

April 13, 1943.

M. PATTERSON

2,316,183

PIN SETTER FOR BOWLING ALLEYS

Filed Aug. 23, 1941

4 Sheets-Sheet 1

FIG. 2

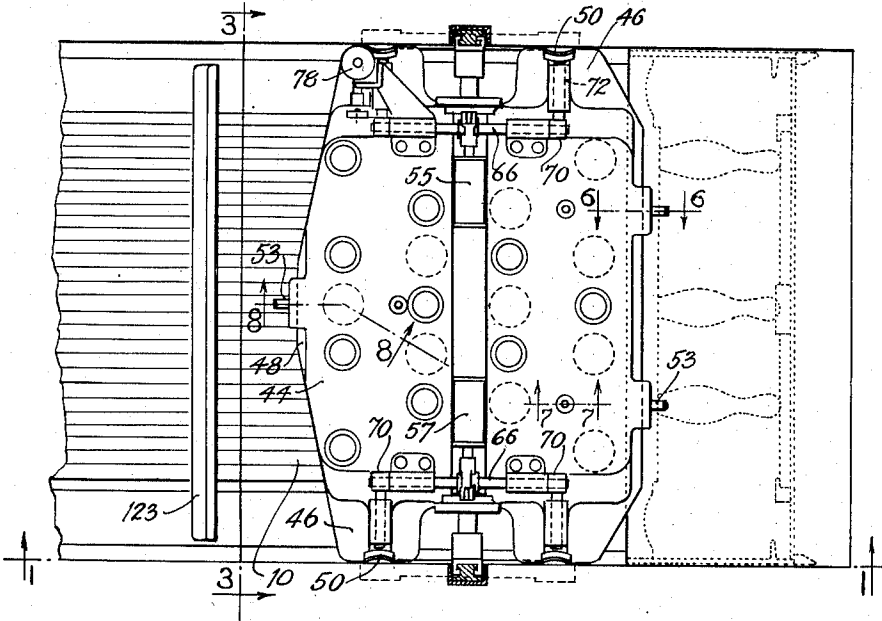


FIG. 1

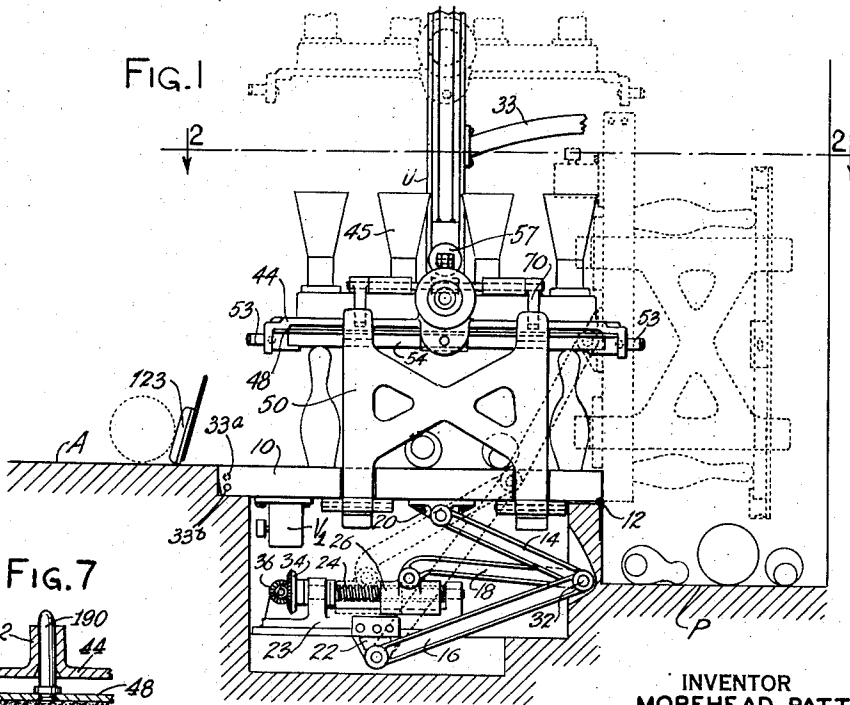
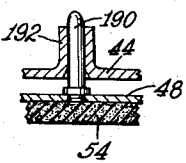


