Nov. 24, 1931. J. C. BACKUS 1,833,813

PIN SETTING APPARATUS

Filed July 14, 1926 6 Sheets-Sheet 1

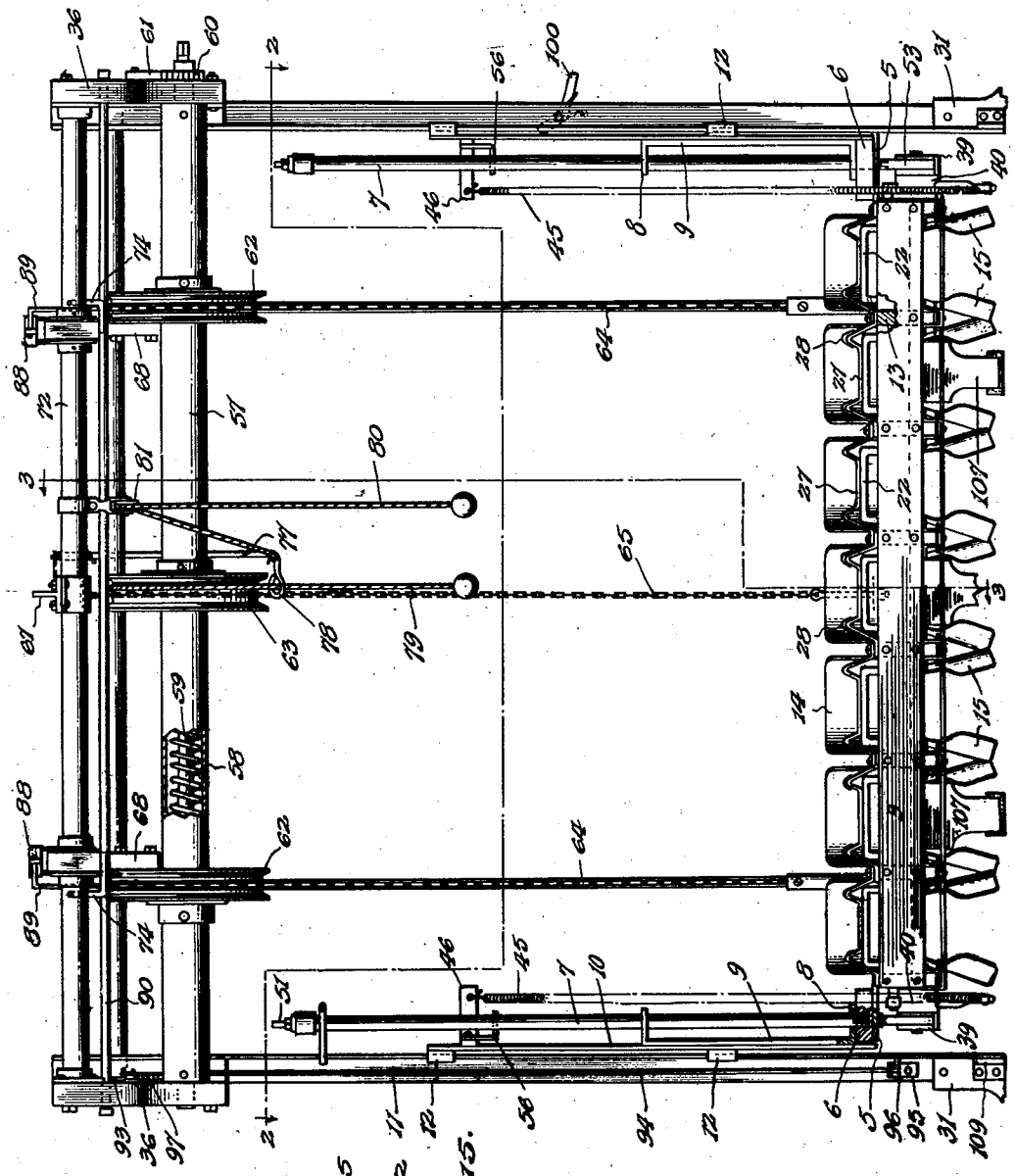


Fig. 1.

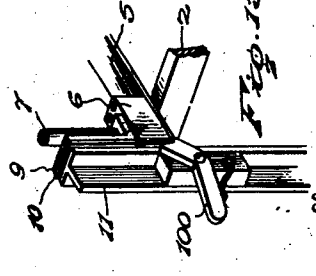


Fig. 15.

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Nov. 24, 1931. J. C. BACKUS 1,833,813

PIN SETTING APPARATUS

Filed July 14, 1926 6 Sheets-Sheet 2

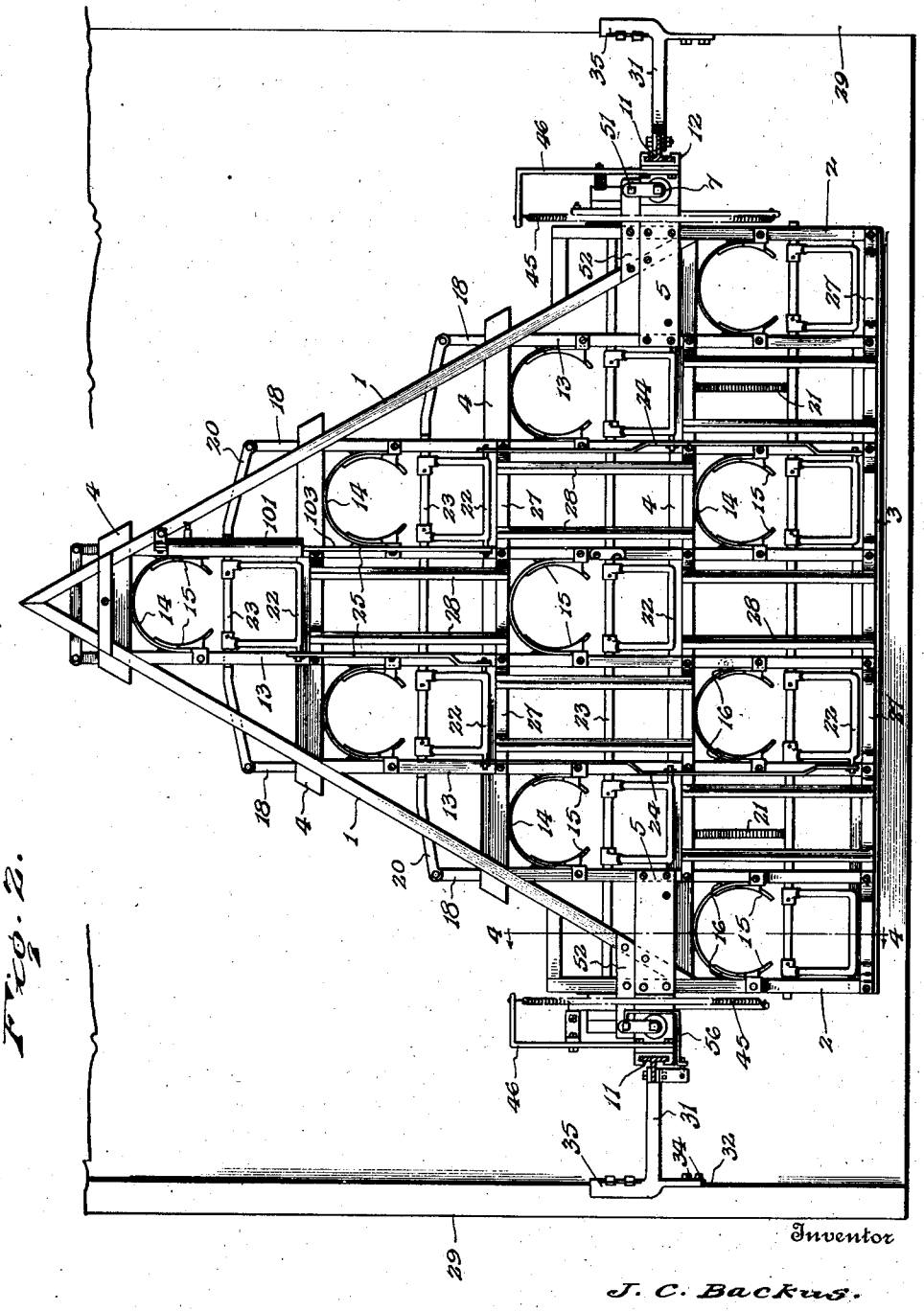


Fig. 2.

