a pit 23. Bowling pins 24 may be arranged to be placed on the alley in the standard triangular formation of ten pins.

While my pin changing apparatus may be associated with many other types of pin setting machines, and in particular with a machine of the type shown in the copending application of Jack Van Horn Whipple and Albert L. Odmark, entitled "Bowling Pin Setters," Serial No. 736,682, filed March 24, 1947, the machine illustrated in Fig. 1 comprises a tiltable tray 25 normally forming the bottom or floor of the pit 23 and inclinable to urge the pins and the ball in the pit towards the rear against a pit cushion 26. A ball and pin lifting mechanism 27 having a plurality of pin and ball carrying flights 28 movable upwardly from the pit to a discharge

position for the pins at 29 is provided, and a ball transfer means 30 is arranged to remove a ball 31 from said mechanism and transfer it to ball return tracks 32. A pin chute 33 is arranged in a position for receiving pins discharged by the conveyor flights when tilted at 29, and the pins pass from said chute into a rotary drum-like pin sorter 34. Within the sorter pins are carried upwardly and are discharged from one of a plurality of doors in the sorter into a distributor mechanism 35 comprising a plurality of distributing chutes 36*a*, 36*b*, etc. The chutes 36 lead into a magazine 37 which is adapted to receive and hold a set of pins prior to their movement into a pin setter 38 having ten vertically positioned and triangularly arranged pin tubes 39. Associated with the pin setter 38 is a pin pickup mechanism 40 for lifting standing pins from the bowling alley bed so that the alley may be swept to remove dead wood therefrom. A sweep device 41 is provided for sweeping the alley and gutters clear of pins, and a guard device 42 acts to stop a bowling ball which may be rolled during certain operations of the machine. Power operating mechanism including a power unit 43 and a control mechanism which may be housed partly in a unit 44 is provided to control the operation of the machine.

The pin changing mechanism to which this specification is drawn is shown generally in Fig. 1, this mechanism comprising pin containers or boxes 45 and 46 positioned generally under the parts 43 and 44, and a pin diversion chute structure 47 comprising diversion chutes 47*a* and 47*b* for diverting pins from the distributor 35 into one or the other of the pin containers 45 and 46.

The general combination in a bowling pin setting machine of means for supporting a reserve set of pins for substitution in the machine, means for receiving pins for transfer out of use by the machine and pin transfer mechanism is disclosed and claimed in my copending application Serial No. 736,643 entitled "Pin Setting Machine," filed March 24, 1947.

In the pin setting machine illustrated the parts 30 to 47 inclusive are all supported upon a carriage 48 which is movable from the normal rear position shown in Fig. 1 wherein the pin tubes 39 are over the respective pin spots on the alley 20, to a forward position approximately three feet ahead of the position shown in order to permit manual setting of pins on the alley by a pin boy. In the machine illustrated a walk 49 extends across the alley and any other adjacent alleys on which similar machines are installed to facilitate initial loading of pins into the machines or pin boxes, to provide a means for obtaining easy access to the pin containers 45 and 46 without interrupting play on the alley, and to facilitate servicing of the power and control units. This walk may be swung upwardly to a vertical position when the carriage 48 is to be moved forwardly. The machine is also provided with an indicator unit or board 50 located in front of the machine and at a suitable distance above the alley bed in order to shield the machine from the approach end of the alley. If desired this indicator unit may be equipped with signal lights arranged in a triangular formation similar to that of the pins on the alley and suitably connected to be illuminated to indicate standing or fallen pins.

Since the operation of such a machine has been described in detail in the copending application of Jack Van Horn Whipple, George P. Bentley and Edward P. Bentley, Serial No. 748,159, filed May 15, 1947, the operation of the machine will be described only briefly and generally here. When the bowling ball 31 is rolled down the alley bed, the ball and usually some of the pins enter the pit 23 and fall upon the tray 25 which is in its lower or horizontal position. At this time the pin and ball elevator 27 is stopped in a position in which two of the flights 28 are behind the pit cushion 26 and the other two of the flights are above the top of the pit cushion so that it is impossible for the pins or ball to strike the elevator flights. The tray as illustrated in Fig. 1 is in the form of a metal framework having a plurality of slots 60 in the rear edge thereof to accommodate the passage of forks or tines 61 on the conveyor flights. Preferably, the tray is covered with a layer 62 of a cushioning and sound deadening material such as rubber or felt. The tray is pivoted adjacent its rear edge on a cross shaft so that it may be moved from a lower horizontal position (which it assumes during actual bowling) to the inclined or upper position indicated, into which it is moved after the ball has been rolled. To swing the tray between its two positions arms 64 extend rearwardly from the opposite side edges thereof, said arms being slotted at 65 to admit a crank pin 66 carried by a sprocket 66*a* on a cross shaft 67, said cross shaft also supporting another sprocket 67*a* for operating the conveyor 27. In this manner the movements of the tray are synchronized with certain movements of the pin and ball elevator.