FIG. 7



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4 Sheets-Sheet 4

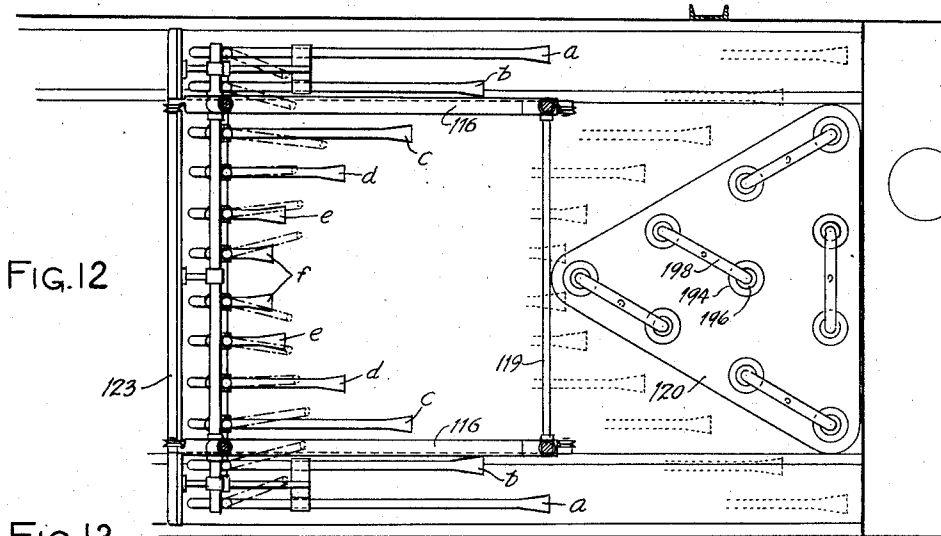


FIG. 12

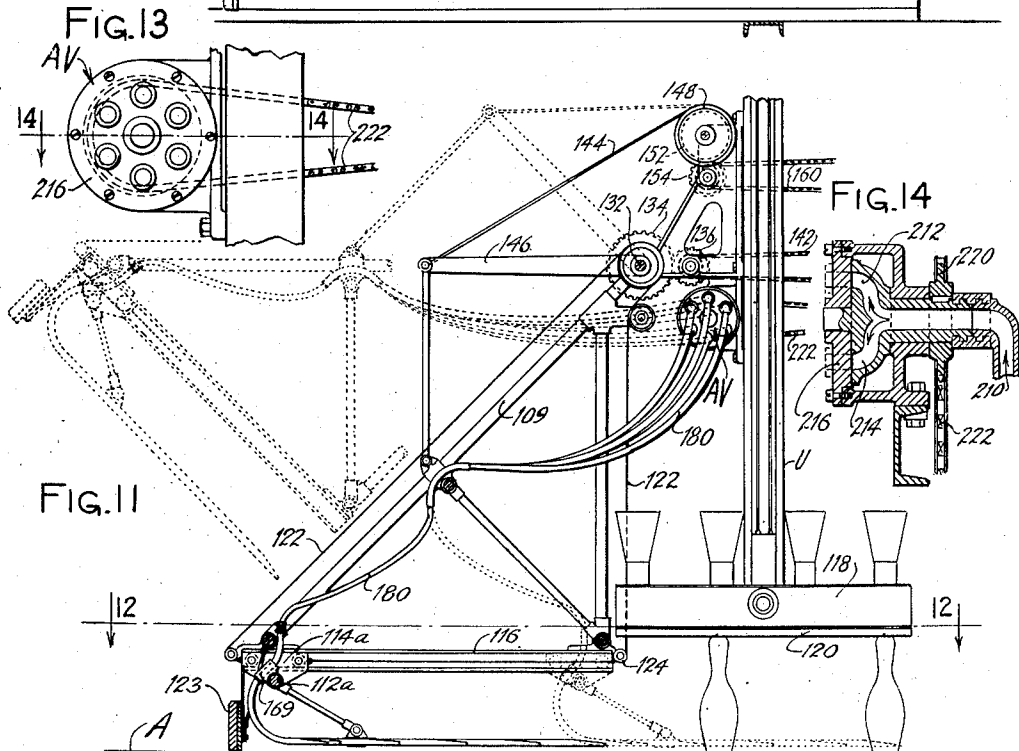


FIG. 11

FIG. 14

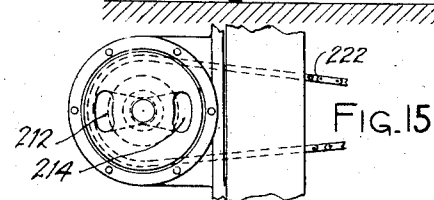


FIG. 15

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2,316,183

PIN SETTER FOR BOWLING ALLEYS

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Application August 23, 1941, Serial No. 408,013

34 Claims. (Cl. 273—43)

This invention relates to bowling pin setting machines and more particularly to improvements in mechanism for removing "deadwood" or fallen pins or other unwanted objects, such as bowling balls, from the bed or gutters of an alley after the throwing of a ball, and before resuming play of the game.

My invention is especially adapted for use with bowling pin setting machines of the type disclosed in co-pending application, Serial No. 204,995 filed April 29, 1938, by Gottfried J. Schmidt for pin setting apparatus for bowling alleys, although it is not intended that its use will be so restricted. In a machine of the type disclosed in said Schmidt application, the pin setting device consists of a traveling elevator or table provided with means for setting and resetting pins on the alley bed, which elevator moves to and from the bed and turns in order to set and reset pins thereon.

According to my invention I utilize the pin setting table as means for effecting the positive holding of standing pins in the exact position they occupy after the throwing of a ball and provide means operative while pins are so held for removing the "deadwood" from the alley and gutters, either by tilting a portion of the alley bed with reference to the pit so that fallen pins and balls will be ejected positively as by sliding, or by shaking the alley bed tilting portions so that the pins will be discharged into the pit, after which the alley portion returns to its horizontal location whereupon the standing pins are freed, and play can be resumed.

It is, therefore, an object of my invention to provide means for holding standing pins remaining on the alley after the throwing of a ball against falling over or movement on the alley, and effect the positive removal of all fallen pins without disturbing the standing pins or interfering with their proper positioning on the alley.

It is an added object of my invention to provide means associated with a pin setter for holding upright on and in the precise position each pin occupied, any standing pins remaining after a ball has been thrown on the alley and for causing that portion of the alley upon which pins are positioned to be tilted relative to the pit or hold said pins on the alley and employ devices acting while the pins are held for discharging all pins except those standing and immovably held on the alley bed into the pit.

It is a further object of my invention to provide a pin setter table having means cooperating therewith for clamping any pins standing on the alley after the throwing of a ball and mechanism

for effecting relative movement between the pin clamping means, alley bed and pit for discharging fallen pins or "deadwood" into the pit.

My invention also contemplates the provision of mechanism for releasing pins after "deadwood" has been removed from the alley and restoring the machine to playing condition.

My invention also consists of the provision of means for holding pins immovable upon the alley bed by devices which engage the tops of the head ends thereof and using mechanism for positively removing all pins not wanted on the alley bed in order to prepare for the continued playing of a particular frame of the game.