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PIN SETTING APPARATUS

Filed July 14, 1926 6 Sheets-Sheet 3

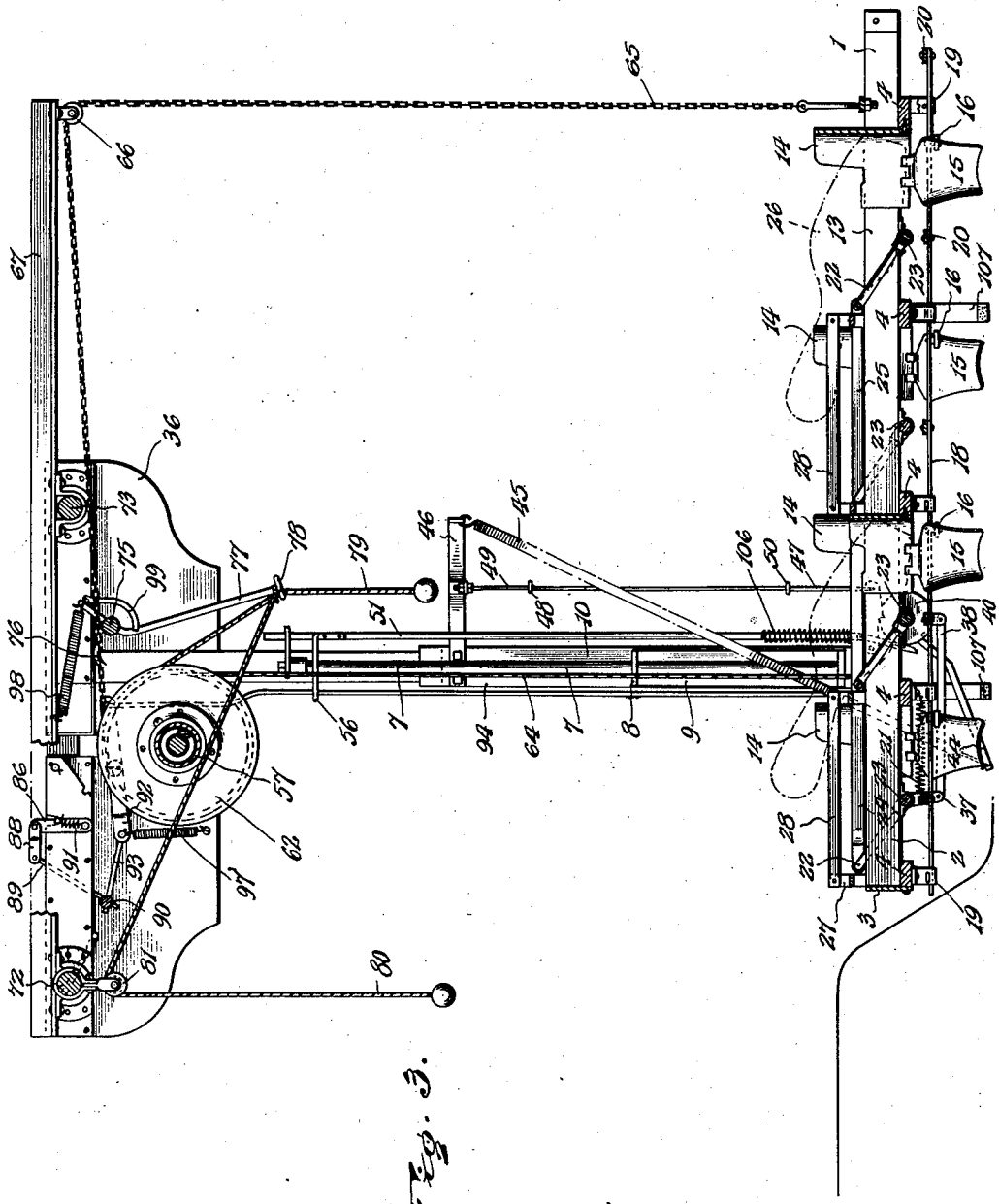


Fig. 3.

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Nov. 24, 1931. J. C. BACKUS 1,833,813

PIN SETTING APPARATUS

Filed July 14, 1926 6 Sheets-Sheet 4

Fig. 4.

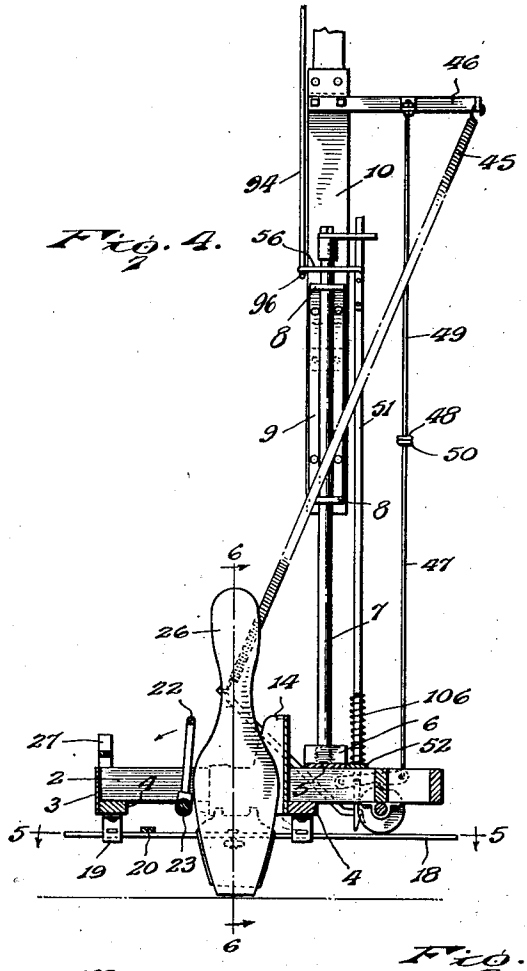



Fig. 5.

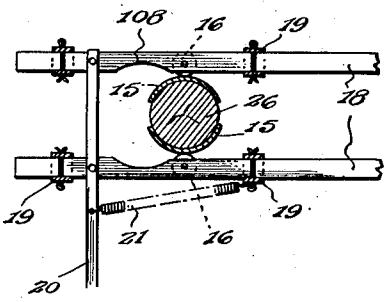



Fig. 6.

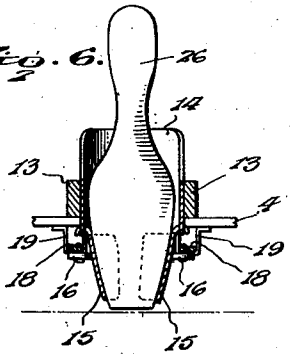



Fig. 13.

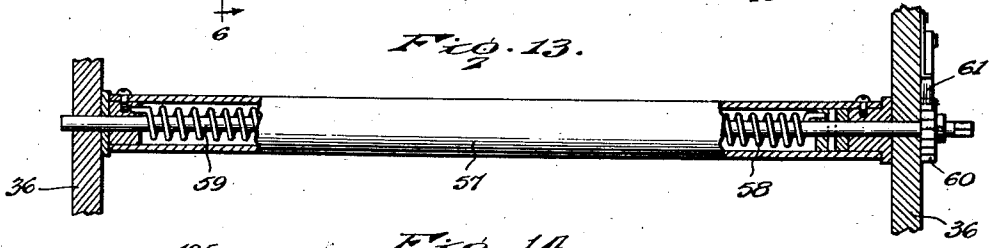
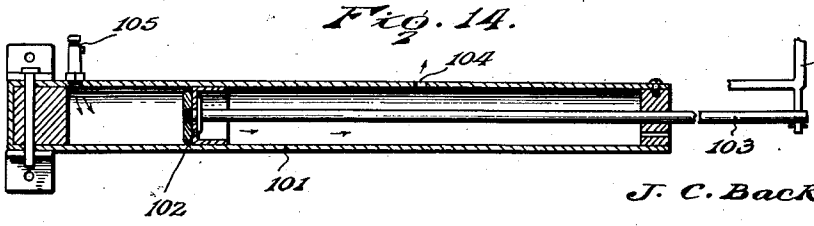



Fig. 14.




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Nov. 24, 1931. J. C. BACKUS 1,833,813

PIN SETTING APPARATUS

Filed July 14, 1926 6 Sheets-Sheet 5

Fig. 7.

