Pat. July 11, 1916. E. HEDENSKOOG 1,190,649.

AUTOMATIC PIN SETTING MACHINE

APPLICATION FILED OCT. 22, 1914. 8 Sheets-Sheet 1

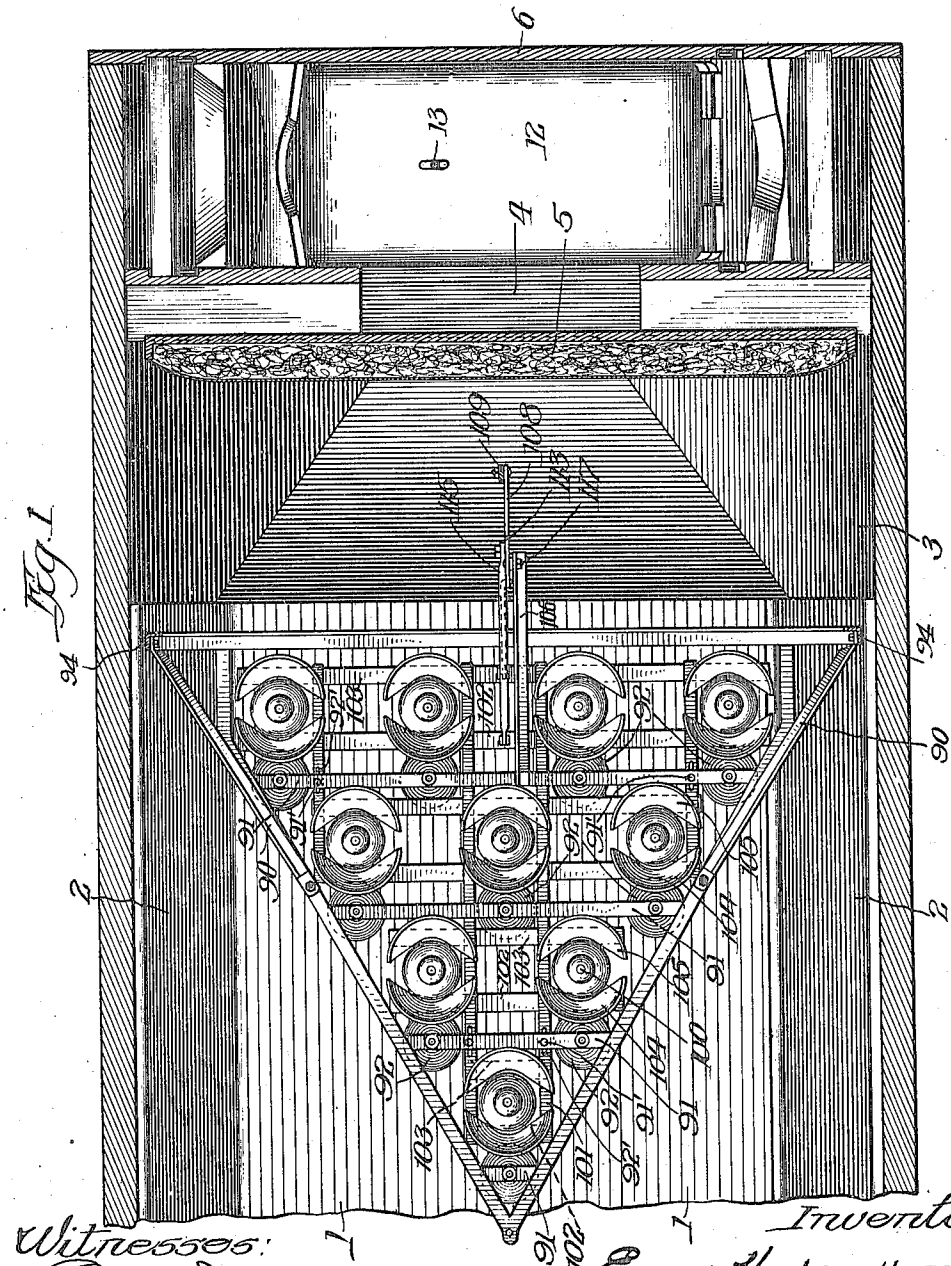