My invention also consists in the provision of automatic means movable into engagement with the head ends of pins remaining upright on the alley bed after a ball has been thrown, and mechanism for controlling the operation of the holding mechanism so that only at the proper time during the playing of a frame are the standing pins clamped on the alley bed against removal therefrom.

My invention is also characterized by a device which is movable to and from a bowling alley in order to set and reset pins upon the bed thereof together with means carried by said device for engaging the head ends of said standing pins and clamping them upon the bed against unwanted removal therefrom during the discharge of fallen pins into the pit after which other mechanism is operative to free the pins for further play of the game.

It is also an object of my invention to provide control mechanism set into operation by the arrival of a bowling pin in a pit and cause pins standing on the alley after the throwing of a ball to be held thereon against undesired removal while all "deadwood" and other unwanted objects are removed and ejected into the pit.

With these and other objects not specifically mentioned in view, the invention consists in certain combinations and constructions which will be hereinafter fully described, and then set forth in the claims hereunto appended.

In the accompanying drawings which form a part of this specification, and wherein the several reference characters designate the same or like elements:

Figure 1 is a side elevation of one form of my invention, on line 1—1 of Figure 2;

Figure 2 is a plan view on line 2—2 of Figure 1;

Figure 3 is a front elevation on line 3—3 in Figures 2 and 4;

Figure 4 is a plan view on line 4—4 of Figure 3 with parts omitted;

Figure 5 is an enlarged view, partly in section, of parts shown in Figure 3;

Figure 6 is a sectional view, to a larger scale, on line 6—6 in Figure 2;

Figure 7 is a sectional view, to a larger scale, on line 7—7 in Figure 2;

Figure 8 is a sectional view, to a larger scale, on line 8—8 in Figure 2;

Figure 9 is a side elevation of a modified form of my invention;

Figure 10 is a plan view taken on line 11—11 in Figure 9, showing somewhat diagrammatically the arrangement between the "deadwood" removing members and the pin clamping mechanism;

Figure 11 is a side elevation, partly in section, of another modified form of my invention;

Figure 12 is a plan view on line 13—13 in Figure 11, showing somewhat diagrammatically the relationship between the alley cleaning members and the pin clamping mechanism;

Figure 13 is an enlarged view of the air valve shown in Figure 11;

Figure 14 is a sectional view of the air valve on line 15—15 in Figure 13; and

Figure 15 is a view similar to Figure 13, but with the air outlet plate removed.

My invention incorporates a pin setting table 44 provided with spaced pin setters 45 of the type disclosed in said Schmidt application, usually in triangular arrangement, which are operative at desired intervals to set pins upon the bed in playing position. The mechanism utilized for raising, lowering and turning the table in the above referred to Schmidt application can be utilized for the same purposes to control the table operation, although because of the novel mechanism which I provide for insuring pins standing on the alley bed, the need for pin resetter devices for lifting standing pins from the alley and resetting them thereon again is obviated.

Referring to the drawings, Figures 1 to 8 show a preferred form of my invention wherein section 10 of the alley, including the gutters and bed which support a set of pins in playing arrangement is movable between conventional kick backs 11 adjacent each gutter, relative to the main portion A of the alley and pit P. In this manner any "deadwood" or fallen pins lying on the section 10 or in the gutters after a ball has been thrown can be removed from the alley. Since it is desirable that any pins remaining standing be held against movement in their on spot or off spot positions, the section 10 is moved in any desired manner to eject the "deadwood" therefrom without disturbing the standing pins. One suitable form of mechanism consists in mounting section 10 for tilting or pivotal movement towards the pit. Accordingly, hinges 12 are fixed to section 10 adjacent pit P and to the vertical portion V at the end of the alley so that this section can be swung from normal horizontal to substantially vertical position, as shown in dotted lines in Figure 1, where fallen pins will fall by gravity into the pit for further handling and distribution by suitable means (not shown). Section 10 at the desired time is swung on its hinges under the action of levers 14, 16 and 18 located beneath the alley A. Lever 14 is pivoted in bearing 20 attached to the bottom of section 10 and lever 16 is pivoted in a bearing 22 attached to a stationary bed 23, which provides bearings for a screw 24. A threaded slide 26 en-

gages the screw 24 and bearing 28 provides a pivot 30 for one end of lever 18. All three levers 14, 16 and 18 are jointed together in bearings on pin 32.

At one end of screw 24 is attached a bevel gear 34 which engages a bevel pinion 36 secured to a transverse shaft 38 (Figure 3). At the outer end of shaft 38 is attached a bevel gear 40 which is meshed with a bevel pinion 42 on a shaft 43 which is driven by suitable connections from reversing motor R.M.

The operation of the above described mechanism is as follows:

After the first ball has been thrown, presumably knocking down some pins but leaving some standing, the pin setter table 44, which is operated by mechanism, not shown but similar to that shown in said Schmidt application, is lowered until a clamping member comes into contact with the head ends of any standing pins and holds them on the section 10 against falling, or any movement relative thereto.

As shown in Figures 1-8, table 44 may be a composite unit composed of several coating parts. Frame 47 supports the several setters 45, and fixed to the frame is a detachable plate 48 provided with several projections 46 for a purpose to be described. During the downward movement of the table, projections 46 move into engagement with cam surfaces 49 of movable locking arms, such as levers 50 pivotally mounted at 51 on each side of the alley, preferably adjacent and movable backwards into and out of the sides or kickbacks 11, so that at all times these arms or levers cannot interfere with the playing of the game or the operation of the machine. It follows, therefore, that when arms 50 have been swung back by projections 46, they will be returned by action of springs 52 into locking co-action with projections 46 engaging surfaces 51a of arms 50, and thus under certain conditions, as will appear hereinafter, plate 48 will be locked against vertical movement with table 44. When plate 48 is locked in this manner, pad 54, carried by plate 48, which may be made of felt, sponge rubber, sheet rubber, or other suitable compressible or elastic material, will be depressed by the head or heads of any standing pin or pins, as the case may be, and provide a secure grip thereon between the pad 54 and alley bed section 10 (see Figures 3, 5 and 8), thereby holding such pins firmly against falling or movement relative to the alley.

