

May 26, 1942.

E. HEDENSKOOG

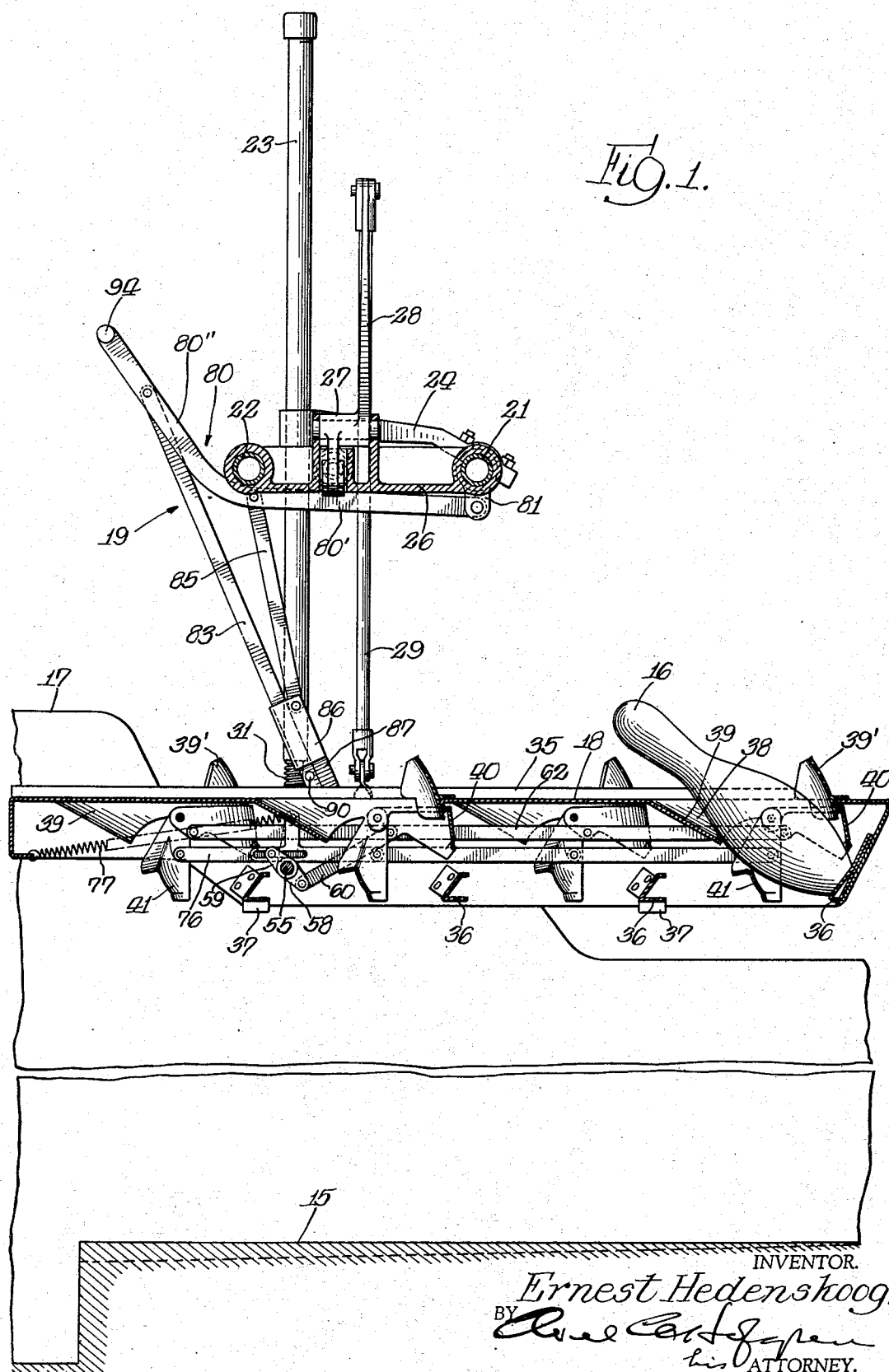
2,284,208

PIN SETTING MACHINE

Filed Feb. 12, 1940

4 Sheets-Sheet 1

Fig. 1.



May 26, 1942.