The pin and ball elevator 27 comprises a pair of roller chains 68, one at each side of the pit 23 and each constrained to follow a special curved path by guide channels 69. Each guide channel has a rear portion through which the chain normally moves downwardly, a bottom portion through which the chain normally moves forwardly, and a forward portion through which the chain normally moves upwardly. The roller chains carry four tined assemblies which extend between the chains and consist of rods 28' and tines 61. These tines are normally driven up through the slots in the tray 25 to pick up pins and balls from below. Generally a ball is picked up on the first flight of the conveyor passing upwardly from the tray and if not on the first flight, almost invariably on the second. As soon as the first flight passes through the pins on the tray, the majority of the pins are picked up and align themselves cross alley on said flight and those which are not carried upwardly on the first flight of tines are picked up on the second flight. The widely spaced tines effectively produce a stringing out or "debunching" of the pins since not all of the pins can get on one flight of tines. This avoids jamming of pins in the chute 33 when they are discharged from the elevator.

The chains 68 are driven from an upper cross shaft 70 which carries a sprocket 71 at each end thereof. The shaft 70 is rotatably supported on the frame 73 for the elevator and is connected to a drive shaft. Preferably the drive shaft is driven by hydraulic means, an electric motor, or other power means (not shown), the operation of which may be controlled automatically to give the pin and ball conveyor the desired movement.

The pin sorter, pin chutes and pin magazine are fully described in the copending application of Jack Van Horn Whipple and Albert M. Odmark, Serial No. 736,682, filed March 24, 1947 and so will be described only briefly here, and

the pin setting and pickup mechanism of the machine illustrated in Fig. 1 is fully described in the copending application of Jack Van Horn Whipple, George P. Bentley and Edward P. Bentley, Serial No. 759,488, filed July 8, 1947.

This invention is particularly directed to the pin changing apparatus of the machine shown in Fig. 1. In said machine and in the machine shown and described in application Serial No. 736,682 heretofore mentioned, there is a vertical rotating sorter **34** having five doors therein through which pins are delivered one at a time into five distributing chutes **36***a–e* which terminate in upending boxes, as the box **100** associated with the chute **36***b*. As fully described in the above mentioned application Serial No. 736,682, these upending boxes are designed in such manner that the pins fall through the bottom of the boxes butt end first so that the pins may be placed head end up in the pin setter units. The two diversion chutes **47***a* and **47***b* are connected respectively to distributing chutes **36***b* and **36***d*. The bowling machine illustrated normally is loaded with twenty pins, and one of the pin containers, as for example container **45**, is loaded with twenty different pins while the other container is empty. During play on the alley both containers are in their raised position as shown in Figs. 1 and 8*a*, said containers being suspended above the alley bed adjacent the front of the bowling machine, but slightly behind the point on the alley bed where the sweep **41** comes down to sweep fallen pins into the pit.

A pin changing cycle may be initiated at any time before the bowling machine starts a cycle of operation, i. e. one set of ten pins should be spotted on the alley and one set of ten pins should be in the machine setting unit. In order to initiate a pin changing cycle an electrical control switch (not shown) or any other conventional means may be provided, and I prefer to provide such an electrical switch at the alley attendant's desk so that the attendant can effect the change of pins merely by operating such control switch.