With plate 48 thus clamped, table 44 is started on its upward movement and spring actuated ball latches designated generally 53, are operated by the relative movement between frame 47 and projections 46 on plate 48 to release the latter from frame 47. Plate 48, therefore, remains clamped to arms 50 holding the standing pins on the alley sections 10 by virtue of its engagement with the heads of standing pins.

In order to insure proper registry between pin setter table 44 and clamping plate 48, locator pins 190 (Figure 7), attached to plate 48, enter corresponding hollow projections 192 in the table 44. Any slight disturbance which may have taken place during the tilting of the alley 10 will thus be corrected before the final movement of the table 44 is latched to the plate 48.

Plate 48 is provided with circular openings 194 (Figure 8) positioned to correspond with the location of the pins as spotted on the alley 10. This permits of a greater flexibility of the compression pad 54 allowing for variations in the length

of pins. Flat discs 196 located in the openings 194 of plate 48 and acted on in pairs by a leaf spring 198, supply additional pressure to the pad 54.

As the table 44 moves upward and away from the alley, shaft 43, driven by suitable connections from reversing motor RM controlled in any suitable manner to raise and lower section 10, operates the tilting mechanism through gears 42 and 40 and shaft 38 to gears 36 and 34. This control may be by manually operated switch MC located adjacent the bowler's playing position so that the bowler at the proper time can operate this switch MC to control the operation of motor RM and hence the movement of section 10.

Gear 34 rotates screw 24 causing slide 26 to advance on the bed 23. As the slide 26 advances, it imparts action to the levers 18, 16 and 14, and through their respective motions the alley section 10 will swing upward around the hinges 12 until it is tilted sufficiently to dump any fallen pins (deadwood) left on the alley as a result of the first ball thrown. As shown in Figure 1 in dotted lines, the section 10 is swung to substantially vertical position with all standing pins firmly clamped thereon against movement so that they will remain at all times properly positioned in their on or off spot positions on the alley bed awaiting the throwing of the next ball. The movement of the section 10 is sufficient to allow any fallen pins or "deadwood" in the alley to slide or drop off the alley bed and gutters during the upward movement of section 10, so that all pins usually will be ejected from the alley before the limit of upward movement is reached. When the alley is being cleared of "deadwood", a guard 123, of the type shown and described in Rundell Patent No. 2,250,503, granted July 29, 1941, may be used.

If desired, the movable section 10 may be vibrated in order to agitate the fallen pins and provide more effectively for their discharge from the alley with greater rapidity. Any suitable vibrating device, either mechanical or electric, may be used for this purpose. As shown diagrammatically in Figures 1 and 3, a vibrator V₁ of the so-called "Buhler" type, similar to that disclosed in Roth Patent No. 1,517,587 may be used. This vibrator preferably is attached to the underside of section 10 and is motor driven from motor M. Two switch contacts 33a and 33b, located near the front and at one side of the section 10, are so constructed and arranged that as the section 10 moves upwardly they will engage a curved member 33 mounted on one of the table guide channels (Figure 1), and make a circuit through motor M to drive the vibrator. The amount of vibration will be dependent upon the length of member 33.

With all "deadwood" ejected from the alley, the direction of movement of shaft 43 is reversed by means of switch SC and reversing motor RM, either manually or in any other suitable manner so that the alley section 10 will return to its original position with the standing pins properly positioned thereon. The reversing motor RM can be cut on or off at the limits of section 10 in any desired conventional manner.

When table 44 is again lowered, ball latches 53 (Figure 6) engage plate 48 and connect it to frame 44 ready to be lifted therewith after the gripper levers 50 have released their hold on the plate. The disengagement of gripper levers 50 from plate 48, in order to make it possible for latches 53 to lock it to the table 44, may be ac-

complished in any desired manner, such for instance as by means of two solenoids described hereinafter, reference being made to Figures 2, 3, 5 and 8.

It will be seen, therefore, that the table 44 is adapted to be raised and lowered relative to the pin supporting bed or section 10 after the first ball has been thrown but that it dwells above the alley as in the above referred to Schmidt application, until after a second ball has been thrown so that any pins standing after the throwing of a ball will only be clamped upon the alley after the throwing of the first ball. If a second ball has to be thrown, the section 10 only is moved to dump fallen pins into the pin.

Assuming that the plate 48 is held in clamped relation to levers 50, that fallen pins have been cleared from the alley by movement of the section 10, and that it is desired to reconnect plate 48 to frame 47 of table 44 in order that standing pins may be released and the second ball thrown in order to continue playing the game. When the table moves down so that latches 53 reconnect plate 48 to table 44, said plate will still be held by engagement of surfaces 51a with projections 46. By suitable instructions the bowler will know that at this time he should press a manually operated normally open switch S which makes a circuit from power lines L₁, L₂ through wires 87b, 88a and 88 thereby energizing solenoids 55 and 57 mounted on table 44. This operation causes the solenoids to pull on levers 62 causing them to rock shafts 66. At the end of these shafts are attached levers 70 which cause pusher bars 72 to force gripper fingers 50 out of engagement with projections 46 thereby releasing plate 48 and making it possible for table 44, through the engagement of latches 53 with the plate 48, to lift the plate therewith as the table travels upward. This action releases the standing pins and the next ball can be thrown.

In the event that the first ball knocks down all pins (a strike), the gripper levers 50 are not permitted to disconnect plate 48 from table 44 but will be pushed away so that the table 44 can carry the plate up as the table rises to allow tilting of the alley section 10 to dump any "deadwood" that may remain in the alley.