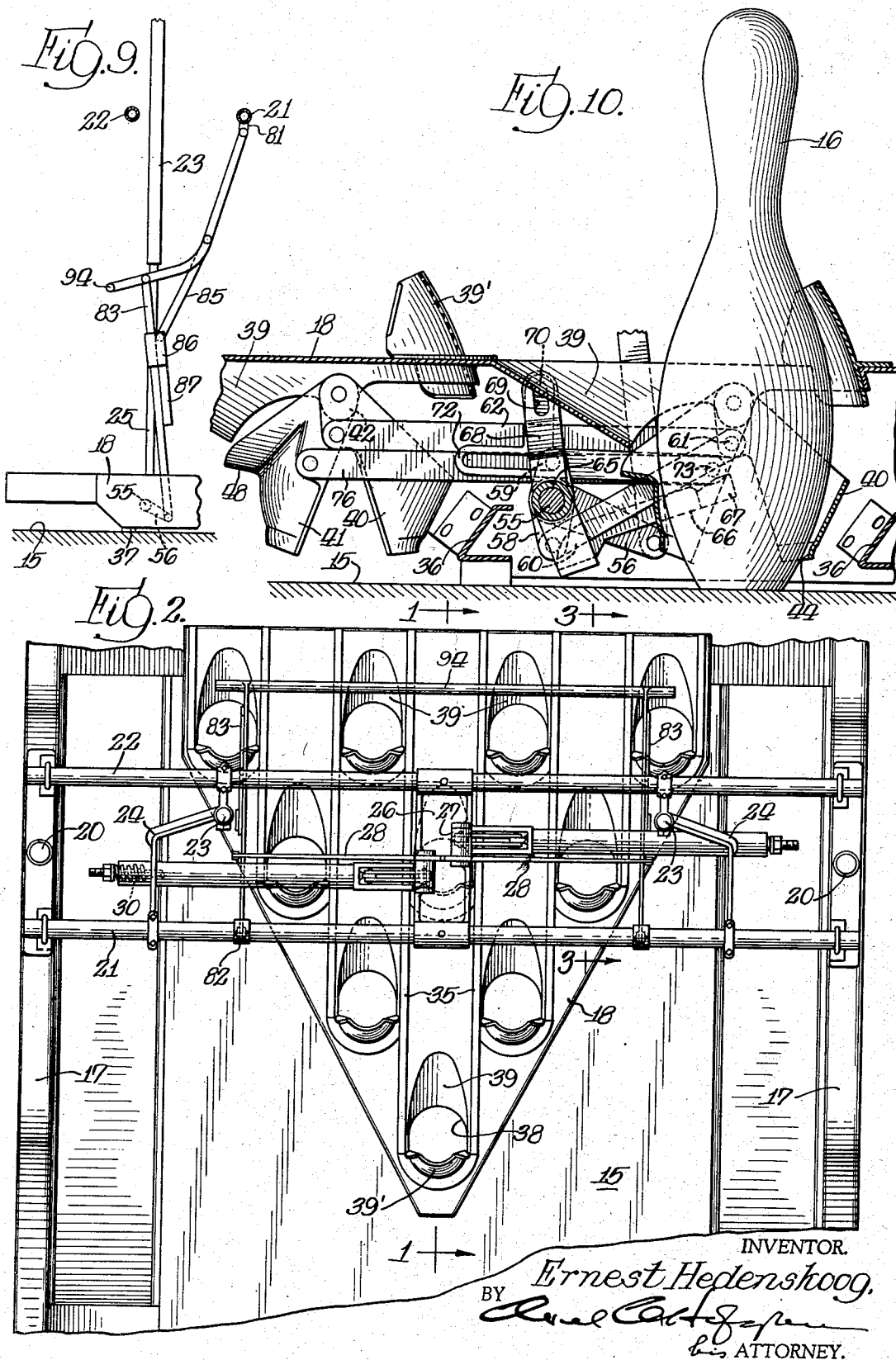
E. HEDENSKOOG

2,284,208

PIN SETTING MACHINE

Filed Feb. 12, 1940

4 Sheets-Sheet 2



May 26, 1942.

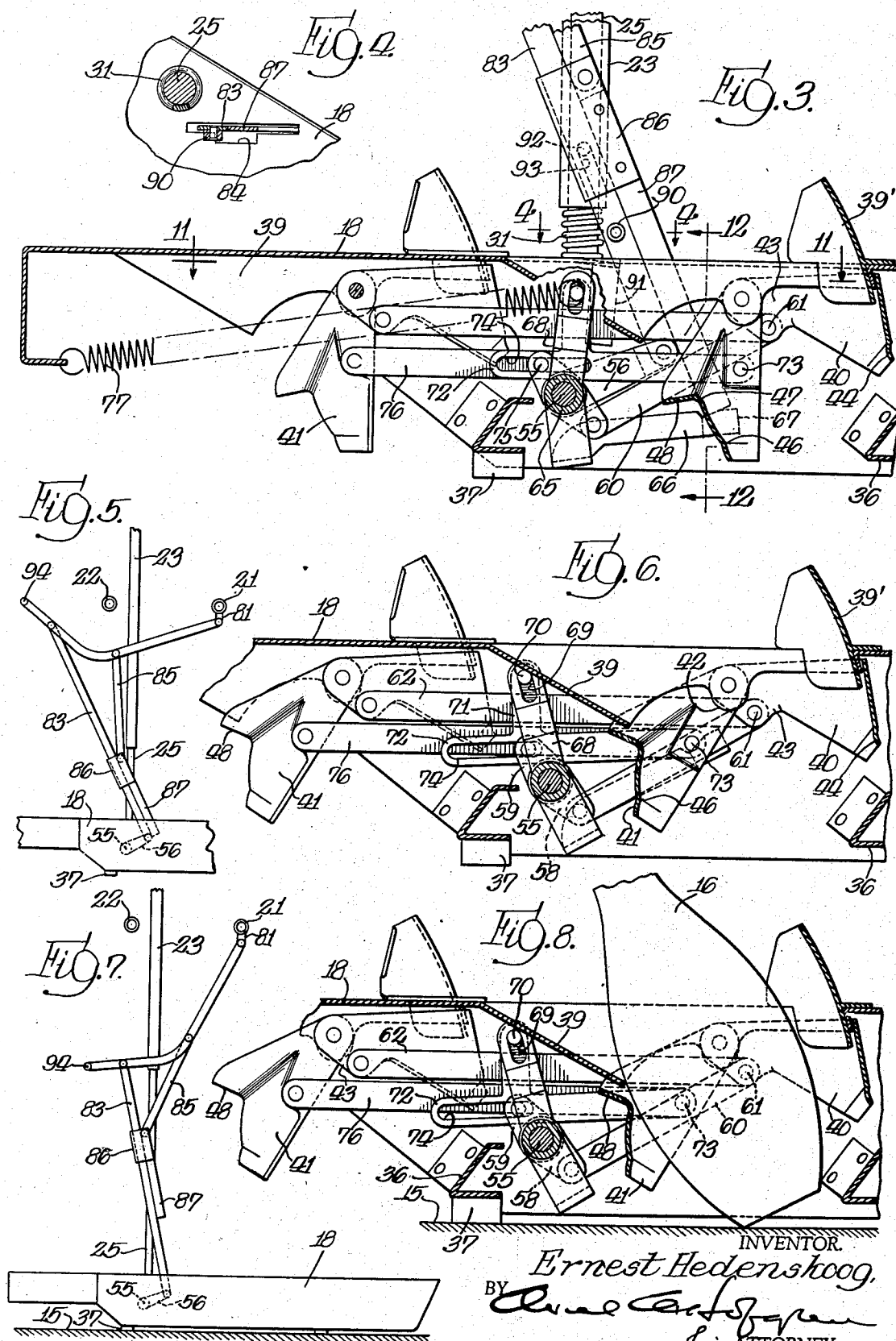
E. HEDENSKOOG

2,284,208

PIN SETTING MACHINE

Filed Feb. 12, 1940

4 Sheets-Sheet 3



INVENTOR.
Ernest Hedenskoog,
BY *Olaf Carlsson*
his ATTORNEY.

May 26, 1942.