Upon initiation of the pin changing cycle four of the five outlet doors from the pin sorter to the respective distributor chutes are closed and held closed during the complete cycle. These doors are preferably solenoid operated, and reference is had to copending application Serial No. 736,682 for a complete disclosure of their structure and operation. The fifth door, which under the conditions just described would be the door leading to distributor chute **36***b*, is held open so that all of the pins will be delivered by the sorter into distributing chute **36***b*. All the pins contained in the machine will now be removed from the machine through distributing chute **36***b* and diversion chute **47***a*, this diversion chute directing the pins into the empty pin container **46** which has been selected to receive the pins from the machine. Initiation of the change pins cycle also energizes a solenoid **101** which is mounted on a bracket **101***b* over the upending box **100** (Figs. 1, 4, 5 and 10). This solenoid actuates a pin switch which diverts the bowling pins from their normal channel in the machine and directs them into the diversion chute **47***a*.

Upon initiation of the change pins cycle the sweep **41** moves down to its alley position, sweeps the alley bed free of pins, and then returns to its front position. The pin conveyor in the pit then operates to deliver the pins to the sorter which in turn delivers them to distributor chute **36***b* and from there they go to the container **46**. When the sweep has returned to its front position, the setter unit sets the remaining ten pins on the alley and returns to its top position in readiness to receive more pins. When the pit is cleared of the first set of ten pins, the sweep clears the alley of the second set of ten pins, and these pins are carried into the sorter and distributor and diversion chute to container **46** so that all pins are removed from the machine. As soon as the twentieth pin passes through the diversion chute **47***a*, a conventional counting device (not shown) which is installed in the lower end of each of the diversion chutes sends a signal to the machine which causes the pin container **45** to be released from its top position. The weight of pins within this pin container causes it to descend to the alley bed, and a self-actuating mechanism causes a discharge door within said container to open so that the twenty different pins within such container are dumped onto the alley bed between the sweep **41** and the pit. Having been relieved of its load of pins, the pin container **45** ascends to its raised position and latches itself in place. The sweep **41** then pushes the different pins which have been deposited on the alley bed into the pit and returns to its dwell position where it remains guarding the machine until all operations are completed, this guard action being the same as described in the application Serial No. 759,488 above mentioned. At the time the pin container **45** was first released to descend to the alley, solenoid **101** was de-energized, actuating the pin switch to put the upending box **100** back into normal operation, and the five outlet doors in the pin sorter were also released for normal operation. Consequently the different pins which are carried into the sorter by the pin lifting mechanism in the pit are delivered through the sorter and upending boxes into the magazine **37** from whence they are delivered into the pin setter. As soon as the pin setter receives ten pins, they are set on the alley and the sweep rises, restoring the machine to a condition ready for bowling. The remaining ten pins continue to come from the sorter from where they are delivered to the magazine **37** in the normal manner.

The machine now holds a complete set of different pins, and the pins which were removed from the machine are stored in pin container **46**. On the next pin changing cycle, the operation is the same as just generally described except that solenoid **101***a* (Fig. 1) actuates a pin switch in upending box **100***a* to direct pins into diversion chute **47***b*, and the pins are removed from the machine and received in pin container **46**, while the pins in container **46** are placed in the machine. This alternate action makes it possible to have two different sets of pins available for use at all times, and each set can be placed in and removed from the machine alternately as often as is desired. If a third set of pins is desired, the pins must be removed from the loaded pin container and new pins must be placed therein. This can be done during the normal operation of the machine without interrupting play on the alley, the walk **49** being provided for this purpose.

Referring now to Figs. 4, 5, 9 and 10, the pin distributing mechanism will be described. The upending box **100** in distributing chute **36***b* is of the same general construction as shown and described in application Serial No. 736,682 above mentioned. The box **100** has a discharge open-

ing in its bottom side leading into the magazine 37. A trap door 102 is mounted in this discharge opening, said trap door being biased in closed position by means of springs 103, and being latched closed in a manner to be described. In normal operation, when a bowling pin 24 enters the box through the cute 36b, the pin slides along until the large or belly portion of the pin strikes a roller 104 which is rigidly secured to a cross shaft 105 by means of arms 106. The force exerted by the pin 24 against the roller 104 causes the roller to pivot about the axis of the shaft 105 so that the shaft rotates in a counterclockwise direction as viewed in Fig. 5. This rotation lifts an actuating rod 107 which is secured at its upper end to the shaft by means of a bracket 108. At its lower end the rod 107 is connected to a lever latch 109 at a point intermediate the ends of said latch. One end of the lever latch 109 is pivotally mounted on a supporting bracket 110 which extends upwardly and also supports the cross shaft 105, and the other end of the lever latch normally engages a notch in a latch roller 111 which has another notch engaging the edge of the trap door 102 as shown in Fig. 9.