As the table reaches the position shown in Figure 5, gripper levers 50 engage projections 46 on plate 48, but since there are no pins left standing, the table will continue to descend until projections 46 come to rest on arms 74, as shown in dotted lines on lever 50. While the table 44 travels this distance a plunger 76, slidably mounted in a cylinder 78, fixed to bracket 79 attached to table 44, has contacted a projection 74 on one of the levers 50 and is pushed up into the cylinder against a spring 80 thereby compressing the spring between the top of cylinder 78 and a collar 81 fast to plunger 76. A lever 82 pivoted at 84 on the cylinder 78 and having one end 75 engaging the plunger 76 will thus be made to swing causing the other end of the lever 77 to bridge two contacts 83, 85, thereby closing a circuit 87, 88 connected to power lines L₁ and L₂ to energize the two solenoids 55 and 57 which operate in the manner described above to force levers 50 out of engagement with projections 46 of plate 48. From this it follows that whenever a "strike" is made, plate 48 will remain secured to frame 47 of table 44 and travel upward therewith. Section 10 will be operated by switch MC

to control the operation of reversing motor RM which moves to and from pin discharge position.

Figures 10 and 11 show a modified form of my invention in which the mechanism for clearing the alley of "deadwood", and balls in the event that the latter have not rolled into the pit, without disturbing any pins which may have been left standing after a ball has been thrown, consists of a frame designated 109 mounting a plurality of pusher bars 110 supported by a cross bar 112 fixed to carriages 114 which are arranged to travel in any suitable manner along tracks 116 forming part of the truss shaped structure 109 used for supporting the removing mechanism and swinging the pusher bars 110 to and from the alley. Tracks 116 are fixed at one end to cross bar 125 and at the other end to cross rod 119. Plates 115 may be fixed to bar 112 and carriages 114 to provide added rigidity to the pusher ejecting mechanism.

After the first ball has been thrown, as in the case of the modification just described, the pin setter table 118 is lowered in the same manner until a pressure pad 120 engages the heads of standing pins and due to the weight of the table 118 clamps all remaining standing pins in the exact position each occupied on the alley bed after the throwing of the ball. It is preferred to employ an elastic pad 120 of the type described above, in order to allow for variations in the height of pins. The pins are thus held securely on the alley while the table 118 is lowered in order that the pusher bars 110 may advance and clear off any fallen pins by pushing them into the pit P.

As shown in Figures 10 and 11, the pushers are of varying height and are arranged with increasing height from the outer pushers to the innermost, and create a plow effect in removing fallen pins, that is, pushers 110a are positioned lower than pushers 110d. Each pusher adjacent its pin engaging front end is provided with shoes 111 in order to engage fallen pins and eliminate possible damage to the alley as the frame 109 is lowered. In order to obtain the best possible result in removing from the alley fallen pins, which may be lying between the standing pins clamped upon the alley bed between table 118, the pushers are preferably formed of flat elastic bars so that if and when a pusher engages a standing pin, it will deflect relative thereto and move therepast but still engage a fallen pin and travel it towards and into the pit without exerting such positive force upon standing pins as would cause them to fall over or be misplaced despite the action of the setter table 118 resting thereon. Any desired number of pushers 110 may be used. As illustrated, I have shown one pusher 113 having a curved pin engaging face 113a at its end provided for each gutter. Eight pushers 110 are shown so arranged that normally each will pass between the spotted positions normally occupied by a set of pins on the alley. This disposition of the pushers 110 tends to insure unrestricted movement past standing pins. Obviously, any other desired arrangement or number of pushers can be used.

Located adjacent the rear end of the tracks 116 is a transverse bar guard 123 extending between the alley gutters so that when the frame 109 is lowered, the guard will be positioned adjacent the alley and prevent unwanted balls or objects from being thrown along the alley bed into the pit during the sweeping operations. Guard 123

is mounted at 127 to frame 109 and has a middle lever support 125 braced to cross bar 129 of the frame 109.

Carriages 114 are provided with rollers 117 so that the carriages may roll along tracks 116. The mechanism for moving the pusher system 110 back and forth relative to tracks 116 after each ball has been thrown, may consist of any suitable device such as a cable 122 attached to each end of the spaced carriages 114. A reference to Figure 10 will show that cable 122 passes over a pulley 124 mounted at the front end of the frame 109 thence over guide pulley 128 and grooved drum 126 to pulley 130 at the opposite end of the carriage 116. Grooved pulley 126 is fixed to shaft 132. Since two pulleys and cable systems are used, one set on each side of the alley, and shaft 132 connects the two sets and transmits the drive to the two sets, only one set has been described.

To one end of shaft 132 is attached a gear 134 which meshes with a gear 136 journalled on a stud shaft 138 mounted in a bracket 139 on upright U of the machine. A sprocket 140 also journalled on shaft 138 and secured to gear 136 is driven by a chain 142 connected in a suitable manner with the drive of the machine. After the pushers 110 have completed their forward and return movement, the entire unit 109 is swung away to clear the alley, pin setter table 118 having been raised from the alley in the meantime freeing the pins which remain in their identical positions for further play. Since table 118 operates in the same manner as that shown in said Schmidt application referred to above, any pins remaining standing on the alley after a second ball has been thrown will not be held by pad 120 and so will be pushed with fallen pins into the pit.