Fig. 1

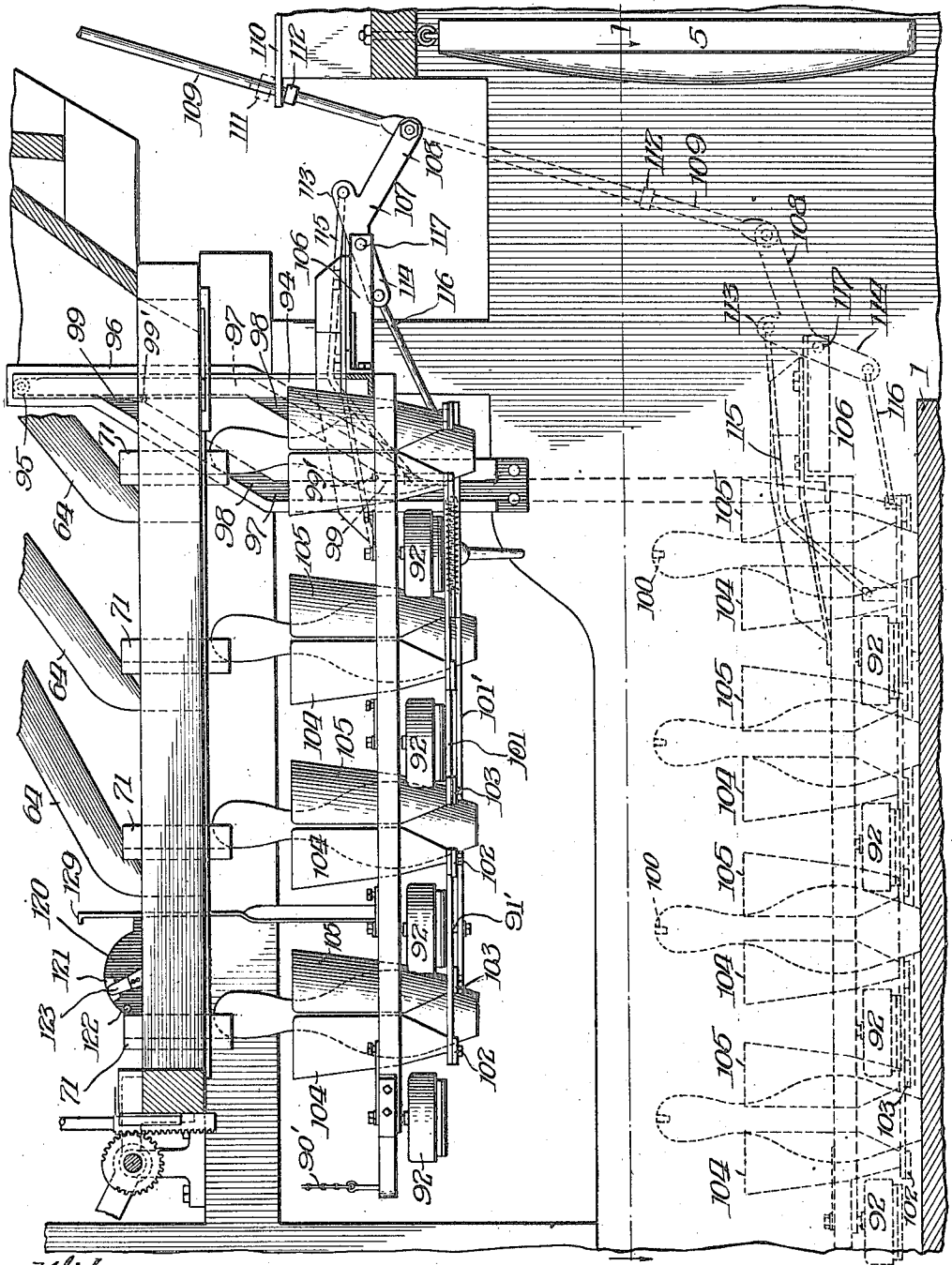
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AUTOMATIC PIN SETTING MACHINE