Obviously, when the lifting rod 107 raises the lever latch 109, the latch roller 111 will be released and the weight of the bowling pin 24 forces the trap door 102 to open, allowing the pin to fall through the discharge opening in the upending box 100. Stops 115 are provided to stop the pin 24 so that it normally cannot continue sliding down the diversion chute 47a, but must fall through the discharge opening in the bottom of the upending box. As may be seen in Fig. 5, the discharge opening is somewhat shorter than the length of a bowling pin, and the roller 104 is so positioned that a pin entering the upending box head end first, as shown in Fig. 5, will be allowed to travel far enough before the trap door 102 is tripped so that the head end of the pin is riding on a solid or integral portion of the bottom of the box 100. Thus, when the trap door 102 opens, the pin 24 falls through the discharge opening butt end first. If the pin enters the upending box butt end first, roller 104 is contacted by the wide part of the pin before the butt end of the pin reaches the opposite end of the discharge opening. Consequently, the door 102 opens and the butt end of the pin falls through first so that again the pin enters the magazine 37 butt end first. After the pin has fallen through the discharge opening, the trap door 102 is closed by springs 103. A spring 116, which surrounds the lower portion of the lifting rod 107, cooperates with bracket 110 to urge the lever latch 109 into engagement with the latch roller 111 so that the door is relatched and the apparatus is ready to receive the next pin.

To this apparatus I have added a novel pin switch which is operable to divert pins from their normal channel into the pin magazine and direct them into the diversion chute 47a during a pin changing cycle. The core 118 of the pin switch actuating solenoid 101 is connected by means of a link 119 to a bar 120. This bar is in turn connected to a pair of latch levers 121, these levers being pivotally mounted on a shaft 122 carried on brackets 123 which extend upwardly from the sides of the box 100. The bar 120 is also pivotally and slidably connected to a latching bar 125 which has a horizontally extending stop member or flag 125a at its lower end. It will be obvious from inspection of Fig. 5 that when solenoid 101 is energized so that its core 118 is pulled inwardly or to the right in such figure, latch levers 121 will move out of engagement with latch 115a. The stop members 115 are carried by a yoke 115b (Figs. 5 and 10), this yoke being pivotally mounted on the brackets 123 at 115c, and the top portion of the yoke incorporating the latch 115a. When solenoid 101 is energized therefore, the stop members 115 will no longer act to stop the motion of a bowling pin, but will pivot out of the way when struck by a pin and will allow the pin to proceed through the diversion chute 47a in the event the trap door 102 remains closed.

The latching bar 125 is pivotally mounted on a pin 126 which is carried on one wall of the box 100, and consequently, when solenoid 101 is energized, the latching bar 125 pivots so that the stop or flag 125a moves under the door 102, locking said door in closed position. So long as solenoid 101 remains energized therefore, bowling pins entering the distributing chute 36b will be diverted from their normal channel and will slide through the diversion chute 47a and enter the pin container 46 which has been selected to receive pins during this pin changing cycle. A spring 127 causes the stops 115 and the yoke 115b to pivot back to their original or latching position after each pin passes, and when solenoid 101 is de-energized after all pins are removed from the machine, a spring 128, which surrounds the solenoid core 118, forces said core out of the solenoid, returning the latch levers 121 to latching engagement with the latch 115a and pivoting the latch bar 125 so that the flag 125a no longer locks the trap door 102.

As mentioned earlier, a similar diversion chute 47b is connected to the distributing chute 36d. These diversion chutes are inclined as shown in Fig. 1 so that the bowling pins will slide by gravity until they reach the selected pin container. As shown in Figs. 1 and 2, the diversion chutes are curved at their ends so that pins sliding down chute 47a will enter pin container 46 while pins sliding down chute 47b will enter container 45. This arrangement is utilized in order that the bowling pins will enter the containers lengthwise with the largest cross sectional dimension of the container so that they are more uniformly deposited in the container. By curving the ends of the chutes as illustrated, the pins leave the chutes travelling toward the mouth of the receiving container, so no diverting mechanism is needed at the ends of the chutes. Furthermore, since only one chute is used at a time, only one common outlet is required.