The mechanism for swinging the pusher unit 109 may be constructed and operated in a manner similar to that set forth in Rundell Patent No. 2,250,503 for Pin removing and guard mechanism for bowling alleys filed December 29, 1938. A preferred form of mechanism consists of a cable 144 attached to an arm 146 which is pivoted on shaft 132 on which is also pivoted the truss shaped frame 109 mounting the pusher unit. Cable 144 is attached to drum 148 fixed to a shaft 150. All parts 144, 146 and 148 are duplicated with one set on each side of the alley shaft 150, which connects the two sets and transmits the drives to the two sets through a gear 152 meshing with gear 154 on shaft 156 which shaft has fixed thereto a sprocket 158 tracking a sprocket chain 160 suitably driven from the main drive shaft.

In the modification of my invention disclosed in Figures 11 to 15, inclusive, I provide pneumatic means for clearing the alley of fallen pins left there after each ball of a frame has been thrown.

The general construction and operation of this mechanism is substantially the same as that described in the modifications shown in Figures 9 and 10, with the difference that nozzles for emitting compressed fluid, such as air, have been substituted for the pusher bars. The nozzles are adapted to advance towards the pins when frame 109 has been lowered from dotted line (Figure 11) to full line position, as do the pusher bars in the construction shown in Figures 9 and 10, but their function ordinarily is not to establish physical contact with the pin but to direct the air blast in such a manner as to subject the pins to

its force and compel the fallen pins to be swept into the pit.

It will be seen that frame 109, as in the case of the form shown in Figures 9 and 10, is provided with spaced side tracks or guides 116 in which travel carriages 114a connected to cross bar 112a to form a substantially rigid traveling support for the several conduits 170—176 provided with nozzles a—e, respectively, for directing compressed air against fallen pins. Preferably, each nozzle is flattened for better distribution of air. The several conduits 170—176 are individually fixed to cross bar 112a by suitable clamps 169. Connected to the end of each conduit adjacent bar 112a is a flexible tube or hose 180, each leading to a control valve AV which regulates the manner in which compressed air is introduced into the conduits. The same carriage operating mechanism and frame lifting device used for positioning and translating pushers 110a, 110d relative to and along the alley bed may be employed.

While the nozzles are not expected to function as pushers, conditions of the "deadwood" may at times be such that the nozzles would actually come in contact with some fallen pins, particularly where pins would have fallen into the gutter. This would in no way be objectionable but could actually prove to be an advantage.

The nozzles a—f are so arranged and positioned that the center nozzles e are the shortest, while those acting with respect to the gutter are the longest. This insures that fallen pins nearest the pit will be positively acted upon by the nozzles. In effect the nozzles are located along a V, corresponding to lines assumed by the outermost pins.

The air conducting system is, as in the case with the mechanism for operating the mechanism parts, preferably made up in two units—one right hand and one left hand—each supplying air to its half of the alley. The air is led into each conduit out nozzle through a valve which distributes it through flexible conductors 180 to the respective nozzles.

The valve selected for purposes of illustration is of the rotary type and it is considered an advantage to have it rotate continuously and only admit air to the valve during the period when the nozzles are advancing towards the pins. The rotary valves may have a double outlet, diametrically opposite each other, permitting air to enter two nozzles simultaneously in each side, four nozzles, therefore, emitting blasts of air at the same time. Obviously any desired arrangement relating to the introduction of air to the conduits may be used.

Referring to the drawings, Figures 11 to 15, inclusive, the air enters the valve at 210 (Figure 14) and is directed into two channels, 212 and 214, 180° apart and thus will enter the flexible conductors 180 through outlet plate 216 as the valve openings pass by their respective connections at the outlet plate. The valve openings 212 and 214 preferably are elongated (Figure 15) so as to admit air to the adjoining outlet as the valve begins to close the outlet which has just been active.

The flexible conduits 180 connect the outlets a, b, c, d, e and f in the outlet plate 216 (Figure 13) to their respective nozzles a, b, c, d, e and f (Figure 12) so that nozzles a and d, b and e, c and f, will emit air blasts, in pairs, progressively as the nozzles are advancing towards the pins. Thus, four nozzles will operate continu-

ously during this period creating an effective pulsating action of the air, sweeping the pins before it and into the pit.

The valve is driven by a sprocket 220 attached to the stem 221 of the valve body. A chain 222 engaging sprocket 220 is driven by the main drive.

The invention above described may be varied in construction within the scope of the claims, for the particular device, selected to illustrate the invention, is but one of many possible concrete embodiments of the same. It is not, therefore, to be restricted to the precise details of the structure shown and described.

What is claimed is:

1. In a bowling pin setting machine for use with an alley having a pin supporting bed and a pit adjacent said bed, a device for holding on said bed in their respective off or on spot positions all pins remaining standing after the throwing of a ball, said device including coaxing pin engaging and clamping members, means for clearly said alley of all fallen pins while said standing pins are held clamped on said bed, and means for preventing operation of said clamping members whenever all pins are felled by the first ball of a frame thrown.

2. In a bowling pin setting machine for use with a bowling alley having a pin supporting bed, a pin handling device movable into engagement with standing pins after a ball has been thrown, means carried by said device for clamping said standing pins upright on said alley bed in their respective off or on spot positions, and means operative while said pins are thus clamped for clearing said alley of fallen pins.

3. In a bowling pin setting machine for use with a bowling alley having a pin supporting bed, a pin handling device movable into engagement with standing pins after a ball has been thrown, means carried by said device for clamping said standing pins upright on said alley bed in their respective off or on spot positions, means operative while said pins are thus clamped for vibrating said bed while said fallen pins are being removed from said alley.

4. In a bowling pin setting machine for use with a bowling alley having a pin supporting bed, and a pit adjacent said bed, means constructed and arranged to engage the upper body portions of standing pins for holding on said bed against movement therefrom or relative thereto all pins remaining standing after the throwing of a ball, and means for removing all fallen pins from said alley while said standing pins are held immovable thereon.