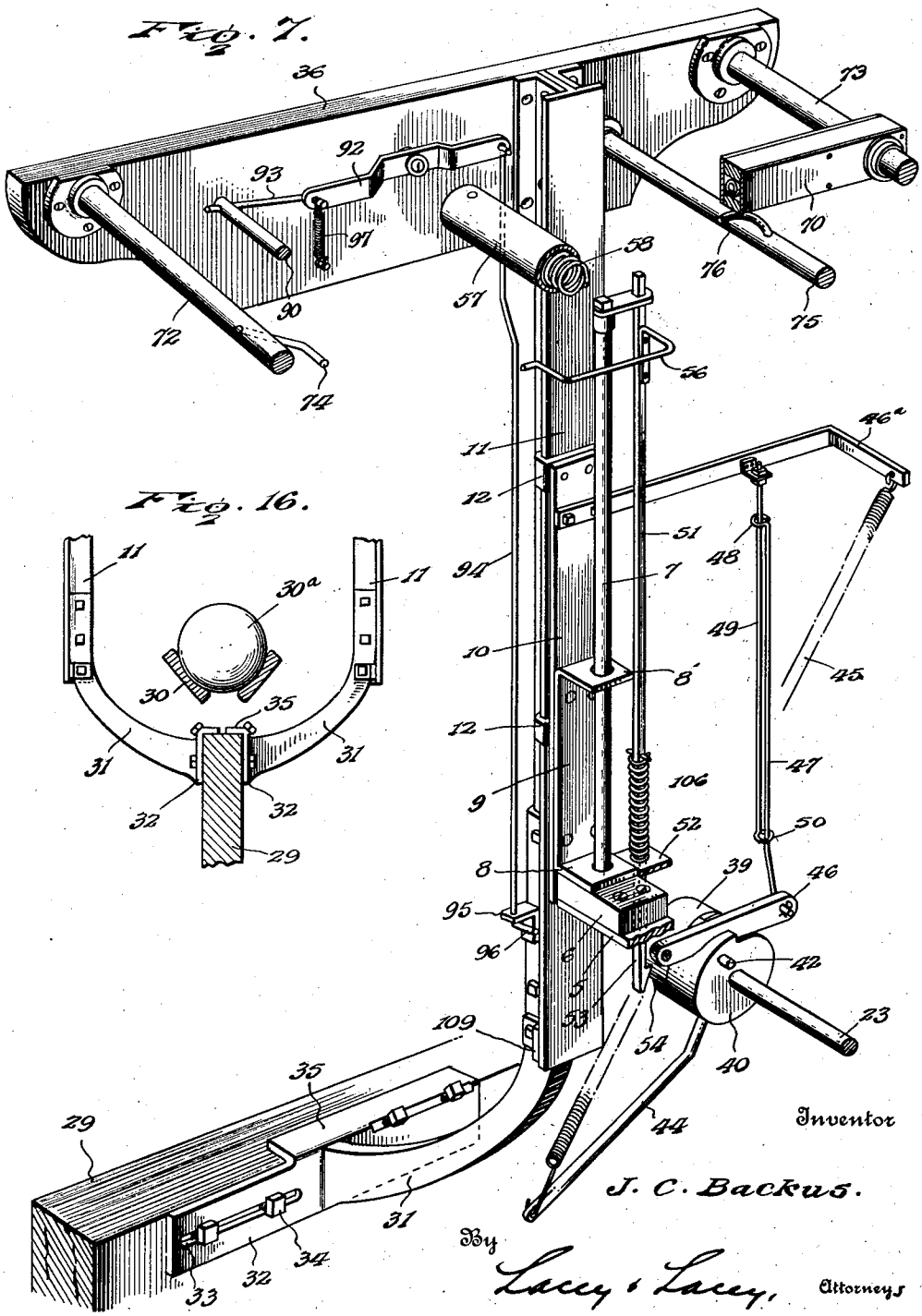



Fig. 16.




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Nov. 24, 1931. J. C. BACKUS 1,833,813

PIN SETTING APPARATUS

Filed July 14, 1926 6 Sheets-Sheet 6

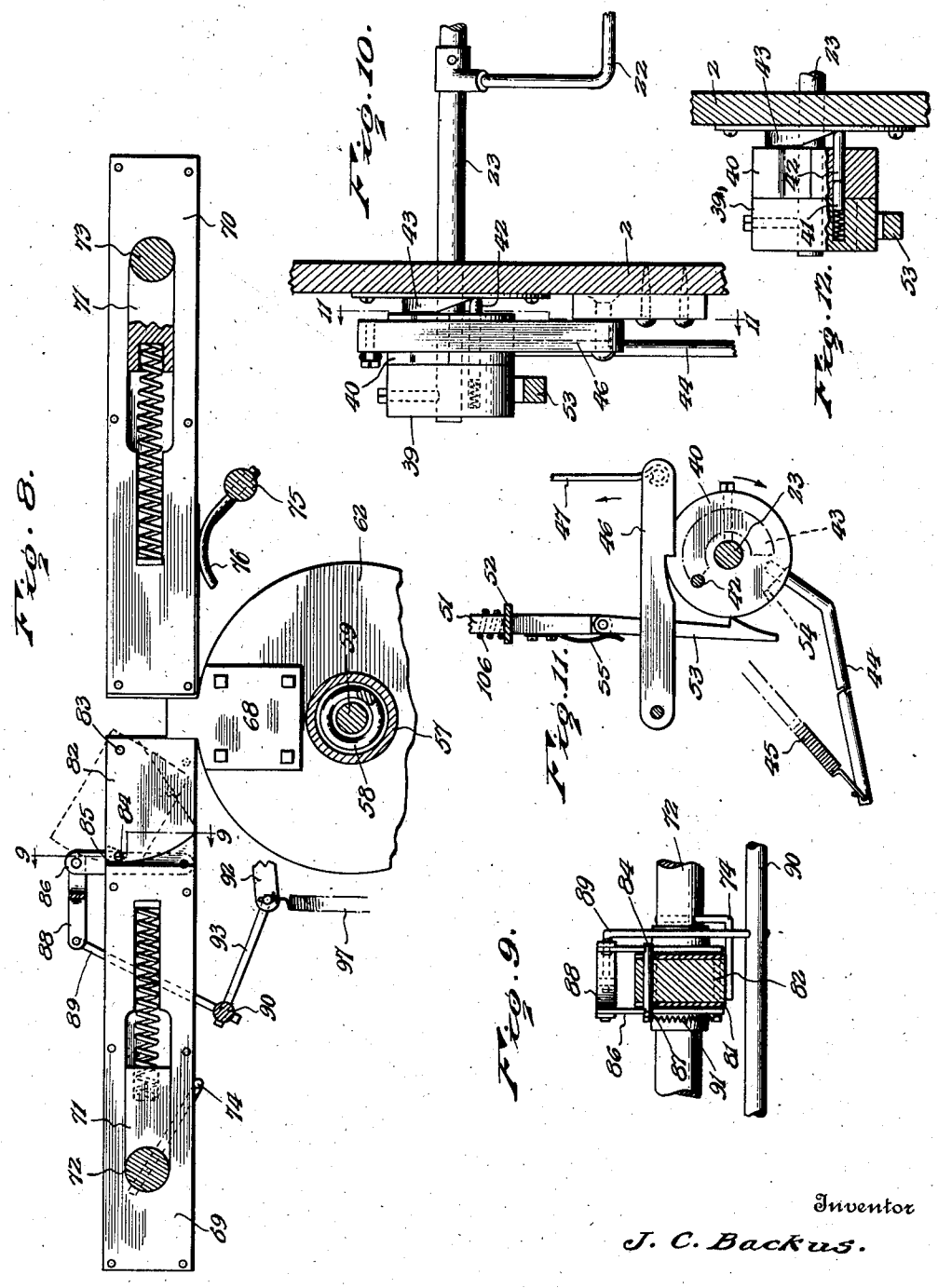


Fig. 8.

Fig. 10.

Fig. 12.

Fig. 11.

Fig. 9.

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Patented Nov. 24, 1931 1,833,813

# UNITED STATES PATENT OFFICE

JOHN CLAYTON BACKUS, OF SMETHPORT, PENNSYLVANIA; HAMLIN BANK & TRUST COMPANY AND FRED BIEVER, OF SMETHPORT, PENNSYLVANIA, EXECUTORS OF SAID JOHN CLAYTON BACKUS, DECEASED

## PIN SETTING APPARATUS

Application filed July 14, 1926. Serial No. 122,434.

This invention relates to apparatus for setting and spotting the pins of bowling alleys and provides an organism which may be supplied as a unit, or built in as occasion may require.

The invention includes a carrier frame mounted for vertical movement and adapted to receive the pins when elevated and deposit them upon the bed of the alley gently and without noise or shock, there being counterbalancing means, preferably a spring roller, associated with the carrier frame to control its movements and automatically return it to normal position after being lowered upon the alley.

The invention contemplates locking means, both for holding the pin carrier elevated and lowered, the one being releasable by hand and the other being actuated automatically to permit the pin carrier to return to normal elevated position after being lowered.

The invention further supplies pin holding means for gripping the pins and preventing their sudden delivery upon the bed of the alley and means for gradually releasing the grip upon the pins whereby the latter drop gently upon the alley without any noise or shock.

It is a further purpose of the invention to utilize the descent of the carrier for tensioning a spring which, when released, operates the pin uprighting mechanism and the frame for closing the pin clamps, the rearward movement of the clamp operating frame tensioning spring means which, when released, moves the frame in an opposite direction to release the pins, the relaxing of the grip upon the pins being gradual so that the pins are delivered upon the bed of the alley gently.

The invention also provides an apparatus of the general character specified which is neat and symmetrical in appearance, free from any cumbersome effects and open so as not to obstruct the view and cast shadows upon the alley.

The invention furthermore provides an apparatus which is positive in action both in setting and spotting the pins and which, when initially operated is automatic in action in depositing the pins upon the bed of the alley and the returning of the carrier frame to normal position and locking the same for the next operation.

While the drawings show a practical embodiment of the invention and a preferred structural organization, nevertheless, changes may be resorted to in adapting the invention to meet varying conditions without departing from the spirit thereof, as defined in the sub-joined claims.

Referring to the drawings hereto attached,—

Figure 1 is a rear view of a ten pin setting apparatus embodying the invention, parts being broken away,

Figure 2 is a horizontal section on the line 2—2 of Figure 1,

Figure 3 is a vertical longitudinal sectional view on the line 3—3 of Figure 1, looking in the direction of the arrows, the dotted lines showing the position of the pins when placed upon the carrier,

Figure 4 is a vertical, longitudinal sectional view on the line 4—4 of Figure 2, looking in the direction of the arrows, showing the position of the parts after the pins have been uprighted and gripped by the clamps preliminary to their delivery upon the bed of the alley.