The construction and operation of the pin containers 45 and 46 is illustrated in Figures 2, 3, 6, 7, 8 and 11–18. The containers are supported above the alley bed adjacent the front of the pin setter and behind the sweep mechanism so that they are out of the way during normal operation of the machine. Each of the containers is provided with similar but separate and independent operating mechanisms. Since these mechanisms are identical for each container, only the mechanisms associated with container 45 will be described, and it will be understood that container 46 operates in exactly the same manner when it is selected as the container to hold the different pins to be supplied to the machine.

The weight of the twenty bowling pins which are stored in container 45 urges said container to descend to its bottom position. However, it is held up by a ratchet mechanism illustrated most clearly in Figs. 6 and 7. At each side of the con-

tainer 45 a cable 135 is rigidly affixed on a bracket 136. These cables are trained over idler pulleys 137 and secured to winding drums 138 which are rigidly affixed to a shaft 140. A counterweight 141 is also attached to shaft 140 by means of a cable 142 which is secured to another winding drum 143 on the shaft. As the shaft 140 rotates, cables 135 and 142 wind and unwind on their respective winding drums. Therefore, as the container 45 descends, cable 135 unwinds from drum 138 while cable 142 winds on to drum 143, causing the counterweight 141 to rise.

A ratchet 145 is rigidly secured to the shaft 140, and a pawl 146 is adapted to engage the teeth of the ratchet to prevent container 45 from descending to the alley when said container is loaded with pins. The pawl 146 is pivotally affixed to a link 147 by pivot pin 148, and said link is pivotally attached at its other end by a pivot pin 149 to a stationary bracket 150 which is affixed to the framework of the machine. Referring particularly to Fig. 7, when the pawl 146 and the link 147 are in the position shown in solid lines, an adjusting screw 151, which is threaded through the end of the pawl and which is adapted to engage a shoulder on the link 147, is adjusted so that the pivot pin 148 is below a straight line drawn between the pivot pin 149 and the point of intersection of the longitudinal center line of the pawl with the front face of the pawl, which point is in a line at right angles to the direction of thrust on the pawl by the ratchet teeth. In this position the pawl 146 is held in engagement with one of the ratchet teeth and the container is prevented from descending.

An actuating solenoid 155 is mounted on the bracket 150 above the link 147, the core 155*a* of said solenoid having an actuating extension 156 secured thereto. This extension thrusts downwardly through a guide collar 150*a* affixed to the bracket 150, and the extension carries an actuating collar 157 which is adapted to engage the link 147 at a point intermediate the ends of said link. As shown in Fig. 7, the position of the collar 157 may be adjusted by means of the lock nuts 158. When the solenoid 155 is energized, the actuating rod 156 is pulled upwardly, lifting link 147 until the pivot pin 148 is above the straight line above described, and the weight of the loaded container 45 causes a thrust against the pawl 146 which urges the pawl and the link 157 to buckle as shown in dashed lines in Fig. 7. As the ratchet 145 continues to turn, the pawl is carried over into the position shown in dotted lines in Fig. 7, thus allowing the container to continue to descend until it reaches its bottom position. After the pins are discharged from the container 45 onto the alley bed the container ascends to its original position, the ratchet 145 reverses its direction of rotation and the pawl 146 engages the ratchet teeth and is carried back up to its locking position. With the parts in this position, the ratchet continues to rotate until the container 45 is again in its raised position. At this time the pawl drops into a notch formed by the teeth of the ratchet and holds the container in its raised position ready to receive pins in the next pin changing operation.

The counterweight 141 is so designed that it slightly overbalances the weight of the empty container, said counterweight being very greatly overbalanced by the weight of the container with a load of twenty pins. This weight distribution between the counterweight and the container biases the container to raised position above the alley bed only when said container is empty of pins, so that the container, when filled with pins, descends as soon as the pivot pin 148 is raised above the straight line above described. As shown most clearly in Figs. 2, 16 and 17, a spring 160 surrounds the shaft 140, this spring being rigidly affixed to the shaft at one end at 161 and being rigidly affixed at its other end to a bracket 162 secured to the framework structure. The spring is so arranged that it is relaxed when the container 45 is raised. As the container descends, the spring is wound up, thus storing energy and retarding the speed of descent of the container so that by the time the container reaches its lowered position adjacent the alley bed, its descent has been braked to a large extent. When the container has discharged its load of pins upon the alley bed, the energy stored in the spring acts to speed the ascent of the container. This extra energy is again exhausted before the container reaches its top position so that there is no sudden jolt as the container latches itself in a raised position.