5. In a bowling pin setting machine for use with an alley having a pin supporting surface and a pit adjacent said surface, a device movable to and from said surface for holding on said surface against movement relative thereto or therefrom standing pins remaining after a ball has been thrown, and means operative after said ball has been thrown for ejecting all fallen pins from said alley into said pit, said device being constructed and arranged to be moved away from said alley after the same has been cleared of fallen pins.

6. In a bowling pin setting machine for use with a bowling alley having a pin supporting bed and a pit adjacent said bed, a device movable towards and from said bed after a ball has been thrown, a member carried by said device for engaging the head ends of any pins standing on

said bed after said ball has been thrown, means for detaching said member from said device for holding said standing pins immovable on said bed, means for clearing said alley of fallen pins while said pins are held, means for re-attaching said member to said device, and means operative whenever all pins are felled by the first ball of a frame thrown for maintaining said pin holding member attached to said device.

7. A bowling pin setting machine for use with an alley having a pin supporting bed, and a pit at the end thereof, comprising a pin handling elevator movable toward said alley bed after a ball has been thrown to hold any pins standing against said bed, and means moving in a substantially horizontal plane relative to said standing pins for removing fallen pins from said bed and into said pit.

8. A bowling pin setting machine for use with an alley having a pin supporting bed and a pit, comprising a pin elevator, pin handling elements carried by said elevator for setting pins on said alley, and a plate carried by said elevator, said elevator being movable towards said bed to clamp standing pins between said plate and bed.

9. A bowling pin setting machine for use with an alley having a pin supporting bed and a pit, comprising a pin elevator, pin handling elements carried by said elevator for setting pins on said alley, a plate carried by said elevator, said elevator being movable towards said bed to clamp standing pins between said plate and bed, and means operative while said pins are clamped for removing all fallen pins and unwanted objects from said alley.

10. A bowling pin setting machine for use with an alley having a pin supporting bed and a pit, comprising a pin handling table movable to and from said bed for setting a predetermined number of pins thereon in playing arrangement, a detachable plate carried by said table, means for detaching said plate from said table to clamp any pins remaining on said alley bed after the throwing of a ball, and means for reconnecting said plate to said table after fallen pins and unwanted objects have been removed from said alley.

11. A bowling pin setting machine for use with an alley having a pin supporting portion and a pit, comprising a pin setting table movable to and from said bed for setting a predetermined number of pins on said bed in playing arrangement, a detachable plate carried by said table, means operative after a ball has been thrown for detaching said plate from said table for holding any standing pins on said portion in their respective on or off spot positions, means for removing all fallen pins from said alley while said pins are thus clamped, and means for re-attaching said plate to said table after removal of said fallen pins.

12. A bowling pin setting machine for use with an alley having a pin supporting portion and a pit, comprising a pin setting table movable to and from said bed for setting a predetermined number of pins on said bed in playing arrangement, a detachable plate carried by said table, means operative after a ball has been thrown for detaching said plate from said table for holding any standing pins on said portion in their respective on or off spot positions, means for shifting said portion and pins held thereon relative to said pit for gravity discharge of fallen pins lying on said portion, and means for returning said

portion to its initial position after removal of said pins.

13. A bowling pin setting machine for use with an alley having a pin supporting portion and a pit, comprising a pin setting table movable to and from said bed for setting a predetermined number of pins on said bed in playing arrangement, a detachable plate carried by said table, means operative after a ball has been thrown for detaching said plate from said table for holding any standing pins on said portion in their respective on or off spot positions, means for shifting said portion and pins held thereon relative to said pit for gravity discharge of fallen pins lying on said portion, means for returning said portion to its initial position after removal of said pins, and means for releasing said plate from said pins to free said pins for further playing and for re-attaching said plate to said table.

14. A bowling pin setting machine for use with a bowling alley having a pin supporting bed and a pit adjacent said bed, means mounting said bed for movement into and out of normal horizontal position, means operative after a ball has been thrown for engaging the upper body portions and clamping any remaining standing pins on said bed against movement therefrom or relative thereto, and means operative while said pins are thus clamped for moving said bed relative to said pit for ejecting fallen pins by gravity from said alley into said pit.

15. A bowling pin setting machine for use with a bowling alley having a pin supporting bed and a pit adjacent said bed, means mounting said bed for movement into and out of normal horizontal position, means operative after a ball has been thrown for clamping any remaining standing pins on said bed against movement therefrom or relative thereto, means operative while said pins are thus clamped for moving said bed relative to said pit for ejecting fallen pins by gravity from said alley into said pit, and means operative while said bed is being moved for vibrating the same to assist in the removal of fallen pins.

16. A bowling pin setting machine for use with a bowling alley having a pin supporting bed and a pit adjacent said bed, means operative after a ball has been thrown for engaging the upper body portions and holding in upright position on said bed and in their respective on or off spot positions any pins remaining standing thereon, and means operative while said pins are thus held for removing fallen pins from said alley into said pit.

17. In a bowling pin setting machine for use with a bowling alley having a pin supporting bed and a pit adjacent said bed, a device movable into engagement with standing pins remaining upright on said alley after a ball has been thrown, means carried by said device for clamping said standing pins upright on said alley bed in their respective off spot or on spot positions, said means comprising a yielding pin engaging member constructed and arranged to bear against the head ends of said pins, and means operative while said pins are thus clamped for clearing said alley of fallen pins and projecting them into said pit.

18. In a bowling pin setting machine for use with a bowling alley having a pin supporting bed and a pit adjacent said bed, a device movable into engagement with standing pins remaining upright on said alley after a ball has been thrown, means carried by said device for clamping said standing pins upright on said alley bed in their respective off spot or on spot positions, said means comprising a yielding pin engaging member con-

structed and arranged to bear against the head ends of said pins, means operative while said pins are thus clamped for clearing said alley of fallen pins and projecting them into said pit, and means preventing movement of balls over said pin supporting bed while said pins are clamped thereon.