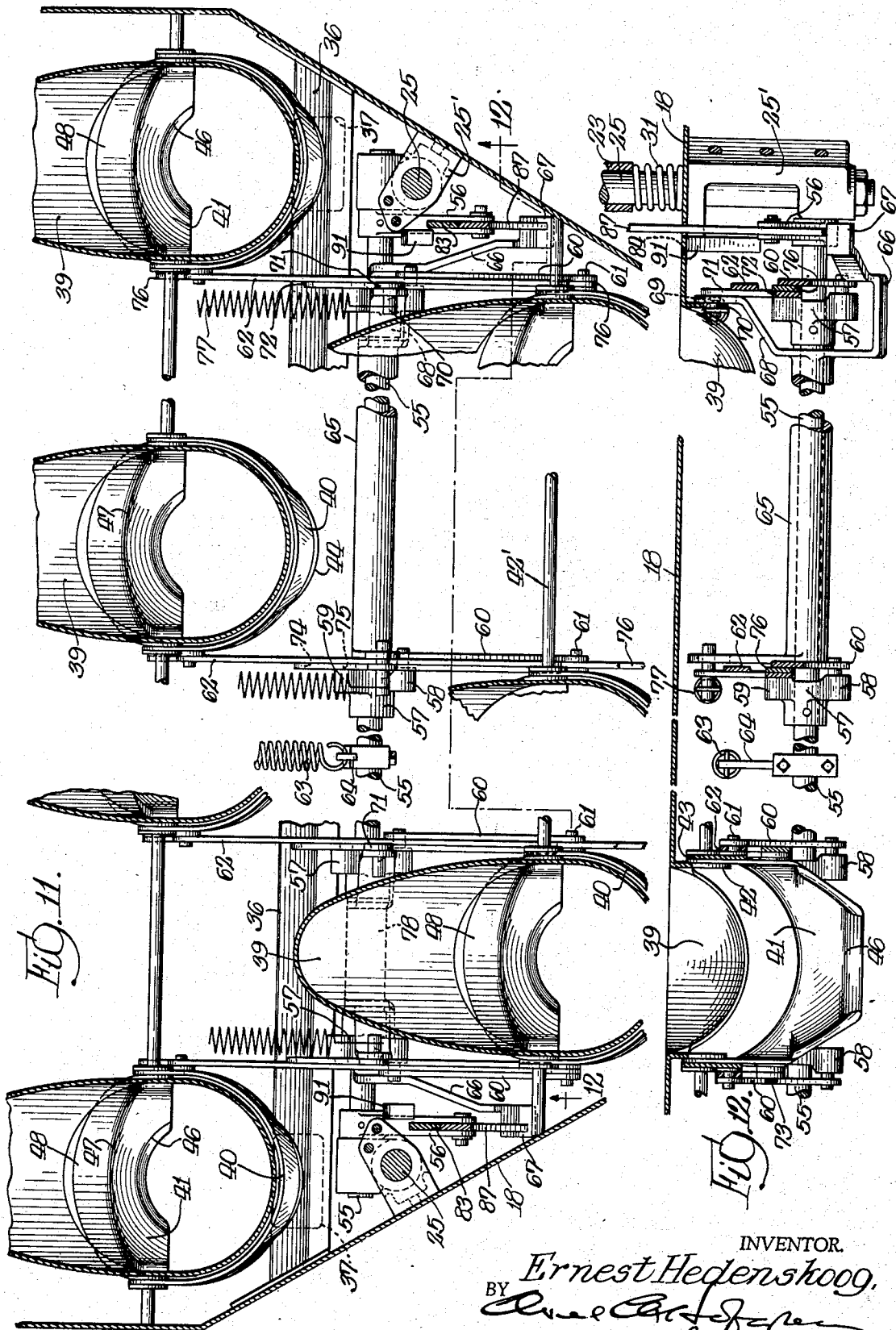
E. HEDENSKOOG

2,284,208

PIN SETTING MACHINE

Filed Feb. 12, 1940

4 Sheets-Sheet 4



INVENTOR.

Ernest Hedenskoog.
BY *Ernest Hedenskoog*
his ATTORNEY.

UNITED STATES PATENT OFFICE

2,284,208

PIN SETTING MACHINE

Ernest Hedenskoog, Muskegon, Mich., assignor to
The Brunswick - Balke - Collender Company,
Chicago, Ill., a corporation of Delaware

Application February 12, 1940, Serial No. 318,485

19 Claims. (Cl. 273—42)

The invention relates generally to a pin setter for a bowling alley and more particularly to a pin setter of the manually actuated type, in which an attendant places the pins in a carriage or frame of the setter and then by appropriate actuation causes the setter to place the pins on the spots on the bowling alley bed.

A general object of the invention is to provide a pin setter of new and improved construction, having a minimum of operating parts so as to permit of economical manufacture and to be free of disorder, while providing an improved pin setting operation.

A more particular object of the invention is to provide a simplified pin setter of the manually actuated type in which lowering of the setter carriage, as well as placing of the pins, is accomplished by actuation of the setting mechanism by power supplied by the attendant as distinguished from actuation as an incident to forceful striking of the setter on the bed.

Another object is to provide a pin setter of new and improved construction in which the pins are spotted in a quiet manner and causing a minimum of wear on the pins and the alley bed.

A further object is to provide a pin setter in which the pins are placed and not dropped upon the alley bed.

Still a further object is to provide a pin setter, which places rather than drops the pins upon the alley bed, in which the spotting means engages the lower portion only of the pins.

Another object is to provide a pin setting machine having pin setting mechanism which, in the placing of the pins, supports the same until substantial contact thereof with the bed, and thereafter imparts a lift to the pins to eliminate or reduce to a harmless degree any scraping of the bed by the pins.

Another object is to provide a pin setting machine in which the pins though set may be readily returned to the pockets in the frame by a simple tipping of the pins by the attendant.

Yet another object is to provide a pin setter, in which lowering of the setter carriage and setting of the pins is accomplished by manipulation of a common handle, having means for preventing discharge of the pins during the initiation of carriage movement.

Still another object is to provide one-piece jaws which may be formed in a single stamping operation.

Other objects and advantages will become apparent from the following description, taken

in connection with the accompanying drawings, in which:

Fig. 1 is a vertical longitudinal sectional view of a portion of a bowling alley and a pin setting machine embodying the features of this invention, the section being taken approximately in the plane of the longitudinal center line of the setting machine.

Fig. 2 is a top plan view of the pin setting machine shown in Fig. 1, the figure being somewhat reduced from the showing in Fig. 1.

Fig. 3 is an enlarged vertical sectional view taken approximately along the line 3—3 of Fig. 2, showing the position of the pin setting mechanism when the frame of the pin setter is in the position shown in Fig. 1.

Fig. 4 is a fragmentary view taken approximately along the line 4—4 of Fig. 3.

Fig. 5 is a view illustrating the position of the actuating mechanism at a transition point in the operation of the pin setting machine.

Fig. 6 is a view similar to Fig. 3, but showing the pin setting mechanism in the positions corresponding to the positions of the actuating mechanism shown in Fig. 5.

Fig. 7 is a view similar to Fig. 5 but showing the actuating mechanism in another transition point in the actuation of the pin setting machine, more specifically, just prior to the spotting of the pins.