Figure 5 is a detail sectional view on the line 5—5 of Figure 4,

Figure 6 is a detail sectional view on the line 6—6 of Figure 4,

Figure 7 is an enlarged detail perspective view of a side portion of the apparatus, showing the normal position of the parts,

Figure 8 is a fragmentary sectional view of the spring roller, the locking means associated therewith, and adjunctive parts, showing the same on a larger scale,

Figure 9 is a detail sectional view on the line 9—9 of Figure 8, looking to the left, as designated by the arrows,

Figure 10 is a fragmentary sectional view of a portion of the carrier frame, an end portion of one of the shafts of the pin uprighting mechanism, the loose pulleys mounted on said shaft and the cam for effecting a release of the pulleys,

Figure 11 is a fragmentary sectional view on the line 11—11 of Figure 10, looking in the direction of the arrows, the dotted lines showing the position of the cam,

Figure 12 is a detail view of the parts illustrated in Figure 10, the pulleys being partly in section to show more clearly the locking mechanism,

Figure 13 is a detail view of the spring roller operating as counterbalancing means for the carrier frame and parts movable therewith,

Figure 14 is a detail sectional view of the means for effecting a gradual release of the pins to permit their delivery upon the bed of the alley, without any noise, or shock,

Figure 15 is a fragmentary view in perspective of a portion of one of the guides and carrier frame showing the latch for holding said frame elevated when not required for active service, and

Figure 16 is a detail view showing the usual runway for the balls and the dividing strip between adjacent alleys, and the means for supporting the guides of adjacent pin setting apparatus.

Corresponding and like parts are referred to in the following description and designated in the several views of the drawings by like reference characters.

The apparatus comprises a carrier, a pin shifter mounted upon the carrier and adapted to adjust the pins to upright or vertical position for delivery, gripping means for holding the pins, whereby to prevent a sudden discharge thereof upon the alley, means for effecting a gradual release of the pins to admit of their delivery upon the alley without any appreciable shock or noise, locking means for securing the carrier both when elevated and when lowered, means for automatically tripping the lower locking means to permit return of the carrier to normal position after the automatic delivery of the pins upon the alleys, counterbalancing means for the carrier and pins placed thereon adapted to automatically return the carrier to normal position after being relieved of the weight of the pins when discharged upon the alley, and guide means mounting the carrier and directing the same in its vertical movements towards and away from the alley when in action.

The carrier consists of a frame approximately of triangular form and including oppositely inclined side members 1, parallel longitudinal members 2 and a rear transverse member 3. A plurality of parallel cross members 4 connect the side members 1 and project a short distance beyond the side members, as shown most clearly in Figure 2. The cross members 4 vary in length and serve to stiffen and reinforce the carrier frame besides providing supporting means for the pin shifter and adjunctive parts. Short bars 5 project laterally from opposite sides of the carrier frame and each receives a block 6 which is secured to its outer end. Each of these blocks has a vertical rod 7 attached thereto and passing loosely through the bent ends 8 of a vertical plate 9 attached to a vertical plate 10 which is slidably mounted upon a vertical guide 11 attached to a convenient portion of the alley. The guide 11 preferably consists of a metal bar of T-form and the plate 10 is provided with upper and lower clips 12 which embrace opposite edge portions of the guide 11 to hold the plate 10 in given position and direct it in its vertical movements. A plurality of longitudinal bars 13 are disposed between the side members 1 and the rear transverse member 3 in parallel relation and equi-distantly spaced. The bars 13 are located in the plane of the members 1 and 3 and are connected thereto in any preferred way and constitute a part of the carrier frame and provide supporting means for the pin shifter and coordinate parts. The cross members 4 are secured to the longitudinal bars 13, as well as to the side members 1. Pin stops and guides 14 are attached to the longitudinal bars 13 and are arranged to coincide with the position of the pins when properly set upon the alley. The pin stops and guides 14 are preferably of sheet metal, although any suitable material may be utilized in forming the same, and they are of circular outline to conform to the major diameter of the pins to admit of their free passage therethrough when discharging upon the alley, The rear portion of the pin stops and guides 14 is cut away, as shown most clearly in Figure 2, to provide clearance for the pins when placed in position upon the carrier, as indicated by the dotted lines in Figure 3. The front portion of the pin stop and guide 14 is extended vertically a distance to insure arresting of the forward movement of the pins when thrown upon the carrier in a none too careful manner by an attendant. The upper rear side portions of the pin stops and guides are cut away, as shown most clearly in Figure 3 of the drawings, for clearance to admit of free movement of the pins from a recumbent position as indicated in the dotted lines in Figure 3, to an upright or vertical position, as shown in Figure 4 of the drawings.

A pair of clamps 15 is associated with each of the pin stops and guides 14 and the clamps of each pair are disposed at opposite sides of the respective pin stops 14 and are pivoted to the bars 13. The clamps 15 are curved to conform to the diameter of the pins, so as to grip the sides thereof to insure a proper spotting of the pins when delivered upon the alley. The clamps 15 are preferably formed of sheet metal and they are pivoted to the carrier frame at their upper ends so as to swing laterally at their lower ends. The

curvature of the clamps also results in the provision of cams for cooperation with elements 16, whereby the clamps are closed in the operation of the apparatus. The clamp operating elements 16 preferably consist of rollers which are mounted upon longitudinal bars 18 disposed beneath the respective bars 13 and slidably mounted in hangers 19 attached to the respective cross members 4. The longitudinal bars 18 are connected by cross bars 20, whereby to form a clamp operating frame which has a limited longiudinal movement to effect a closing of the clamps and a release thereof to admit of a discharge of the pins. Coil springs 21 form yieldable connecting means between the carrier frame and the clamp operating frame and these springs normally hold the clamp operating frame at the limit of its forward movement and exert a rearward pull thereon when said springs are subjected to tension in a manner hereinafter to be described.

The pin shifter or uprighting means includes a plurality of U-shaped elements 22 and transverse shafts 23 to which the respective lifting elements 22 are connected, whereby the shafts and lifting elements move in unison. A lifting element 22 is provided for each pin stop and guide 14 and is located rearwardly thereof and normally inclines, as indicated most clearly in Figure 3 of the drawings. The several shafts 23 are mounted in bearings applied to the carrier frame and increase in length from the front to the rear of the carrier frames. so that the front shaft is the shortest and receives a single lifting element 22, whereas the rear shaft 23 is the longest and has four lifting elements 22 mounted thereon. The several shafts are connected in series by means of links 24 and 25 to insure synchronous movement of the shafts and lifting elements. The links 25 connect the lifting elements of the front and the second shafts. The links 24 connect the lifting elements of the second, third and last shafts. When the shafts 23 are rotated in a clock-wise direction, the lifting elements 22 are elevated from the inclined position shown in Figure 3, to the upright or approximately vertical position shown in Figure 4, with the result that the pins 26 are uprighted preliminary to their discharge upon the alley.

A pin rest and guide is associated with each of the pin stops and guides 14 to receive the pins 26 when supplied to the carrier preliminary to being placed upon the alley. The pin rests and guides comprise U-shaped elements 27 which are attached to the carrier frame. Longitudinal bars 28 connect corresponding front and rear elements 27 and are spaced apart a distance to receive and support the pins 26 when placed thereon and moved forwardly to the respective positions to engage the stops 14 and lifting elements 22, as indicated by the dotted lines in Figure 3 of the drawings. The elements 27 associated with the rearmost pin stops 14 and lifting elements 22 do not require the association of bars 28 therewith, because of their position. The pin rests and guides are fixed and may be mounted upon the carrier frame in any preferred way and serve as convenient means for receiving, supporting and directing the pins 26 to proper place when thrown upon the carrier when loading the same.

While the vertical guides 11 may be of any construction and supported in any convenient and substantial way, nevertheless, the means illustrated are preferred, particularly in installations having a dividing strip 29 at each side of the alley and which form separating means between adjacent alleys. The run way 30 for the balls $30^a$ is usually disposed above the dividing strip 29, hence the desirability of providing brackets, which, as shown, comprise arms 31 and an attaching base 32. The arms 31 curve so as to clear the run-way 30 and the base 32 is slotted as indicated at 33 to receive the fastenings 34 and admit of adjustment of the brackets on the dividing strip 29. A flange 35 at the upper edge of the base 32 overlaps the dividing strip 29 and sustains the major part of the load carried by the brackets. The upper ends of the guides 11 are attached to a suitable overhead structure 36 which may form a part of the apparatus or a part of the alley.