APPLICATION FILED OCT. 22, 1914. 8 Sheets-Sheet 2



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Fig. 2

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AUTOMATIC PIN SETTING MACHINE

APPLICATION FILED OCT. 22, 1914. 8 Sheets-Sheet 3

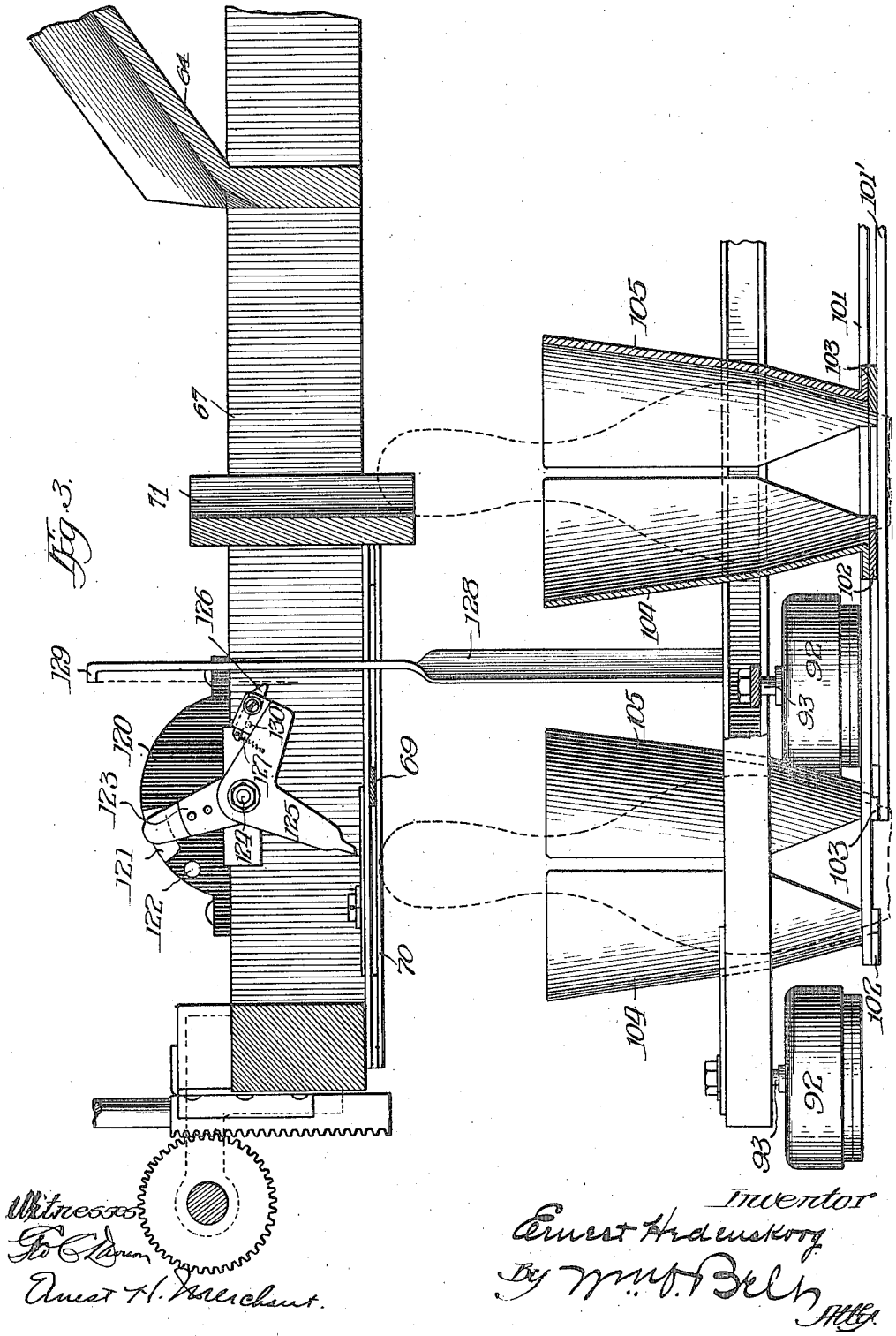


Fig. 3.

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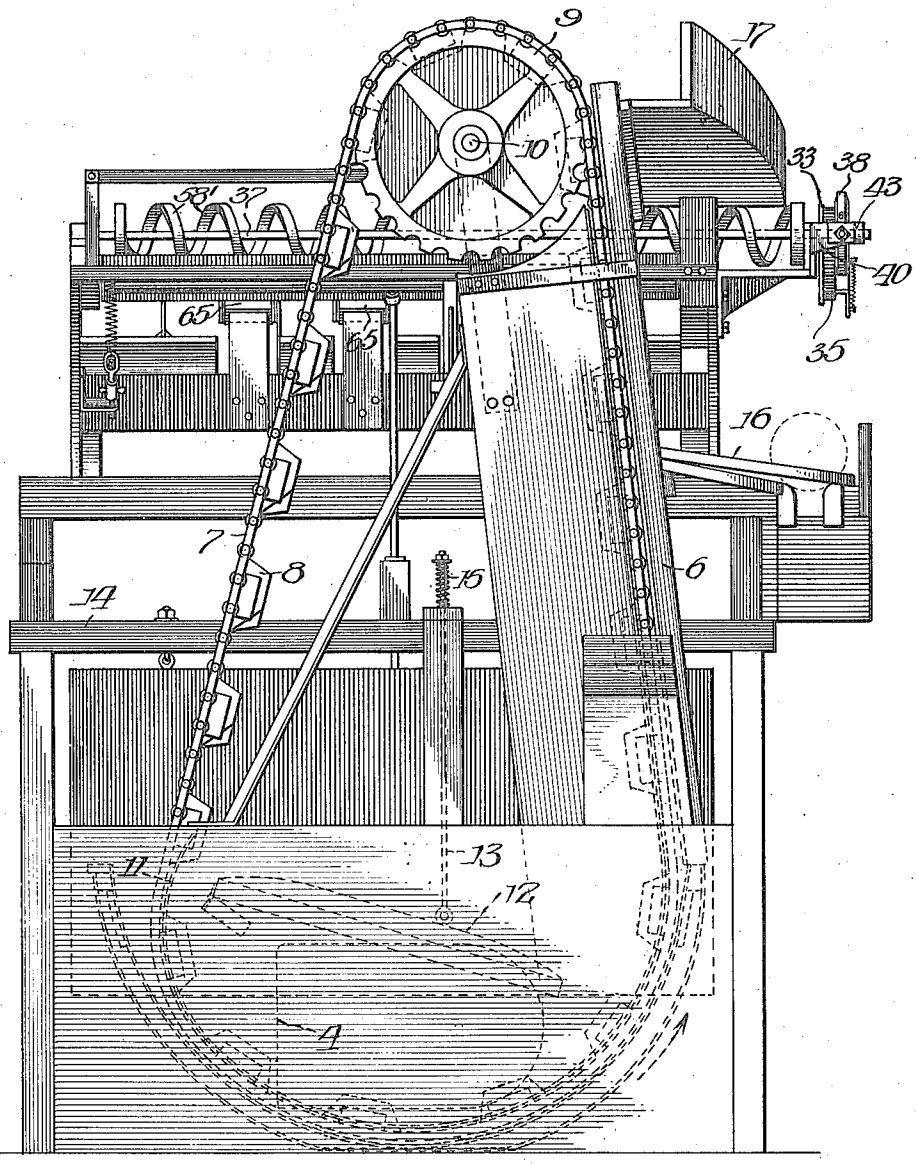
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AUTOMATIC PIN SETTING MACHINE

APPLICATION FILED OCT. 22, 1914. 8 Sheets-Sheet 4

Fig 4.