Fig. 8 is a view similar to Figs. 3 and 6, showing the position of the pin setting mechanism corresponding to the position of the actuating mechanism shown in Fig. 7, but with the pin positioned to illustrate a feature of the invention pertaining to the removal of pins from the alley bed.

Fig. 9 is a view similar to Figs. 5 and 7, showing the actuating mechanism at the end of the pin setting operation.

Fig. 10 is a view similar to Figs. 3, 6 and 8, showing the pin setting mechanism in the positions corresponding to the position of the actuating mechanism shown in Fig. 9.

Fig. 11 is a horizontal sectional view taken approximately along the line 11—11 of Fig. 3 and drawn on a scale the same as Fig. 3.

Fig. 12 is a vertical sectional view taken approximately along the line 12—12 of Figs. 3 and 11.

While the invention is susceptible of various modifications and alternative constructions, it is here shown in the drawings and will hereinafter be described in a preferred embodiment. However, it is not intended that the invention

is to be limited thereby to the specific construction disclosed, but it is intended to cover all modifications and alternative constructions falling within the spirit and scope of the invention as defined in the appended claims.

For purposes of disclosure, there has been shown in Fig. 1 a longitudinal section of a portion of a standard bowling alley. Such an alley comprises generally a bed 15, upon which pins 16 are adapted to be arranged in playing position, and alley dividing rails 17 (see Fig. 2). Disposed above the bed 15 is a pin setting machine, embodying the features of this invention, which comprises generally a setter frame or carriage 18 and actuating means 19. Mounted above the alley is a structure for supporting the pin setting machine and for guiding the setter frame in its vertical movement toward and from the bed 15 in the pin setting operation. This structure may comprise simply a pair of posts 20, one upstanding from each rail 17, cross-bars 21 and 22, and vertical guide sleeves 23 secured in brackets 24 clamped to the cross-bars 21 and 22.

The setter frame 18 is guided in its vertical movement by a pair of rods 25 (see Figs. 11 and 12) fixedly secured at their lower ends in a casting 25', one at each side of the frame 18, on about a line through the center of gravity, and slidably received in the corresponding sleeve 23. The frame 18 is suspended and counter-balanced in the same manner disclosed and claimed in the United States Letters Patent to Bishop No. 1,615,064, dated January 18, 1927. Such structure comprises generally a casting 26 (Figs. 1 and 2) clamped between the cross-bars 21 and 22 centrally thereof. Pivotaly mounted in the casting are a pair of cranks 27 having arms 28 extending in opposite directions, and each having pivotally connected to its free end a link 29 the lower end of which is pivotally connected to the frame 18. Compression springs 30 are connected to the cranks 27 in a manner tending to lift the frame 18, all as more particularly disclosed in the Bishop Patent No. 1,615,064 above mentioned. The springs 30 are of such strength that they will hold the frame 18 in raised position, even when filled with pins. A short compression spring 31 encircles each rod 25 at the end near the frame 18 to abut the sleeve 23 and act as a shock absorber as the frame returns to its uppermost position.

The setter frame 18 is generally triangular (Figs. 1 and 2) and in the present instance is composed of sheet metal suitably reinforced as by longitudinal strips 35 on the top and transverse braces 36 on the bottom. Certain of the braces 36 carry pads 37 which rest upon the bed 15 when the frame 18 is in its lowermost position. The frame is formed with a plurality of pin receiving pockets 38 arranged in accordance with the spots on the alley bed. A chute 39, to guide the pins into the pockets and to aid in supporting the pins in a reclining position, is formed to the rear (as viewed from the apex of the frame) of each pocket by depressing the sheet metal top of the frame 18. Opposite the chute, the edge of each pocket bears a shield 39'. This shield, in the first instance, prevents the pins from overshooting the pocket, and tends to guide the pins into the pocket as they are tossed onto the frame by an attendant. The shield 39' also aids in the setting of the pins, as will later become more apparent, and to that end has the general shape of a segment of a

frustum of a cone so as to project rearwardly over the opening of the pocket. By such rearward projection, the shield prevents forward tilting of the pins during the setting thereof, yet retains a large pocket opening, facilitating insertion of the pins. To accommodate the contour of the pin, the shield along its elements is very slightly parabolic, while the side edges of the shield are bent back to eliminate sharp edges which might mar the pins.

To provide a rest for the base ends of the pins while in reclining position in the pockets, one of the braces 36 is positioned beneath the forward edge of each transverse row of pockets, and positioned with one face in a rearwardly and downwardly inclined position. This face extends downwardly to the top of the pads 37 and thus is spaced from the bed 15 only a distance equal to the thickness of the pad 37 when the frame rests on the bed, which is very material in the proper setting of the pins. The chute 39 and the braces 36 will support a pin in the reclining position shown in Fig. 1, but will permit the pins to pass through when in upright position.

Means is provided herein for setting the pins without engaging the neck thereof and, moreover, for gently depositing the pins accurately without scraping the bed and without dropping the pins through any substantial distance. Such means comprises generally a front jaw 40 and a cooperating rear jaw 41 for each pocket, and means for controlling the jaws. The jaws are mounted to swing about the same axis and are pivotally attached to ears 42 depending from diametrically opposite points of each pocket opening, such attachment being effected through small rods 42' extending between adjacent pockets (Fig. 11).

The construction of the jaws, the timing of their movements, and the support of each pin 16, are so interrelated that just prior to the time of setting of the pins they are supported very closely adjacent the bed and at the time of setting are given a lift so that they are set without scraping the bed, yet without dropping any substantial distance onto the bed. To that end, the front jaw 40, as best seen in Figs. 3, 10 and 11, is given a unique shape which may be approximately described as an ellipsoidal strip having one edge lying in a plane, while the other edge is roughly triangular but having successive inward offsets to form at each end a tab 43, for the attachment of an actuating link, and at the center a blunt and recessed tip. On its inner face at its recessed tip, the jaw is formed with a bead 44. Because of the shape of the strip, the jaw does not contact a pin save at the bead 44 and then only at the ends of the bead. This gives the front jaw 40 a two point contact only, assuring a more accurate action thereof on a pin to be set.

The rear jaw 41 also is given a unique shape. This shape is best seen in Figs. 3, 11 and 12, and results in the jaw having a main portion like a blunt ended scoop. On the inner face at the lower edge is a bead 46, and spaced therefrom is a second bead 47. Beyond the bead 47 the jaw is bent outwardly to form a lip 48 adding strength, while providing additional clearance for swinging of the jaw to open position. Here again contact of the jaw 41 with a pin is only at the beads 46 and 47, and then only at the ends thereof to provide four point contact.