A pair of vertical guide rods 165 are provided, one of such rods being rigidly attached to the main machine structure on either side of the container 45 by means of supports 166. The container is slidably mounted on these guides by means of holes in the flanges 167 of the upper structure of the container.

The container 45 has a pair of pin discharging trap doors 168 in its bottom portion, these doors being hinged at their outer edges to the sides of the box by means of hinges 169. The doors are held closed by latches which cooperate with latch bars 170 affixed to the doors. The latches comprise a pair of L-shaped members 171, each having a latching portion 171*a* at one end thereof. The members 171 are pivoted adjacent their angled portion on a supporting bracket 172 which is affixed to the container framework, and the other end of each latching member is pivotally and slidably connected to a connecting link 173, this slidable connection being effected by means of a slot 173*a*. The other or upper end of each of the connecting links 173 is pivotally connected to a strike bar 174 which is suspended from the top framework of the pin container by means of bolts 175, the strike bar being slidable on these bolts to the extent of the length of such bolts.

The bottom of each of the trap doors 168 is provided with a roller 176 so that the surface of the alley bed will not be marred from the opening of the doors.

Means are also provided to close the trap doors 168 after the pin discharging operation. For this purpose a leaf spring member 180 is affixed to the outer edge of each of the doors and extends outwardly therefrom, each leaf spring carrying a roller 181 at its extending end. Cam blocks 182 are mounted on the machine framework at the level of the bottom of the container when said container is in its raised position, these cam blocks extending into the path of the rollers 181.

Referring now to Fig. 8, a pin discharging operation of the container 45 is illustrated. In Fig. 8*a*, the container 45 is latched in its raised position above the alley bed 20. In Fig. 8*b* the solenoid 155 has been energized, causing the actuating collar 157 to exert a thrust against the link 147 so that the ratchet 145 has been released in the manner heretofore described. The weight of pins within the container causes the container to descend to its lower position adjacent the alley bed. As the container approaches the position of

Fig. 8b, a support collar 183 mounted on the guide rod 165 contacts the strike bar 174. This contact stops the descent of the strike bar, but the container itself continues down, the strike bar 174 sliding upward on the bolts 175 until it strikes the upper flange of the box framework. By this relative action between the strike bar and the container framework the connecting links 173 are raised, pivoting the latch members 171 and unlatching them from the latch bars 170.

At this point the weight of the pins within the container causes the trap doors 168 to drop down so that the rollers 176 contact the alley bed 20. The energy stored in the spring 160 urges the container to ascend so that the rollers 176 roll along the alley bed until the doors are completely open and the pins are discharged from the container. As the container ascends the doors 168 remain open until rollers 181 contact the cam blocks 182, as shown in Fig. 8c. As the container continues to move upwardly to the raised position of Fig. 8d, rollers 181 roll along the inclined surface of the cam blocks 182 until the doors are closed. The weight of the latching mechanism brings the strike bar 174 to its lower position on the bolts 175, causing the latch members 171 to be in position to engage with the latch bars 170 when the doors 168 close.

I prefer to construct each pin container with an angle iron frame 190 and woven wire mesh walls indicated at 191, the wire being welded to the frame, and I have achieved satisfactory results with a great saving in weight and material by constructing the sides of the pin container of ⅛ inch wire woven into approximately one inch square mesh.

I claim:

1. In a bowling pinsetting machine having a frame located above the alley and a pinsetter mounted thereon, means for mechanically gathering pins from the pin supporting end of the alley to the pit and means for conveying gathered pins from the pit to the pinsetter for resetting on the alley, apparatus enabling operation of the machine with one complement of pins or another comprising, in combination, a pin container slidably mounted on said frame for movement between a raised position and a lowered discharge position and adapted to receive in random fashion an entire complement of pins, means on the frame for supporting said container in a position above the alley and out of the way of standing pins, means operable to permit discharge of the pins from the container to the pin gathering means and means selectively operable to divert from the conveying means an entire complement of pins.