One of the shafts 23 has a depending arm 37 which is connected by means of a link 38 to the clamp operating frame Figure 3. When the shafts 23 are rotated to move the elements 22 into vertical position for uprighting the pins 26, the clamp operating frame is caused to move rearward, with the result that the springs 21 are tensioned. This rearward movement of the clamp operating frame causes the rollers 16 to ride upon the clamps 15 and press the same together so as to grip the pins 26 and prevent dropping thereof upon the alley. Pulleys 39 and 40 are mounted upon opposite end portions of the shaft 23 immediately preceding the rearmost shaft. Duplicate parts are provided to cooperate with the respective pulleys 39 and 40, hence a detailed description will suffice for a full understanding thereof. The pulleys 39 are fast to the ends of the shaft 23. The pulleys 40 are loose upon the shaft and are disposed between the pulleys 39 and the longitudinal members 2 of the carrier frame. Locking means are associated with the pulleys 39 and 40 to cause both to rotate in unison under certain conditions and admit of independent rotation under certain other conditions. The pulleys 39 and 40 are provided with openings which are adapted in one position of the pulleys to register and these openings receive a spring actuated locking pin 41 and a releasing pin 42, the latter projecting and adapted

to ride upon a cam 43 whereby the pin 42 is moved inward a distance to cause the locking pin 41 to clear the pulley 40 and thereby admit of relative independent rotation of the pulleys. The cam 43 is mounted upon the outer side of the member 2. An arm 44 projects from the pulley 40 and a coil spring 45 connects the outer end thereof with an arm $46^a$ attached to the slide 10, the arrangement of the parts being such that during the final descent of the carrier the springs 45 are tensioned to admit of the pulleys 40 being rotated when released. A dog 46 is pivoted at one end to the carrier frame and cooperates with the pulley 40 to prevent rotation thereof during the final descent of the carrier frame and the tensioning of the spring 45. A rod 47 is connected at its lower end to the free end of the dog 46 and its upper end terminates in an eye 48 which slidably receives a rod 49 depending from the arm $46^a$. The lower end of the depending rod 49 terminates in an eye 50 which slidably receives the rod 47. When the carrier frame reaches the limit of its downward movement the rod 47 has reached a position to bring the eye 48 in engagement with the eye 50 so that in the final downward movement of the carrier the dog 46 is moved to effect release of the pulley 40. This is shown most clearly in Figure 4 of the drawings. A bar 51 parallels the rod 7 and is connected at its upper end thereto for movement therewith. The lower end of the bar 51 passes loosely through a plate 52 projected laterally from the carrier frame. A dog 53 is pivoted to the lower end of the bar 51 and its lower end is adapted to engage a notch 54 in the pulley 39. A flat spring 55 is secured to the bar 51 and exerts a pressure on the dog 53 to normally hold it in engagement with the pulley 39, so that when the pulley reaches a position with the notch 54 opposite the engaging end of the dog 53 the latter will enter the notch 54. A trip 56 is attached to the upper portion of the bar 51 and serves to effect a release of the counterbalance whereby the carrier, when relieved of the weight of the pins is automatically returned to normal position. This will be described more fully hereinafter.

A spring roller 57 is located a determinate distance above the alley and extends transversely thereof and is mounted in the side pieces 36 of the overhead structure. The coil spring 58 within the roller 57 is adapted to be tensioned and for this purpose, a shaft 59 passes through the roller and spring, one end of the latter being connected to the shaft and the opposite end to the roller. The spring 58 is tensioned to a greater or less extent by rotation of the shaft 59, the same being held in the adjusted position by means of a ratchet wheel 60 fast to a projecting end thereof and a dog 61 pivoted to a side piece 36 and adapted to engage the teeth of the ratchet wheel 60. Pulleys 62 and 63 are fast to the spring roller 57, the pulleys 62 being disposed near the ends of the roller and the pulley 63 about midway thereof. Flexible connections 64, such as chains, connect the rear portion of the carrier frame with the pulleys 62 and a flexible connection 65 connects the front portion of the carrier frame with the pulley 63 and passes over a guide pulley 66 at the outer end of an extension or arm 67 of the overhead structure. The spring 58 is tensioned to counterbalance the carrier frame and a predetermined number of pins 26 and when the carrier frame has discharged its load the spring 58 comes into play to return the carrier to normal position by winding the flexible connections 64 and 65 on the respective pulleys 62 and 63. Each of the pulleys 62 is supplied with a stop which constitutes an extension of a block 68 attached to the side thereof and a lock member is located upon each side of the stop to engage the same and prevent rotation of the spring roller 57 in either direction. These lock members are of similar formation and are designated by the numerals 69 and 70, the latter being mounted to receive a pivotal movement and a longitudinal movement, whereas the member 69 is mounted to receive a longitudinal movement only. Each of the lock members 69 and 70 is longitudinally slotted and receives a spring actuated block 71, whereby provision is had for an outward movement of the lock members against the tension of the springs coacting with the block 71. The lock member 70 operates to prevent a clock-wise movement of the roller 57. The lock member 69 operates to prevent a counter-clock-wise movement of the roller 57.

Cross pieces 72 and 73 are located above the alley and serve as connecting means for the side pieces 36 and supporting means for the respective lock members 69 and 70. Supports 74 carried by the cross piece 72 engage beneath the lock members 69 and maintain them in horizontal position. A transverse shaft 75 mounted in the side pieces 36 has lifters 76 in position to engage under the lock member 70 for elevating their inner ends to clear the stops of the pulleys 62, whereby the roller 67 may rotate in a clock-wise direction. An arm 77 fast to the shaft 75 depends therefrom at a forward inclination and terminates in a lateral eye 78 through which an operating cord 79 or like flexible element passes and terminates in a knob. The cord 79, or like part, is wound about the middle pulley 63 in the same direction as the flexible connection 65, so that when pulled upon it effects a clock-wise rotation of the roller 57 and an unwinding of the flexible connections 64 and 65. In this manner provision is had for overcoming the tension of the spring 58 in the event of the combined weight of the carrier and the pins thereon failing to overcome the tension

of the spring when it is required to lower the carrier, either to spot the pins or to deposit a few pins upon the alley. The initial pull upon the cord 79 effects a turning of the shaft 75 and a lifting of the inner ends of the lock members 70 so that a continued pull upon the cord will effect a clock-wise rotation of the roller 57 and a lowering of the carrier. A cord 80 or like flexible element is connected at one end to the lower end of the arm 77 and passes over a guide pulley 81a suspended from the cross piece 72 and extends within convenient reach to be pulled upon when it is desired to disengage the lock members 70 from the stops of the pulleys 62 so that the roller 57 may be free to turn in a clock-wise direction under the combined weight of the carrier and the pins thereon.

The lock member 69 includes side plates 81 and a block 82 which is pivoted at its upper inner corner to the side plates, as indicated at 83. The pivoted block 82 carries a pin 84 which projects at opposite ends to enter notches 85 in the upper edges of the side plates 81, whereby to hold the block 82 in normal position. Links 86 disposed against the outer sides of the plates 81 and pivoted at their lower ends thereto are notched in their edges as indicated at 87 to receive the projecting ends of the pins 84 to hold the block 82 from upward movement. A forked link 88 is pivoted to the upper ends of the links 86 and is connected to the upper end of an arm 89 projecting from a transverse shaft 90. The block 82 is normally held in operative position by means of a spring 91. A lever 92 pivoted intermediate its ends to a side piece 36 is connected at one end to an arm 93 projecting from the shaft 90 and its opposite end is connected to the upper end of a vertical rod 94 which extends along the adjacent guides 11 and passes loosely through a lug 95 and terminates in a lateral extension 96 which is disposed in the path of the trip 56 to be operated thereby to release the pivoted block 82 which is free to turn to admit of counter-clock-wise movement of the roller 57, whereby the carrier may be returned to normal position. By having the lock-members 69 and 70 yieldably mounted each operates as a buffer to minimize the shock when the stops 68 strike either one of the lock members when the roller 57 reaches the limit of its rotation in either direction. A spring 97 normally exerts a down pull upon the inner connecting ends of the arms 93 and lever 92. A spring 98 normally holds the shaft 75 in predetermined position and is connected at one end to an element projecting upwardly from the shaft 75. A stop 99 limits the movement of the shaft 75 in one direction and engages the arms 77.