19. In a bowling pin setting machine for use with a bowling alley having a pin supporting bed and a pit adjacent said bed, a frame movable towards said bed and into engagement with standing pins after a ball has been thrown, mechanism mounted on said member for clamping said standing pins on their respective off spot or on spot positions including, a plate, yielding members carried by said plate for holding said standing pins upon said alley, and means operative while said pins are so held for removing fallen pins therefrom.

20. In a bowling pin setting machine, the combination with an alley having a bed supporting a plurality of pins in playing position, of a pin handling member located above said bed and movable after the throwing of a ball into engagement with the tops of standing pins for holding said pins upright on said bed, and means operative while said pins are held by said member for removing fallen pins from said alley.

21. In a bowling pin setting machine, the combination with an alley having a pin supporting bed, of a pin handling member mounted above said bed for movement to and from said bed after a ball of a frame has been thrown, and selective means for causing said member to clamp any pins which remain standing after the throwing of the first ball of a frame only and hold said pins immovable in their respective on or off spot positions on said bed, while said member is moving away from said bed.

22. In a bowling pin setting machine, the combination with an alley having a pin supporting bed, of a pin handling member mounted above said bed movable to and from said bed after a ball has been thrown, selective means for causing said member to clamp any pins which remain standing after the first ball only of a frame has been thrown and hold said pins immovable thereon, and means operative while said pins are held clamped thereon for removing any fallen pins from said alley after each ball has been thrown.

23. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins therein, and means associated with said device for engaging the tops of any pins remaining standing after the throwing of a ball for holding said pins immovable on said alley portion while said device moves away from said portion.

24. In a bowling pin setting machine for an alley having a pin supporting position and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means associated with said device for engaging the tops of any pins remaining standing after the throwing of a ball for holding said pins immovable on said alley portion, and means for removing fallen pins from said alley while said pins are so held.

25. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means associated with said device for engaging the tops of any pins remaining standing after the

throwing of a ball for holding said pins immovable on said alley portion, means for removing fallen pins from said alley while said pins are so held, said last named means comprising a carriage positioned above said alley, and means carried by said carriage for effecting removal of said fallen pins.

26. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means associated with said device for engaging the tops of any pins remaining standing after the throwing of a ball for holding said pins immovable on said alley portion, means for removing fallen pins from said alley while said pins are so held, said last named means comprising a carriage, a plurality of pin engaging elements carried by said carriage, and means for moving said carriage back and forth above said alley portion to cause said elements to engage and push any fallen pins from said alley into said pit.

27. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, and means carried by said device constructed and arranged to engage the tops of any standing pins after the throwing of a ball for holding said pins immovable in their on or off spot positions on said alley, said means comprising a compressible member, and means for removing from said alley any fallen pins while said member engages said standing pin tops.

28. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means carried by said device constructed and arranged to engage the tops of any standing pins after the throwing of a ball for holding said pins immovable in their on or off spot positions on said alley, said means comprising a compressible member, a frame movable into a position adjacent said alley after a ball has been thrown, and means carried by said frame operable while said pins are held by said member for removing from said alley all fallen pins.

29. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means carried by said device constructed and arranged to engage the tops of any standing pins after the throwing of a ball for holding said pins immovable in their on or off spot positions on said alley, said means comprising a compressible member, a frame movable into a position adjacent said alley after a ball has been thrown, a carriage mounted on said frame, ejecting members carried by said carriage, and means for operating said members to effect the removal of fallen pins from said alley.

30. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means associated with said device for engaging the tops of any pins remaining standing after the throwing of a ball for holding said pins immovable on said alley portion, means for removing fallen pins from said alley while said pins are so held, and means for controlling the passage of said fluid through said members.

31. In a bowling pin setting machine for an

alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means carried by said device constructed and arranged to engage the tops of any standing pins after the throwing of a ball for holding said pins immovable in their on or off spot positions on said alley, a frame movable into proximity with said alley after a ball has been thrown, a carriage mounted for movement on said frame above said alley, a plurality of ducts fixed to said carriage and extending towards the positions normally occupied by said pins, and means for introducing compressed air into said ducts to force fallen pins from said alley into said pit.

32. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means carried by said device constructed and arranged to engage the tops of any standing pins after the throwing of a ball for holding said pins immovable in their on or off spot positions on said alley, a frame movable into proximity with said alley after a ball has been thrown, a carriage mounted for movement on said frame above said alley, a plurality of ducts fixed to said carriage and extending towards the positions normally occupied by said pins, means for introducing compressed air into said ducts to force fallen pins from said alley into said pit, and means for moving said carriage towards said pit while said compressed air is being ejected from said ducts.

33. In a bowling pin setting machine for an

alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means carried by said device constructed and arranged to engage the tops of any standing pins after the throwing of a ball for holding said pins immovable in their on or off spot positions on said alley, a frame movable into proximity with said alley after a ball has been thrown, a carriage mounted for movement on said frame above said alley, a plurality of ducts of varying lengths mounted in spaced relation on said carriage, and means for introducing compressed air through said ducts to force fallen pins from said alley into said pit.

34. In a bowling pin setting machine for an alley having a pin supporting portion and a pit adjacent said portion, a device movable to and from said portion for setting pins thereon, means carried by said device constructed and arranged to engage the tops of any standing pins after the throwing of a ball for holding said pins immovable in their on or off spot positions on said alley, a frame movable into a position adjacent said alley after a ball has been thrown, means carried by said frame operable while said pins are held by said member for removing from said alley all fallen pins, and a guard located at the front of said frame constructed and arranged to be positioned adjacent said alley when said frame has been moved into operative position for preventing unwanted objects from moving over said alley portion while said ejecting members are in operation.

MOREHEAD PATTERSON.