2. A machine as defined in claim 1 having a second pin container, means on the frame for movably supporting said second container for movement from an out of the way position to a position adjacent the alley bed for discharging pins therefrom and means for directing an entire complement of diverted pins into one of said containers.

3. A machine as defined in claim 2 having the pin containers located side by side in front of the machine and vertically above the gathering area of the pin gathering means.

4. A machine as defined in claim 1 having a second movable container for holding pins, means for yieldably biasing said second container to raised position above the pin gathering area of the alley, latch means for holding said second container in raised position and means for releasing said latch means to permit said second container to descend and discharge its pins on to the alley within reach of the pin gathering means.

5. In a pinsetting machine having a complement of pins therein and having means for setting pins on an alley bed in normal play and mechanical pin gathering means for delivering pins to the setting means, pin changing apparatus for substituting different pins for the pins in said machine comprising in combination means operable upon the initiation of a pin changing operation for diverting pins from their normal channel in said machine, and for removing said diverted pins from said machine, a vertically movable pin container adapted to hold said different pins and having a normally latched pin discharge door, means for biasing said container to raised position above the alley bed only when said container is empty of pins, latch means comprising a pawl and ratchet normally retaining said pin container in raised position, means for releasing said latch means to permit said pin container to descend under its load of pins when said diverted pins have been removed from the machine, and means operable upon descent of said container for unlatching said discharge door to discharge said different pins on to the alley bed.

6. In a pinsetting machine having mechanical pin gathering means, a pin sorter and a plurality of pin distributing chutes and having a complement of pins therein, pin changing apparatus for substituting different pins for the pins in said machine comprising in combination, a pin switch operable upon the initiaton of a pin changing operation, said switch being associated with at least one distributing chute for diverting pins from their normal channel in said machine, a first container adapted to receive pins from said machine, a diversion chute for directing diverted pins into said container, a second vertically movable pin container adapted to hold said different pins and having a normally latched pin discharge door in the bottom, means for biasing said second container to raised position above the alley bed only when said second container is empty of pins, latch means comprising a solenoid operated pawl and a ratchet normally retaining said pin container in raised position, means for energizing said solenoid upon completion of said diverting operation, energization of said solenoid releasing said latch means to permit said second pin container to descend under its load of pins, means operable upon descent of said container for unlatching said door to discharge said different pins on to the alley bed, and means for closing said door upon ascent of said second container.

7. In a pinsetting machine having a complement of pins therein and having means for setting pins on an alley bed in normal play, mechanical pin gathering means for delivering pins to the setting means, a pin sorter and a plurality of pin distributing chutes, pin changing apparatus for substituting different pins for the pins in said machine comprising in combination, a plurality of selectively operable pin switches, each being associated with a different distributing chute for diverting pins from their normal channel in said machine, a pair of vertically movable pin containers one of which receives pins from said machine and the other of which holds said different pins, a plurality of diversion chutes, one of said diversion chutes being

connected to one of said different distributing chutes for diverting pins into the first mentioned container, a normally latched pin discharge door in the bottom of each of said containers, means for yieldably biasing each of said containers to raised position above the alley bed, latch means associated with the container holding the different pins, said latch means comprising a solenoid operated pawl and a ratchet for normally retaining said pin holding container in raised position, means for energizing the solenoid to release the latch to permit said last mentioned container to descend under its load of pins, means operable upon descent of said last mentioned container for unlatching said door to discharge said different pins from said container on to the alley bed, and means for closing said door upon ascent of said container.

8. In a pinsetting machine having mechanical pin gathering means and a pin distributing chute with a discharge opening in the normal pin channel and having a complement of pins therein, pin diverting means comprising in combination, a diversion chute associated with said pin distributing chute, stop means normally operable to block pins from said diversion chute and direct them into said discharge opening, a pin switch operable to block said discharge opening and render said stop means inoperable and means operable from without said machine for holding said pin switch continuously operative to remove the entire complement of pins from said machine.