When the pin setting apparatus is not required for action and the pins are set in the accustomed way, the carrier is elevated and held out of the way by means of a latch 100 which is pivoted to an upright 11 and adapted to engage the outer end of the adjacent projection 5 of the carrier. This is shown most clearly in Figure 15. To insure a gradual release of the pins 26, whereby to prevent any noise or shock when delivered upon the alley, a cylinder 101 is mounted upon the carrier frame and a piston 102 operating therein has its rod 103 connected to one of the lifting elements 22 so as to retard the return movement of the lifting element and the clamp operating frame connected thereto. As a result the clamp operating frame moves slowly, thereby gradually releasing the clamps 15 and allowing the pins 26 to settle slowly upon the alley. After the piston 102 passes a point in the cylinder 101 provided with a relief opening 104, the clamp operating frame is free to receive a quick movement under the action of the springs 21. A valve 105 at the forward end of the cylinder 101 controls the ingress of air and the movement of the piston 102 as will be readily appreciated. When the bar 51 is drawn downward by the counter-clockwise movement of the pulley 39 engaging the dog 53, a spring 106 mounted on said bar is compressed and operates to return the bar to normal position when the dog 53 is disengaged from the notch 54 of the pulley 39. Feet 107 depend from the carrier and their lower ends are padded and these feet prevent shock and noise in the event of the carrier receiving a rapid downward movement, as resulting from a sudden pull upon the cord 79. Moreover, these feet limit the downward movement of the carrier and prevent the lower ends of the clamps 15 from coming in contact with the alley. The longitudinal bars 18 are cut away adjacent the rollers 16 to provide ample clearance for the clamps 15 when the clamp operating frame is in normal position. This is shown most clearly in Figure 5 of the drawings. In the operation of the apparatus, the parts occupying the relative positions shown in Figure 4 of the drawings, the pin receiving and carrier frame being elevated, a predetermined distance above the bed of the alley and held in such position by the locking means. The pin boy or other attendant places the pins 26 upon the carrier frame, said pins assuming the inclined position indicated by the dotted lines in Figure 3, their forward ends being in contact with the stops 14 and their rear ends resting upon the cross pieces of the lifting elements 22 so as to be uprighted thereby when the lifting elements are moved into the position indicated in Figure 4. When the carrier frame receives a full set of pins it automatically descends when the lock member 70 is moved to release the spring roller 57 by pulling upon either one of the cords 79 or 80. When pulling upon either of the cords 79 or 80, the arm 77 is

moved to effect a rocking of the shaft 75 and in consequence the lifters 76 operate to disengage the lock members 70 from the stops 68 of the pulleys 62 when the spring roller 57 will be rotated in a clock-wise direction by the unwinding of the chains or like flexible elements 64 and 65 from the pulleys 62 and 63. In the event of the carrier frame receiving a few pins 26 the aggregate weight of which is insufficient to effect a lowering of the frame against the restraining action of the counter-balance, it will be necessary to exert a pull upon the cord 79 to effect a positive rotation of the roller 57 to cause the descent of the frame with the pins thereon. This action is also necessary when the apparatus is utilized to accurately spot the pins by a lowering of the frame, as will be readily appreciated. At a point in the descent of the pin carrying frame the slides 10 are arrested in their downward movement by the lower clips 12 coming in contact with stops 109 at the lower ends of the guides 11 and this results in an arrest of the downward movement of the arms 46a and the rods 49. In the continued movement of the carrier frame the springs 45 are tensioned and when said frame reaches the limit of its downward movement the dog 46 is disengaged from the pulley 40, this being effected by contact of the eye 48 of the rod 47 with the eye 50 of the rod 49. The pulleys 40 being released from the locking dog 46 and being locked to the pulleys 39 are rotated in a clock-wise direction by the action of the springs 45, thereby effecting a rotation of the connected series of shafts 23, whereby the pins 26 are uprighted and dropped between the clamps 15 which have been closed by the action of the clamp operating frame moving rearwardly, and causing the rollers 16 to press corresponding clamps together, whereby to grip the pins 26 and prevent them from dropping upon the bed of the alley. It must be remembered that the clamp operating frame is connected to one of the shafts 23 of the pin elevating or uprighting mechanism and in consequence said frame is moved rearwardly simultaneously with the forward movement of the pin elevating mechanism. This rearward movement of the clamp operating frame tensions the springs 21. At a point in the clock-wise rotation of the pulleys 39 and 40, the dog 53 engages the notch 54 of the pulley 39 and at this moment the pulley 39 is released from the pulley 40 by the pin 42 engaging and riding upon the cam 43. The instant the pulleys 39 and 40 are disengaged the springs 21 previously tensioned operate to move the clamp operating frame forwardly, thereby withdrawing the rollers 16 from engagement with the clamps 15 to release the same. The forward movement of the clamp operating frame is controlled by the action of the piston 102 in the cylinder 101 so that the gripping action of the clamps 15 upon the pins 26 is gradually relaxed and the pins permitted to slowly settle upon the bed of the alley without any noise or shock. When the pins finally settle upon the bed of the alley the piston 102 reaches a point in the cylinder 101 to clear the relief opening 104, thereby permitting the final movement of the clamp operating frame and pin uprighting mechanism to be rapid. During the counter clock-wise rotation of the pulley 39 the bar 51 is drawn downward by engagement of the dog 53 with the notch 54 of the pulley 39 and as the bar 51 descends the trip 56 is brought in contact with the stop 96 and in the continued descent of the bar 51 the rod 94 is drawn downward, thereby operating the lever 92 and rocking the shaft 90 in a counter-clock-wise direction and effecting a release of the movable element or block 82 of the lock member 69 and permitting the roller 57 to rotate in a counter-clock-wise direction under the tension of the spring 58 so as to wind the chains or analogous connections 64 and 65 upon the respective pulleys 62 and 63, thereby returning the carrier frame to normal or predetermined position for the next operation.

The plates 10 and the rods 7 have a relative sliding movement to each other and to the respective guides 11, hence the parts 10 and 7 may be considered as elements of a double slide. These double slides permit of the proper tensioning of the operative springs 45 by stopping one slide 10 at a point where the continued downward movement of the second slide 7 will be the proper movement to give the right tension to the operative springs 45 and it is readily seen that the relative movement of the two slides can be regulated so as to obtain any relative movement required. Also, it is the two-piece slide 10 and 7 that permits the raising of machine from operative position to the "out of use" position and this is peculiar solely to this machine. It is further observed that after this double slide has been set in proper relative position that when the pin carrier descends all parts mounted thereon lower with it. When the descent of the slides 10 is arrested by contact with the stops 109 the downward movement of the arms 46a attached thereto likewise ceases. The slides 7 continue to move downward, thereby tensioning the springs 45. If it were not for the double slides and their action, the operative springs 45, the dog 46, and automatic latch 51 would require their upper ends to be attached to the overhead framework and they would receive double the up and down movement necessitated by the present arrangement. Moreover when the pin carrier is in normal position or upper position the rod 51 would extend far above the overhead framework and in case of the

"out of use" position it would extend much higher up than the space available in many instances. The double slides enable the installation of the present machine in places having a limited overhead space and which otherwise would preclude the setting up of the machine.

Having thus described the invention, I claim:

1. In pin setting apparatus, a carrier frame mounted for vertical movement towards and away from the bed of the alley, locking means for holding the carrier in lowered position, and trip means actuated by the carrier in its final downward movement to effect automatic release of the locking means, whereby the carrier is free to return to normal position after reaching the limit of its descent.

2. In pin setting apparatus, a carrier frame mounted for vertical movement, counterbalancing means therefor including a rotary member, locking means in cooperative relation with said rotary member to prevent movement thereof, and a yieldable mount for the locking means to admit of the same functioning as a buffer.

3. In pin setting apparatus, a vertically movable carrier, counterbalancing means therefor including a rotary member, oppositely disposed locking means to prevent rotation of said member in either direction, manually operable means for effecting release of a locking means to permit lowering of the carrier, and automatic means actuated by descent of the carrier to effect release of the other locking means to permit return of the carrier to normal position.

4. In pin setting apparatus, a vertically movable carrier, counterbalancing means therefor including a rotary member, a pivoted lock member adapted to coact with the said rotary member, lock releasing means including a swinging arm, a flexible element connected with the swinging arm for actuating the same, a second flexible element loosely engaging the swinging arm and wound about the said rotary member to effect a release of the lock member and a positive rotation of the rotary member for lowering the carrier when the weight thereof is insufficient to overcome the counterbalance.

5. In pin setting apparatus, a vertically movable carrier, counterbalacing means therefor including a rotary member, lock means associated with said rotary member to hold the carrier in predetermined position, lock releasing means and a flexible element loosely engaging the lock releasing means and wound about the said rotary member, whereby to effect positive rotation thereof when released to effect lowering of the carrier when its weight is insufficient to overcome the counterbalance.

6. In pin setting apparatus, a vertically movable carrier, counterbalancing means therefor, including a rotary member a lock member pivotally and yieldably mounted and adapted to coact with said rotary member to prevent rotation thereof in one direction and to function as a buffer and releasable means for disengaging the lock member from the rotary member.

7. In pin setting apparatus of the character specified, a vertically movable carrier, counterbalancing means therefor including a rotary member, a lock member including a pivoted element normally in engagement with the said rotary member to prevent rotation thereof, means mounted upon the lock member for normally holding the pivoted element in predetermined position, and means for tripping said holding means to effect release of the pivoted element.

8. In pin setting apparatus of the character set forth, a vertically movable carrier, counterbalancing means therefor including a rotary member, a lock member including side plates and a pivoted element there-between, stop elements projecting from opposite sides of the pivoted element and normally engaging said side plates, links upon opposite sides of the lock member and normally engaging the said stop elements to retain the pivoted element in normal position, and actuating means for releasing the said pivoted element to admit of movement of the said rotary member.

9. In pin setting apparatus of the character specified, a vertically movable carrier, a rotary member, connecting means between the rotary member and carrier, a lock member including side plates and a pivoted element therebetween normally in engagement with said rotary member to prevent rotation thereof, a pin mounted in the said pivoted element and projecting beyond opposite sides thereof to engage the side plates of the lock member, links pivoted to the lock member and notched to receive the projecting ends of the said pin to hold the pivoted element in predetermined position, and means for effecting release of the links from the pin to admit of free movement of the pivoted element.