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AUTOMATIC PIN SETTING MACHINE

APPLICATION FILED OCT. 22, 1914. 8 Sheets-Sheet 5

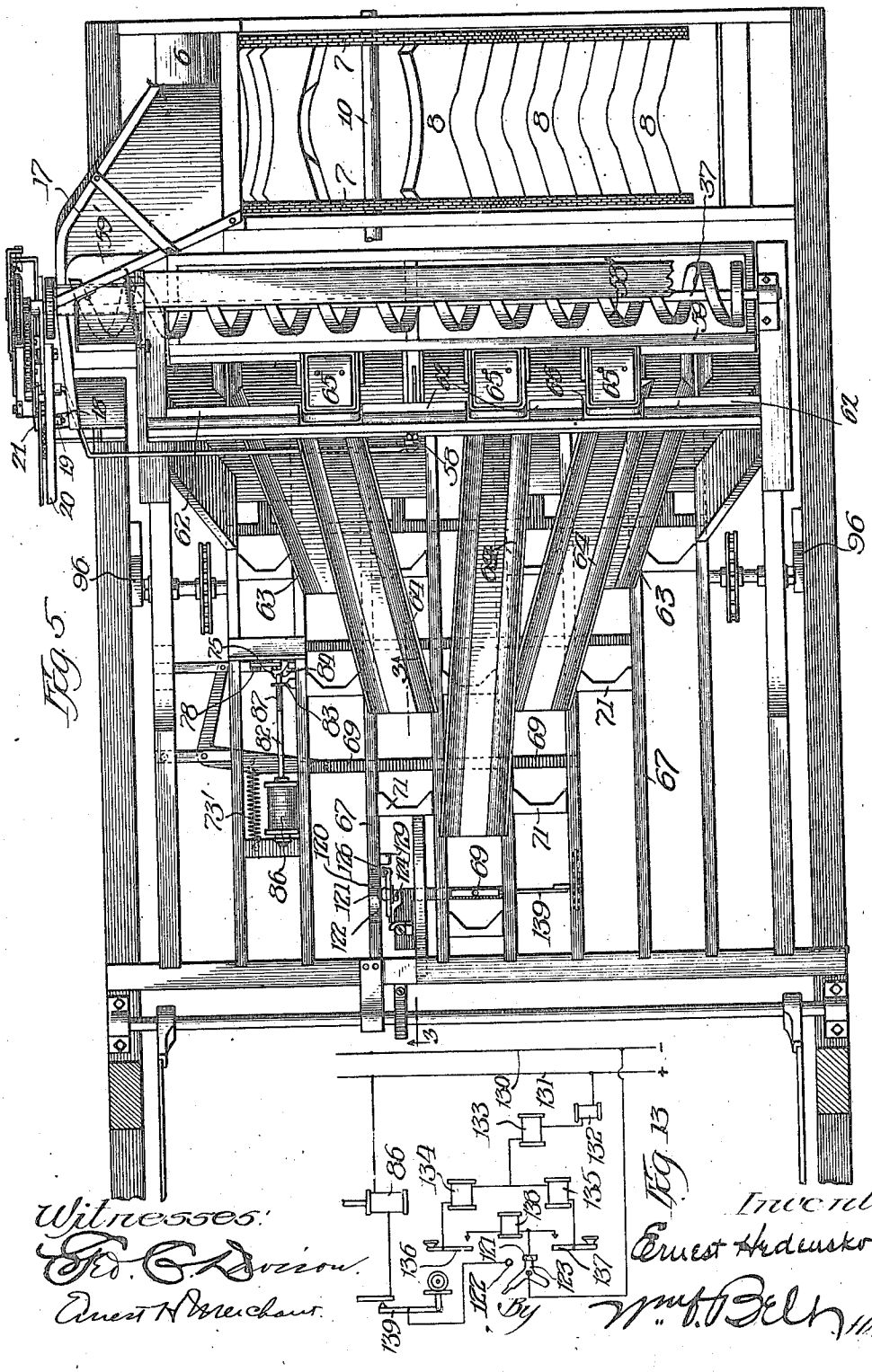


Fig. 5

Fig. 13

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AUTOMATIC PIN SETTING MACHINE