Suitable mechanism is provided for appropriately interconnecting the several jaws and

for effecting their control from the actuating means 19. Such mechanism includes a rockable main shaft 55 (see Figs. 3, 11 and 12) extending transversely of the frame 18 and journaled in the castings 25'. At each end, the shaft 55 has pinned thereto an arm 56 which serves as the connecting medium between the shaft and the actuating means 19, as will later appear. Also pinned to the shaft 55 for rotation therewith are a plurality of cranks 57, each having an arm 58 and an arm 59 extending almost diametrically opposite to one another. These cranks 57 all have the same angular position relative to the shaft 55 but are spaced longitudinally thereof so that one is positioned between each the first and second, the second and third, the fourth and fifth, and the sixth and seventh longitudinal rows of pockets 38, counting from the left in Figs. 2 and 11. Pivotaly connected to the arm 58 of each crank 57 is a driving link 60 the other end of which is pivotally connected as by a pin 61 to a tub 43 of the front jaw 40 of the first pocket, forward of the crank. This jaw is in turn connected to the front jaw of each of the pockets in adjacent rows by a connecting link 62. In this manner all of the front jaws 40 are interconnected for simultaneous action. The front jaws 40 are yieldably urged to an open or normal position by a large tension spring 63 which is anchored at one end to the frame 18 and at the other end to an arm 64 pinned on the shaft 55.

Loose on the shaft 55 near one end thereof is a sleeve 65 having at its outer end an offset crank arm 66 with a lug 67 at its free end projecting laterally into the plane of but radially beyond the end of the arm 56. Also on the outer end of the sleeve 65 is a second arm 68 which projects vertically. This arm has at its free end (see Fig. 3) a slot 69 in which is received a pin 70 carried by an upstanding ear 71 of a driving link 72. The forward end of the link 72 is pivotally connected to the rear jaw 41 of the adjacent pocket by a pin 73 welded to the jaw. The rear end of the link 72 is formed with an elongated longitudinal slot 74 and receives a pin 75 carried on the end of arm 59 of crank 57, thus having a lost motion connection with the main shaft 55 and providing for movement of the rear jaw independently of the front jaw. Jaw 41, to which driving link 72 is connected, is in turn connected by pin 73 to a connecting link 76 engaging similar pins 73 on the rear jaws 41 of the remaining pockets in longitudinal rows six and seven. A tension spring 77 is anchored at one end to the frame 18 and at the other end to the pin 70 on the link 72, thus tending to rotate the sleeve 65 in a counter-clockwise direction, as viewed in Figs. 3 and 6, and moving the rear jaws 41 to fully open or normal position. Such position is determined by the lip 48 on the rear jaw 41 striking the chute 39. The proportioning of the parts is such that when the rear jaws are in fully open position the pin 75 on arm 59 is just short of the forward end of the slot 74, as clearly seen in Fig. 6.

At its inner end, sleeve 65 has an arm similar to its arm 68, and this arm is connected by similar linkage to the shaft 55 and to the rear jaws 41 of the pockets in rows four and five. At the left end of the shaft 55 is a sleeve 78, similar in all respects to the sleeve 65 save that it is shorter. This sleeve controls the rear jaws 41 of the pockets in rows one, two and three and, in particular, has an offset arm 66' the same as

sleeve 65, so as to be actuated by the actuating means 19, as will presently appear.

As previously stated, it is a feature of this machine that both the vertical movement of the carriage 18, as well as the actual pin setting, are effected through actuating means 19 under the control of the attendant or pin boy. To that end, the actuating means 19 is given a unique construction having no direct connection with the carriage 18 but serving to actuate the carriage 18 through the resistance to actuation of the pin setting mechanism. Accordingly, there is provided at each side of the machine a toggle mechanism comprising a bent lever 80 (Figs. 1, 5, 7 and 9), having a first portion 80' and a second portion 80'' making an angle of approximately 55° with the first portion. This lever is pivoted at the free end of its first portion to depending ears 81 of a collar 82 clamped onto the cross-bar 21 and extends rearwardly from that point. In the normal position of the lever 80, that is, when the frame 18 is in the raised, inactive position (Fig. 1), the first portion 80' of the lever is approximately horizontal.

Pivotaly attached near the free end of portion 80'' is one end of a main actuating link 83 which passes through a T-slot 84 (Fig. 4) in the top of the carriage 18 and is pivotally connected to the end of arm 56. Pivotaly attached to the lever 80 approximately at the juncture of the portions thereof is one end of an auxiliary actuating link 85, the other end of which is pivotally attached to a slide 86 mounted on the link 83. The slide 86 has fixed thereto a finger 87 of considerable length which rides on the edge of link 83 and projects through the slot 84 in a position to engage and actuate arm 66. More specifically, the finger 87 engages arm 66 during the final portion of the upward return movement of the frame 18 and rocks the sleeve 65 in a clockwise direction, as viewed in Figs. 3 and 6, against the action of springs 77 to swing rear jaws 41 to actuated position. In this position jaws 41 prevent the pins from dropping through the pockets during the loading of the frame. Conversely, during the initial portions of the down movement of frame 18, the finger 87 is withdrawn to permit spring 77 to swing jaws 41 to full open position conditioning the pockets for the reception of standing pins. The exact point of engagement and disengagement of finger 87 with arm 66 is shown in Figs. 3, 5 and 6.

As stated, the frame 18 is actuated solely through the resistance to actuation of the pin setting mechanism. In order, therefore, that a sudden application of force to the lever 80 for the purpose of initiating down movement of the frame 18 may not actuate the setting mechanism prematurely, suitable safety means are provided. Herein this means takes the form of a roller 90 carried by the link 83 at a point just above the top of frame 18 when in normal, raised position. Should the link 83 now tend to move downwardly through the slot 84, the roller 90 would strike the frame and prevent such relative movement of the link and frame. As the frame moves downwardly, the link 83 assumes a more nearly vertical position (see Figs. 5 and 7), until at the time the frame 18 rests on the bed 15 the roller 90 is above the stem portion of the T-slot 84 and is thus free to pass therethrough. Preferably there is secured beneath the top of the frame 18 a rearwardly inclined cam block 91 which prevents the roller 90 from engaging beneath the top of frame 18. The link 83 also carries a pin 92 (Fig.

3) which strikes the top of the frame 18 and serves as a final limit stop to movement of the toggle mechanism. A slot 93 is formed in slide 86 to accommodate the pin 92. The levers 80 are connected by a handle 94 to assure uniformity of operation of the toggle mechanism, as well as convenience for the attendant.

The functions, proportions, advantages and sequences of operation of the various parts will become more apparent from the following description of the operation of the machine.