10. In pin setting apparatus, a vertically movable carrier, counterbalancing means therefor including a rotary member having a projecting stop, lock members disposed upon opposite sides of said stop to prevent movement of the rotary member in either direction said lock members being pivotally and yieldably mounted to function as buffers, manually operable means for releasing one of the lock members to admit of lowering of said carrier and automatically actuated means for releasing the other lock member to admit of return of the carrier to normal position.

11. In pin setting apparatus of the character specified, the combination with a carrier, stops thereon for positioning the pins, a con-

nected series of pivoted elements, means for actuating said pivoted elements to upright the pins in conjunction with the said stops, clamps for receiving the pins as they are lifted, means for operating the clamps to release the pins, and retarding means for controlling the speed of operation of the releasing means.

12. In pin setting apparatus of the character specified, a carrier, stops thereon to position the pins, pivoted elements disposed in the rear of the respective stops and normally inclined, means for actuating the pivoted elements for uprighting the pins in conjunction with the said stops, means for receiving the pins as they are raised by the pivoted elements and holding them above the alley, means for operating the receiving means to release the pins, and retarding devices for controlling the speed of operation of the releasing means.

13. In pin setting apparatus, a carrier, pin stops thereon, a plurality of shafts mounted upon the carrier, pin uplifting elements fast to the respective shafts, connecting means between the pin uplifting elements of the respective shafts to effect a synchronous movement thereof, means for turning the shafts and operating the pin uplifting elements, devices for receiving the pins as they are uplifted and holding them above the floor, means for operating the receiving devices in synchronism with the uplifting devices, and means for operating the holding devices to open and close the same.

14. In pin setting apparatus, a carrier, pin clamps thereon, a frame movably mounted upon the carrier, elements on the frame adapted to engage the pin clamps and effect a closing thereof for gripping the pins to prevent their discharge, means for stopping the carrier above the alley floor, and means for moving the frame to release the clamps and deposit the pins.

15. In pin setting apparatus, a carrier, pin clamps thereon, a frame movably mounted upon the carrier and elements on the frame adapted to engage the pin clamps and effect a closing thereof for gripping the pins to prevent their discharge, and means for retarding the movement of said frame in a reverse direction, whereby to gradually relax the grip of the clamps to permit the pins to gently discharge upon the bed of the alley.

16. In pin setting apparatus, the combination with a carrier for receiving and supporting pins, means for stopping the carrier so as to hold the pins above but adjacent the alley, pin clamps mounted on the carrier, of a movable frame and clamp operating elements carried by the movable frame to effect a closing of the clamps upon movement of the frame in one direction and a release of the clamps when the frame is moved in a reverse direction.

17. In pin setting apparatus of the character specified, the combination with a carrier for receiving and supporting the pins, and clamps thereon for gripping the pins, of a frame movable longitudinally on the carrier and clamp operating elements on said frame adapted to ride upon the clamps to effect a closing thereof when the frame is moved in one direction and to clear the clamps when the frame is moved in an opposite direction to permit release of the clamps.

18. In pin setting apparatus, the combination with a carrier for the pins, clamps pivoted to the carrier and having cam portions, a frame movable longitudinally of the carrier and elements on the frame to coact with the cam portions of the clamps to close the latter when the frame is moved in one direction and to release the clamps when the frame is moved in a reverse direction.

19. In pin setting mechanism, the combination with a carrier for the pins, clamps thereon and pin uprighting mechanism, of clamp operating means, connecting means between the uprighting mechanism, and the clamp operating means, a yieldable connection between the carrier and pin uprighting mechanism, and operating means actuated by the descent of the carrier for tensioning the said yieldable connection.

20. In a pin setting apparatus of the character specified, the combination of a vertically movable carrier for the pins, pin uprighting mechanism, clamps for gripping the pins. clamp operating means, connecting means between the pin uprighting means and the clamp operating mechanism, a spring connection between the carrier and the pin uprighting means, spring operating means tensioned upon the descent of the carrier for actuating the pin uprighting and clamp operating mechanisms, including a lock mechanism for normally holding the spring operating means inactive during the tensioning thereof and a trip mechanism for releasing the lock mechanism to permit action of the said spring operating mechanism.

21. In a pin setting apparatus of the character specified, the combination of a vertically movable carrier for the pins, pin uprighting mechanism, clamps for gripping the pins, clamp operating means, connecting means between the pin uprighting means and the clamp operating mechanism, a spring connection between the carrier and the pin uprighting means, spring operating means tensioned upon the descent of the carrier for actuating the pin uprighting and clamp operating mechanisms, including a lock mechanism for normally holding the spring operating means inactive during the tensioning thereof and a trip mechanism for releasing the lock mechanism to permit action of the said spring operating mechanism, and means for retarding the reverse movement of the

clamp operating mechanism for gradually relaxing the grip of the clamps upon the pins, to permit the latter to settle gently upon the bed of the alley.

22. In pin setting apparatus, the combination of a vertically movable pin carrier, pin clamps thereon, clamp operating mechanism, a spring connection between the pin carrier and the clamp operating mechanism, spring operating means for the clamp operating mechanism adapted to be tensioned during the descent of the pin carrier, locking means between the spring operating means and the clamp operating mechanism, and means for effecting release of the said locking mechanism.

23. In pin setting mechanism, the combination of a pin carrier mounted for vertical movement, pin clamps thereon, clamp operating mechanism, a spring connection between the pin carrier and the clamp operating mechanism, spring operating means for the clamp operating mechanism adapted to be tensioned upon the descent of the carrier frame, locking means for securing the spring operating means during the tensioning thereof, a trip mechanism for releasing said locking means, and a lock mechanism for releasing the clamp operating mechanism to permit a reverse movement thereof.

24. In pin setting apparatus, the combination of a vertically movable pin carrier, pin clamps thereon, clamp operating mechanism, spring means for moving the clamp operating mechanism in a reverse direction and adapted to be tensioned during the movement of said mechanism to close the clamps, spring operating means for the clamp operating mechanism adapted to be tensioned upon the descent of the pin carrier, means for holding the clamp operating mechanism inactive during the tensioning of the operating spring, means for tripping the locking means, a lock mechanism between the spring operating means and the clamp operating mechanism, and means for releasing the last mentioned lock mechanism.

25. In pin setting apparatus, the combination of a vertical movable pin carrier, pin clamps thereon, a clamp operating frame, a spring connection between the pin carrier and clamp operating frame adapted to be tensioned during the operation of the clamp operating frame to close the clamps, an operating spring adapted to be tensioned during the final lowering of the pin carrier, fast and loose pulleys, there being connecting means between the fast pulley and the clamp operating frame, connecting means between the loose pulley and the operating spring, a dog for holding the loose pulley during the tensioning of the operating spring, trip means for disengaging the dog from the loose pulley, locking means between the fast and loose pulleys and means for releasing the loose pulley from the fast pulley.

26. In pin setting apparatus, the combination of a vertically movable pin carrier, pin clamps thereon, a clamp operating frame, a spring connection between the pin carrier and clamp operating frame adapted to be tensioned during the operation of the clamp operating frame to close the clamps, an operating spring adapted to be tensioned during the final lowering of the pin carrier, fast and loose pulleys, there being connecting means between the fast pulley and the clamp operating frame, connecting means between the loose pulley and the operating spring, a dog for holding the loose pulley during the tensioning of the operating spring, trip means for disengaging the dog from the loose pulleys, a bar movable with the pin carrier, a dog carried by said bar and adapted to engage the fast pulley, a spring between said bar and the pin carrier, adapted to be tensioned by the downward movement of the bar, and means for retarding the reverse movement of the clamp operating frame.

27. In pin setting apparatus, the combination of a vertically movable pin carrier, clamps thereon, a clamp operating frame, a shaft, connecting means between said shaft and the clamp operating frame, spring means between the pin carrier and clamp operating frame, adapted to be tensioned when said frame is actuated to operate the clamps, an operating spring adapted to be tensioned in the final descent of the pin carrier, fast and loose pulleys on the said shaft, connecting means between the operating spring and the loose pulley, a dog for securing the latter during the tensioning of the operating spring, trip means for releasing said dog, locking means between the fast and loose pulleys, a vertically movable bar, a dog carried by said bar adapted to engage the fast pulley, a spring between said bar and pin carrier and adapted to be tensioned when the bar is drawn downward by the action of the fast pulley, locking means between the said fast and loose pulleys, means for effecting release of the two pulleys, retarding means for causing a slow reverse movement of the clamp operating frame, locking means for holding the pin carrier in lowered position and a trip mechanism for releasing the locking means to permit of the return of the pin carrier to normal position.

28. In pin setting apparatus, the combination of a vertically movable pin carrier, counterbalancing means therefor, lock means to prevent reverse movement of the counterbalancing means, a bar mounted upon the pin carrier and having an independet vertical movement, a trip carried by said bar, connecting means leading from the before-mentioned lock mechanism and including a stop to be engaged by the said trip, whereby to release

the counterbalancing means to permit the return of the pin carrier to normal position and actuating means for the said bar.