9. In a bowling machine having a pin distributing chute with a discharge opening in the normal pin channel, pin diverting means comprising in combination, a trap door in said discharge opening, a pin actuated latch operable by a pin moving in the distributing chute for releasing said trap door, said latch normally holding said door in closed position, a diversion chute connected to said pin distributing chute, a pivotally mounted stop arranged to be struck by a pin in said distributing chute for blocking pins from said diversion chute and directing them into said discharge opening, a latch normally locking said stop against pivotal movement in pin blocking position, a pivotally mounted lever for locking said trap door independently of said pin actuated latch, and a solenoid having a core connected to said last mentioned latch and said lever, movement of said core when said solenoid is energized moving said last mentioned latch to release position and moving said lever into locking engagement with said trap door.

10. In a pinsetting machine having a pin distributing chute with a discharge opening in the normal pin channel, pin changing apparatus for substituting different pins for the pins in said machine comprising in combination, a diversion chute associated with said pin distributing chute, stop means normally operable to block pins from said diversion chute and direct them into said discharge opening, a pin switch operable upon the initiation of a pin changing operation to block said discharge opening and render said stop means inoperable, a first pin container for receiving pins from said diversion chute, a second vertically movable pin container adapted to hold said different pins, a normally latched pin discharge door in said vertically movable container, means for biasing said container to raised position above the alley bed only when said container is empty of pins, latch means comprising a pawl and ratchet normally retaining said vertically movable container in raised position, means for releasing said latch means operated by pins moving through said diversion chute to permit said vertically movable container to descend under its load of pins, and means operable upon descent of said container for unlatching said discharge door to discharge said different pins on to the alley bed.

11. In a pinsetting machine having a pin distributing chute with a discharge opening in the normal pin channel, pin changing apparatus for substituting different pins for the pins in said machine comprising in combination, a trap door in said discharge opening, a pin actuated latch operable by a pin moving in the distributing chute for releasing said trap door, said latch normally holding said door in closed position, a diversion chute connected to said pin distributing chute, a pivotally mounted stop arranged to be struck by a pin in said distributing chute for blocking pins from said diversion chute and directing them into said discharge opening, a latch normally locking said stop against pivotal movement in pin blocking position, a pivotally mounted lever for locking said trap door independently of said pin actuated latch, a solenoid having a core connected to said last mentioned latch and said lever, movement of said core when said solenoid is energized moving said last mentioned latch to release position and moving said lever into locking engagement with said trap door, a pair of vertically movable pin containers one of which receives pins from said diversion chute and the other of which holds said different pins, a normally latched discharge door in the bottom of each of said containers, means for yieldably biasing each of said containers to raised position above the alley bed, latch means associated with the container holding the different pins, said latch means comprising a solenoid operated pawl and a ratchet for normally retaining said container in raised position, means for energizing the solenoid to release the latch associated with said last mentioned container to permit the container to descend under its load of pins, means operable upon descent of said last mentioned container for unlatching said door to discharge said different pins from said container on to the alley bed, and means for relatching said door upon ascent of said container.

12. In a pinsetting machine having a complement of pins therein and having means for setting pins on an alley bed in normal play, mechanical pin gathering means for delivering pins to the setting means, a pin sorter and a plurality of pin distributing chutes, pin changing apparatus for substituting different pins for the pins in said machine comprising in combination, a plurality of selectively operable pin switches, each being associated with a different distributing chute for diverting pins from their normal channel in said machine, a pair of vertically movable pin containers located above the alley bed adjacent the front of said machine, one of said containers receiving pins from said machine and the other container holding said different pins, a plurality of diversion chutes, one of said chutes directing diverted pins into said first mentioned container, a normally latched pin discharge door in the bottom of each of said containers, means for yieldably biasing each of said containers to raised position above the alley bed, latch means associated with said container holding the different pins, said latch means comprising a solenoid operated pawl and a ratchet for normally retaining said container in raised position, means

for energizing the solenoid to release the latch to permit the last mentioned container to descend under its load of pins, means operable upon descent of said last mentioned container for unlatching said door to discharge said different pins from said container on to the alley bed, means for closing said door upon ascent of said container, and a walk extending transversely across the alley adjacent said containers for providing access to said containers during the operation of said machine without interrupting play on said alley.

GEORGE A. MONTOOTH.

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