Let it be assumed, therefore, that the setter frame 18 is in its raised position, that is, in the position shown in Fig. 1, and that the pins 16 have been placed in the pockets of the frame so that the machine is ready for the next pin setting operation. Under those circumstances, the pins 16 are supported in a reclining position, as shown in Figs. 1 and 3, with their base resting on the brace 36; the actuating mechanism 19 is in the position shown in Fig. 1; and the jaws 40 and 41 are in the positions shown in Fig. 1, and more clearly in Fig. 3. Shaft 55 has now through the link 83 been rotated in a counter-clockwise direction, as viewed in Fig. 3, to the limit of its movement, with the result that jaw 40 is in its fully retracted or open position. At the same time, finger 87 has rotated arm 66 in a clockwise direction, as viewed in Fig. 3, with the result that actuating link 72 has been moved forwardly, that is, to the right, and thus swing all of the jaws 41 to a position beneath the pockets where they serve to prevent the pins 16 from dropping through the pockets as they are tossed into the frame by the pin boy or attendant. Such movement of the rear jaws 41 independently of the front jaws 40 is permitted by the pin and slot connection 74 and 75.

To effect a setting or spotting of the pins, the attendant now grasps the handle 94 and pulls downwardly thereon. With such application of force to the handle 94, the frame 18 is moved downwardly toward the bed 15 because the strength of spring 63 holding the pin spotting mechanism in normal inactive position is greater than the effect of springs 30 which is not counter-balanced by the weight of the frame 18 and the pins 16 loaded therein. Thus there is no rotation of the shaft 55, but there is movement of the slide 86 relative to the frame 18, with the result that the finger 87 permits arm 66 to be rotated in a counter-clockwise direction under the influence of spring 77, thereby returning jaws 41 to their wide open or inactive position. This movement takes place during the initial downward actuation of the handle 94 and is completed by the time that the handle is substantially in a horizontal plane with the bars 21 and 22. The actuating mechanism is now in the position shown in Fig. 5, while the pin spotting mechanism is in the position shown in Fig. 6, with the pin 75 almost at the extreme forward end of the slot 74. It will readily be apparent that with the rear jaws 41 returned to their normal, inactive positions, the pockets 38 are wide open to receive any pins that may be standing on the bed.

Such approach of the frame 18 to the bed is assured and improper operation is guarded against by the provision of the roller 90 carried by the link 83 which is disposed to abut the top of the frame 18, in case of improper operation. Without such safety means, this possible improper operation might result if for some reason or other the frame 18 were stuck, or if the attendant suddenly pulled down on the handle 94

so that the inertia of frame 18 might overcome the spring 63.

From the time that the jaws 41 are swung to their fully open position, that is, from the point of operation shown in Figs. 5 and 6 until the frame 18 rests on the alley bed, no additional change in position of the pin spotting mechanism takes place, but it remains in the position shown in Fig. 6. The actuating means 19, however, continues to change its position in order to effect such downward movement of the frame 18 onto the alley bed. When the frame 18 rests upon the bed, the actuating mechanism is in the position shown in Fig. 7, that is, with the portion 80'' of the lever 80 now in substantially horizontal position. Incidentally, this brings the handle 94 down to a level such that the pin boy may now press downwardly upon the handle 94 for further rapid actuation of the mechanism.

With the frame 18 resting on the alley bed, further movement of the frame 18 is now impossible and thus further application of force to the handle 94 will cause actuation of the pin spotting mechanism and the placing of the pins in upright position upon the alley bed. The final movement should preferably be a comparatively rapid movement in order that the jaws 40 and 41 may properly perform their pin spotting function. During such final short movement of the handle 94, the link 83 rotates the shaft 55 in a clockwise direction, as viewed in Fig. 3, and thus through the arms 58, of the several cranks 57 pinned to the shaft, and the actuating links 60 rotates the front jaws 40 to the position shown in Fig. 10. In such rotation of the front jaw 40, it engages the front face of a pin near the base thereof and sweeps the same off of the pin base rest 36. It is to be noted that the base of the pin is supported very closely adjacent the bed when the frame 18 rests on the bed and moves even closer to the bed as the front jaw 40 is actuated. The distance which a pin drops in its spotting operation is thus reduced to a minimum.

While there is no direct connection between the shaft 55 and the rear jaws 41, these jaws are not actuated simultaneously with the front jaws 40 through the medium of the pin 75 carried on the arm 59 of the crank 57. As previously stated, in the return of the jaws 41 to their fully open position, as illustrated in Fig. 6, the forward end of slot 74 in the rear jaw actuating link 72, is positioned substantially in contact with the pin 75 so that rotation of the crank 57 in a clockwise direction will cause the pin 75 to strike the end of the slot and actuate the link 72 in a manner causing the rear jaws 41 to swing forwardly to pin spotting position. In such movement of the rear jaws 41 to pin spotting position, the ends of the upper bead 47 of the jaw engage the rear face of the pin, prior to the time that the base of the pin leaves the pin base rest 36, and raise the pin off of the edge of the chute 39. These points of engagement are higher up on the pin than are the points of engagement of the front jaw 40, so that the joint action of the jaws will effect an up-ending or righting of the pin, but are below the maximum diameter of the pin so that the tapering portion of the pin bearing against the bead 47 acts as a cam tending to impart a lift to the pin. As a result thereof, though the pin would, during a slow setting thereof, scrape the alley bed, during a proper rapid setting, the lift imparted by the jaws 40 and 41 is sufficient to raise the pin the

slight extent required to prevent any detrimental scraping of the bed by the pin, with its resultant wear on the pin and the bed. With the completion of such final rapid movement of the handle 94, the pins are spotted on the bed and the actuating mechanism 19 is in the position shown in Fig. 9, while the pin spotting mechanism takes the positions shown in Fig. 10. In this position, the base of the pin is accurately spotted by engagement therewith of the lower head on each the front and rear jaws. At the same time, the pin is prevented from tilting rearwardly by the upper head 47 on the rear jaw and is prevented from tilting forwardly by the shield 39'. The pins are now properly set and the frame is ready to be returned to its raised, inactive position.

During such return movement, the sequence of operation is, of course, just the reverse of that during the downward movement. As a consequence, during the initial upward movement of the handle 94 and prior to any upward movement of the frame 18, the jaws 40 and 41 are returned to their fully open position, releasing the pins 16 and freeing the frame for upward movement without disturbing the position of the pins. Thereafter, the frame 18 moves upwardly, while the pin setting mechanism remains in the position shown in Fig. 6, until the carriage and the actuating means 13 reaches the position illustrated in Fig. 5, that is, where the finger 87 again contacts the lever 66. During the remaining final portion of the upward movement, the finger 87 now again rotates arm 66 causing the rear jaws 41 to be swung to the position shown in Fig. 3, wherein they prevent any accidental dropping through the pockets of the pins during the loading of the frame.