29. In pin setting apparatus, a carrier, pin clamps thereon, a shifter frame for uprighting the pins, a slidable frame for closing the pin clamps and both frames interconnected whereby the movement of either one causes a movement of the other one.

30. In pin setting apparatus, a carrier, pin clamps thereon, a shifter frame for uprighting the pins, a slidable frame for closing the pin clamps and both frames inter-connected whereby the movement of either frame causes a reverse movement of the other frame.

31. In pin setting apparatus, a carrier, pin clamps thereon, a shifter frame for uprighting the pins, a movable frame for closing the pin clamps and both frames inter-connected whereby the uprighting of the pins and the closing of the pin clamps are simultaneous.

32. In pin setting apparatus, the combination of double slides, a pin carrier mounted upon one of the slides, pin delivery mechanism on the carrier, and operative connections between the pin delivery mechanism and the other slide brought into play when the movement of the last mentioned slide is arrested and the pin carrier and its slide continue to move.

33. In pin setting apparatus, the combination of double slides, a pin carrier mounted upon one of the slides, pin delivery mechanism on the carrier, and spring means for operating the pin delivery mechanism connected with the other slide and tensioned by a continued movement of the first mentioned slide after the movement of the last mentioned slide has been arrested.

34. In pin setting apparatus, the combination of double slides, a pin carrier movable with one of the slides, pin delivery mechanism on the carrier, spring means for operating the pin delivery mechanism connected with the other slide and adapted to be tensioned by a relative movement of the slides, and trip means for releasing the spring operating means after the same has attained a predetermined tension.

35. In pin setting apparatus, the combination of guides, primary slides on the guides, auxiliary slides mounted on the primary slides, a pin carrier mounted on the auxiliary slides, pin delivery mechanism on the pin carrier, stops for arresting the downward movement of the primary slides without affecting the continued downward movement of the auxiliary slides and the parts mounted thereon, and pin operating means having connection with the primary slides and brought into play by a continued movement of the auxiliary slides after the movement of the primary slides has been arrested.

36. A pin-setting machine for bowling alleys, comprising a frame movable toward and from the alley bed, bottom rests carried by the frame, slides for receiving the pins and directing the bottoms thereof onto said bottom rests, and means for depositing the pins on the alley bed.

37. A pin-setting machine for bowling alleys, comprising a frame suspended for vertical movement above the alley bed and having pockets therein for receiving pins to be positioned, and setting means carried by said frame for engaging said pins bodily at points remote from the greatest diameter of their body portions, said pin-engaging means being further adapted to position said pins on said alley bed.

38. A frame for receiving pins and positioning the same on a bowling alley, comprising a plurality of pin-receiving pockets, pin-engaging and positioning means mounted on said frame, means for normally holding said pin-engaging means out of engagement with said pins, and means carried by said frame for actuating said pin-engaging means to engage the pins and position the same upon the alley bed, said holding means being automatically actuated to disengage said pin-engaging means after the pins have been positioned.

39. In a pin setting apparatus, means for automatically positioning the pins above and in proximity to the alley bed, means for releasing the pins to permit them to settle downward in upright position on the alley bed, and means for automatically limiting the speed of said releasing means whereby the pins shall be deposited gently and without jar on the bed.

40. In a pin setting apparatus, means for automatically uprighting the pins on the pin carrier into a position immediately above and in proximity to the alley bed when the carrier is lowered into proximity to the bed, means for releasing the pins from engagement with the pin carrier to permit them to settle in upright position on to the alley bed, means urging the carrier to an elevated position, means releasing the carrier to permit it to move upward when said pins have been fully released, and means for controlling the time required for the operation of said pin releasing means and said carrier releasing means.

41. In a pin setting apparatus, means for automatically uprighting the pins on the pin carrier into a position immediately above and in proximity to the alley bed when the carrier is lowered into proximity to the bed, means for releasing the pins from engagement with the pin carrier to permit them to settle in upright position on to the alley bed, means urging the carrier to an elevated position, means releasing the carrier to permit it to move upward when said pins have been fully released, and means acting to automatically retard the release movement of

the pin releasing means and then permit the rapid movement of the carrier releasing means.

42. In a pin setting apparatus, a pin carrier movable toward and away from the alley, means for holding the pins in position on the carrier, means for operating the holding means to gradually deposit the pins upon the alley, and means for varying the speed of operation of the holding means at the will of the operator.

43. In a pin setting apparatus, a pin carrier movable toward and away from the alley, means for locking the carrier adjacent the alley, means for holding the pins in position upon the carrier, means for releasing the pin holding means to deposit the pins upon the alley, means for releasing the lock, and means for returning the pin carrier to its initial position.

44. In a pin setting apparatus, a pin carrier movable toward and from the alley, means for holding the carrier with the pins adjacent the alley, means for gradually depositing the pins upon the alley, means actuated by the last mentioned means for releasing the pin carrier, means for raising the pin carrier to its initial position, and means for locking the carrier in its initial position.

45. In a pin setting apparatus, a pin carrier movable toward and away from the alley, rests for the pins on the pin carrier, means for lifting the pins from their rests to vertical position, clamping devices carried by the pin frame for holding the raised pins, means actuated by the pin carrier in its downward movement for operating the lifting devices and closing the clamps so as to hold the pins off the alley when raised to vertical position, means for gradually opening the pin holding devices to quietly deposit the pins upon the alley, and means for returning the pin frame to initial position.

46. In a pin setting apparatus, a pin carrier movable toward and away from the alley, means for storing the energy of the moving carrier as it is moved from its first to its second position, means for locking the pin frame in its lowered position, means for releasing the energy storing means, means operated by the energy storing means for gradually depositing the pins upon the alley, and means for restoring the pin carrier to its initial position.

47. In a pin setting apparatus, a pin carrier movable toward and away from the alley, means for holding the pin carrier with the pins adjacent the alley, means for depositing the pins upon the alley, and means operable by the depositing means for operating the holding means after the pins have been deposited so that the pin carrier may return to its initial position.

48. In a pin setting apparatus, a pin carrier movable toward and away from the alley, means for holding the pin carrier away from the alley, means for holding the pin carrier adjacent the alley, means for depositing the pins, manually operable means for releasing the first mentioned holding means, and means operated by the pin depositing means for releasing the means which hold the pin carrier adjacent the alley.

49. In a pin setting apparatus, a pin carrier movable toward and away from the alley, means for holding the pin carrier away from the alley, means for holding the pin carrier so that the pins shall be adjacent the alley, manually operable means for releasing the pin carrier from its initial position, means for depositing the pins upon the alley, means for thereafter releasing the means which hold the pin carrier adjacent the alley, and means for returning the pin carrier to initial position.

50. A pin setting machine for bowling alleys, comprising a frame suspended for vertical movement above the alley bed and having pockets therein for receiving pins to be positioned, and setting means carried by said frame for engaging said pins bodily above and below the greatest diameter of their body portions, said pin engaging means being further adapted to position said pins on said alley bed.

51. A frame for receiving pins and positioning the same on a bowling alley, comprising a plurality of pin receiving pockets, pin engaging and positioning means mounted on said frame, means for normally holding said pin engaging means out of engagement with the pins while the pins are in the pockets, and means carried by said frame for actuating the pin engaging means to engage the pins while in the pockets and position the same upon the alley bed, said holding means being automatically actuated to disengage said pin engaging means after the pins have been positioned.

52. A pin setting machine for bowling alleys, comprising a frame movable toward and from the alley, bottom rests carried by the frame, guides for receiving the pins and directing the bottoms thereof on to the said rests and means for engaging the pins and positively controlling the movement thereof while the pins are being positioned on the alley.

53. A frame for receiving pins and positioning the same on a bowling alley, comprising a plurality of pin receiving pockets, pin positioning means for removing the pins from the pockets and positioning them on the alley, means for normally holding said pin positioning means out of engagement with said pins, and means carried by said frame for actuating said pin positioning means to remove the pins from the pockets and position the same upon the alley, said holding means being automatically actuated

to disengage said pin positioning means after the pins have been positioned.

54. A frame for receiving pins and positioning the same on a bowling alley, comprising a plurality of pin receiving pockets for holding the pins in a recumbent position, pin lifting and positioning means mounted on said frame, means for normally holding said pin lifting and positioning means out of engagement with said pins, and means carried by said frame for actuating said pin lifting and positioning means to engage the pins while in the pockets and position the same upon the alley bed, said holding means being automatically actuated to disengage said pin lifting and positioning means after the pins have been positioned.

55. A frame for receiving pins and positioning the same on a bowling alley, comprising a plurality of pin receiving pockets in which the pins lie in a recumbent position, pin engaging and positioning means for lifting and removng the pins from the pockets and position the same on the alley, means for actuating the pin engaging and positioning means to engage the pins while in the pockets and position the same upon the alley, and means for operating the pin engaging and positioning means to release the latter after the pins have been positioned.

In testimony whereof I affix my signature.

JOHN CLAYTON BACKUS. [L. S.]