When the attendant accidentally sets the pins with some pins remaining standing and while the bowler is still entitled to another ball, a re-setting of those certain standing pins only and removal of the remaining pins is required. Such re-setting of the standing pins and removal of the remaining pins is herein readily effected, because of the support of the pins by the pin base rest 36 so closely adjacent the alley bed. As clearly seen in Fig. 8, when a pin standing on the alley bed is tilted rearwardly for the purpose of causing it to assume its normal, reclining position in the pocket 18, the forward edge of the base of the pin is raised above the lower edge of the pin base rest 36 long prior to the time that the forward edge of the pin is in contact with the pin base rest 36. As a result, in the continued forward movement of the pin base, as an incident to tilting to reclining position, there is no possibility that the pin will strike the lower edge of the rest 36, but on the contrary the base of the pin moves easily and uninterruptedly onto the rest. Thus, to return the pins from a standing position resting on the alley bed to their reclining position in the frame ready to be lifted with the frame, it is only necessary for the attendant to swing the pins to such reclining position, and there is no need that the pins be lifted even the slightest amount. Once the desired pins have been returned to their position in the pockets, the frame may be raised with certain of the pins left standing. This setting of a few number of pins is thus readily accomplished without any lifting of the pins and without any necessity of the attendant to crawl underneath the frame and reset the pins by hand.

It is believed apparent from the foregoing that 75

I have perfected a pin setting machine having many unique features and many improvements in construction and operation. With the pin setter herein disclosed, the pins may be set very quietly without dropping the pins any considerable distance, which results in loosening of the spots on the alley bed, and without detrimental scraping of the bed by the pins, which also tends to loosen the spots and to round the edges of the base of the pins, making the same less stable. Moreover, this is accomplished with a machine having a simplified construction resulting in a minimum number of parts which may become out of adjustment, resulting in economy of manufacture. This pin setting machine, moreover, does not mar or discolor the neck of the pins, but effects setting of the pins without engagement of the neck thereof. Numerous other advantages and features will be readily apparent from the study of the foregoing disclosure.

I claim as my invention:

1. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position, including a rest for the base of a pin capable of supporting a pin until the same contacts the alley bed, pin spotting mechanism mounted on said frame operable only after the frame contacts the alley bed and as a result of such contact including jaws operable to engage and up-end a pin prior to disengagement thereof from said pin base rest and without contact between the pin and the alley bed, and means operable by an attendant to place said frame upon the alley bed and thereafter actuate said pin spotting mechanism.

2. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position, pin spotting mechanism mounted on said frame including jaws engaging the pin only beneath the neck thereof, and means operable by an attendant to place said frame upon the alley bed and thereafter actuate said pin spotting mechanism.

3. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position, pin spotting mechanism mounted on said frame including jaws engaging a pin in a manner to impart a lift to the entire pin during the up-ending thereof, and means operable by an attendant to place said frame upon the alley bed and thereafter actuate said pin spotting mechanism.

4. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position, pin spotting mechanism mounted on said frame including jaws engaging a pin at the front and rear and only beneath the maximum diameter of the pin to tend to impart a lift thereto in the up-ending thereof, and means operable by an attendant to place said frame upon the alley bed and thereafter actuate said pin spotting mechanism.

5. A pin setting machine for bowling alleys

comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position, pin spotting mechanism mounted on said frame including for each pocket a front jaw swingably mounted on said frame and operable to engage a pin near the base thereof and a rear jaw swingably mounted on said frame and operable during the up-ending of the pin to engage the same at a point higher on the pin than said front jaw but below the maximum diameter of the pin, and means operable by an attendant to place said frame upon the alley bed and thereafter actuate said pin spotting mechanism.

6. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position including a chute leading to each pocket and defining the rear edge of the pocket opening and a rest for the base of a pin closely adjacent the bottom of the frame, said rest and said chute supporting a pin in inclined position by engagement respectively with the base and above the maximum diameter of the pin, pin spotting mechanism mounted on said frame, said mechanism including a front jaw swingably mounted on said frame and operable in the actuation of said mechanism to engage the front of the pin near the base thereof to sweep the same off said base rest and a rear jaw swingably mounted on said frame and operable simultaneously with said front jaw to engage the rear of the pin at a point higher on the pin than the front jaw but below the maximum diameter of the pin, and means operable by an attendant to place said frame upon the alley bed and thereafter actuate said pin spotting mechanism.

7. A pin setting mechanism for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position including a chute leading to each pocket and defining the rear edge of the pocket opening, a rigid upstanding and rearwardly inclining shield defining the forward edge of the pocket opening, and a rest for the base of a pin closely adjacent the bottom of the frame, said rest and said chute supporting a pin in inclined position by engagement respectively with the base and above the maximum diameter of the pin, pin spotting mechanism mounted on said frame, said mechanism including a front jaw swingably mounted on said frame and operable in the actuation of said mechanism to engage the front of the pin near the base thereof to sweep the same off said base rest and a rear jaw swingably mounted on said frame and operable simultaneously with said front jaw, said jaw having a first means to engage the rear of the pin at a point higher on the pin than the front jaw to aid in the up-ending thereof and a second lower means for aiding in the spotting of the pin, both points of engagement being below the maximum diameter of the pin, and means operable by an attendant to place said frame upon the alley bed and thereafter actuate said pin spotting mechanism.

8. A pin setting machine for a bowling alley comprising, in combination, a support, a frame

guided in said support for vertical movement toward and from the alley bed, means biasing said frame toward raised position, pin setting mechanism carried by said frame, means connected between said frame and said mechanism biasing the same to inactive position, and manually operable means for lowering said frame to the alley bed and thereafter effective to actuate said setting mechanism comprising toggle mechanism pivotally connected to said support and only to said pin setting mechanism and operable to actuate said pin setting mechanism only after and as a result of contact of the frame with the alley bed.

9. A pin setting machine for bowling alleys comprising, in combination, a support, a frame having a plurality of pin receiving pockets guided by said support for vertical movement toward and from the alley bed, means biasing said frame to raised position, pin setting mechanism carried by said frame including a front and a rear jaw for each pocket, and actuating means therefor, said rear jaw being mounted for movement jointly with or independently of said front jaw, independent means biasing each said front and said rear jaw to inactive position, said last named means being stronger than said frame biasing means, and manually operable means for lowering said frame onto the alley bed and thereafter actuating said pin setting mechanism comprising a lever pivotally connected to said support, a link pivotally connected to said lever and to the actuating means for said front jaws, and means connected to said lever operable when said frame approaches raised position to swing said rear jaw into blocking position beneath the pocket.

10. A pin setting machine for bowling alleys comprising, in combination, a support, a frame having a plurality of pin receiving pockets guided by said support for vertical movement toward and from the alley bed, means biasing said frame to raised position, pin setting mechanism carried by said frame including a front and a rear jaw for each pocket, and actuating means therefor, said rear jaw being mounted for movement jointly with or independently of said front jaw, independent means biasing each said front and said rear jaw to inactive position, said last named means being stronger than said frame biasing means, and manually operable means for lowering said frame onto the alley bed and thereafter actuating said pin setting mechanism comprising a lever pivotally connected to said support, a link pivotally connected to said lever and to the actuating means for said front jaws, a slide on said link, a finger fixed to said slide extending parallel with said link, and a second link connected between said lever and said slide operable when said frame approaches raised position to project said finger into engagement with the actuating means for said rear jaw to swing the same into blocking position beneath the pocket.

11. A pin setting machine for bowling alleys comprising, in combination, a support, a frame having a plurality of pin receiving pockets guided by said support for vertical movement toward and from the alley bed, means biasing said frame to raised position, pin setting mechanism carried by said frame comprising a swingably mounted front and a swingably mounted rear jaw for each pocket, and actuating means for the jaws comprising a transversely extending shaft rockably mounted in said frame, an arm fixed on each end of said shaft, a plurality of cranks fixed on said

shaft having a first arm connected to one of the front jaws, a link connecting said one of the front jaws to the remainder of the front jaws in its longitudinal row, said cranks having a second arm carrying a pin, an actuating link connected to one of the rear jaws and having a slot in which said pin engages to form a lost motion connection between the rear jaws and the actuating means for the front jaws, links interconnecting the rear jaws, a sleeve rotatably mounted on said shaft near each end thereof having an arm engaging said actuating link and a crank arm adjacent the arm on said shaft, independent spring means urging said front and said rear jaws to open position, and manually operable means for lowering said frame onto the alley bed and thereafter actuating said pin setting mechanism comprising toggle mechanism at each side of said frame interconnected by a handle, each said toggle mechanism comprising a lever pivotally mounted to said support, a link pivotally connected to said lever and to the arm on said shaft, a slide on said link, a finger fixed to said slide extending parallel with said link and adapted when projecting into said frame to engage the crank arm on the sleeve, and a second link connected between said lever and said slide and being of such length and connected at such point to be operable when said frame approaches raised position to project said finger into engagement with said crank arm to swing said rear jaws into blocking position beneath the pockets.

12. A pin setting machine for a bowling alley comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, means biasing said frame toward raised position, pin setting mechanism carried by said frame including a front jaw and a rear jaw movable independently of said front jaw, and manually operable means for lowering said frame and actuating said jaws.

13. A pin setting machine for a bowling alley comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, means biasing said frame toward raised position, a pin setting mechanism carried by said frame including a front jaw and a rear jaw movable independently of said front jaw, means biasing said jaws to open position, said last named means being stronger than said frame biasing means, means operating when said frame is in raised position to swing said rear jaw into active position, and manually operable means for lowering said frame, withdrawing said rear jaw swinging means, and actuating said pin setting mechanism.

14. A pin setting mechanism for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and away from the alley bed, a plurality of pin receiving pockets in said frame, pin setting mechanism carried by said frame including a pivotally mounted front jaw and a pivotally mounted rear jaw for each pocket, means biasing said jaws to open position, means operable when said frame is in raised position to swing said rear jaw beneath the pocket to prevent dropping of a pin therethrough, said last mentioned means operable during the initial movement thereof to permit withdrawal of said rear jaw from beneath said pocket to open the same for the reception of a standing pin, during continued movement to place said frame upon the alley bed, and during the final movement simultaneously to actuate said jaws to effect setting of a pin.

15. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and away from the alley bed, means biasing said frame to raised position, pin setting mechanism carried by said frame including front and rear pivoted jaws, means biasing said pin setting mechanism to inactive position, said last named means being greater than the bias of said frame to raised position, manually operable means connected to said support and only to said pin setting mechanism operable to lower said frame onto the alley bed and thereafter to actuate said pin setting mechanism, and means for permitting actuation of said rear jaws and for preventing actuation of the front jaws of said pin setting mechanism during the initial actuation of said manual means.

16. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and away from the alley bed, means biasing said frame to raised position, pin setting mechanism carried by said frame, means biasing said pin setting mechanism to inactive position, said last named means being greater than the bias of said frame to raised position, manually operable means connected to said support and only to said pin setting mechanism operable to lower said frame onto the alley bed and thereafter to actuate said pin setting mechanism, said manual means including a link extending through the upper surface of said frame, and means for preventing improper actuation of the pin setting machine during the initial actuation of said manual means comprising a T-slot in the top surface of said frame through which said link projects, and a roller carried by said link, said roller being disposed above the cross-bar portion of said T-slot during initial actuation of said manual means and over the stem portion of said T-slot during later actuation of said manual means to permit passage of said roller through said slot.

17. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position, pin spotting mechanism movably mounted on said frame including jaws engaging the pin only beneath the neck thereof and shields stationarily mounted on said frame and uprising from the forward edges of said pockets in positions to engage the upper portion of the pin during the setting operation, and means operable by an attendant to place said frame upon the alley bed and actuate said pin spotting mechanism.

18. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, said frame having pockets for receiving and supporting pins in a reclining position, pin spotting mechanism mounted on said frame including jaws engaging a pin at the front and rear and only beneath the maximum diameter of the pin to tend to impart a lift thereto in the up-ending thereof and shields stationarily mounted on said frame along the front edges of said pockets and adapted to engage and guide the upper portions of the pins during the setting operation, and means operable by an attendant to place said frame upon

the alley bed and thereafter actuate said pin spotting mechanism.

19. A pin setting machine for bowling alleys comprising, in combination, a support, a frame guided in said support for vertical movement toward and from the alley bed, means biasing said frame toward raised position, pin setting mechanism carried by said frame, means connected between said frame and said mechanism

5 biasing said mechanism to inactive position, and a single handle operated control means for lowering said frame to the alley bed and thereafter operating said pin setting mechanism, said means for biasing said mechanism operating to prevent actuation of the mechanism until said frame engages the alley bed.

ERNEST HEDENSKOOG.