APPLICATION FILED OCT. 22, 1914. 8 Sheets-Sheet 6

Fig. 9.

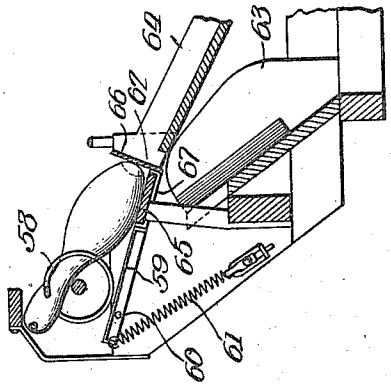
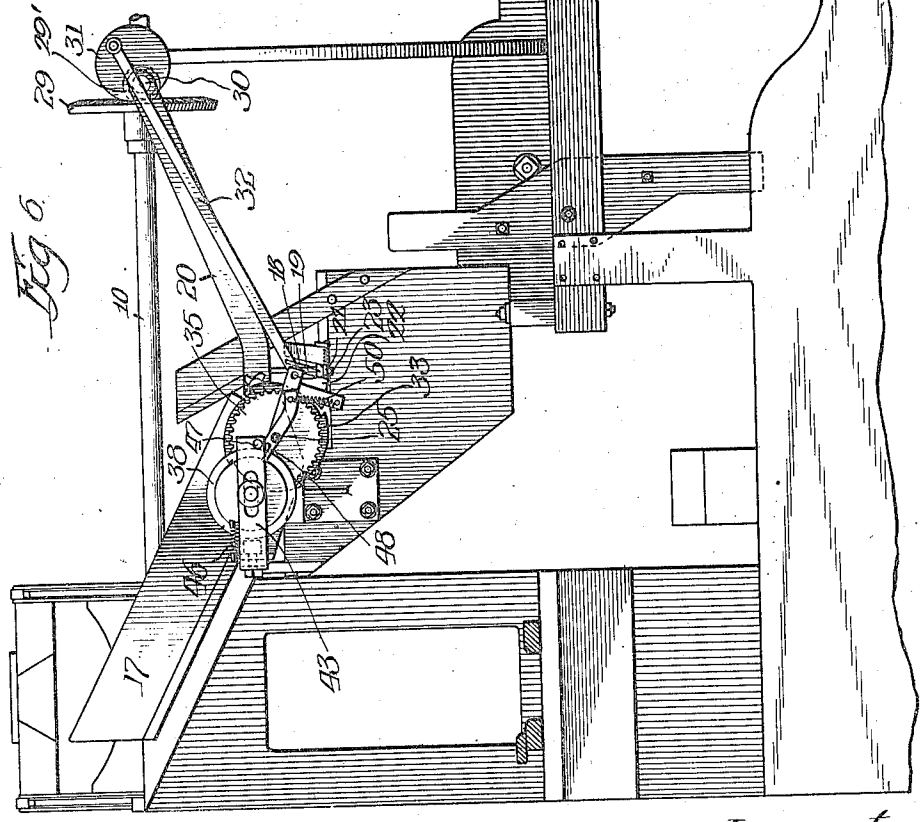


Fig. 6.



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Pat. July 11, 1916. E. HEDENSKOOG 1,190,649.

AUTOMATIC PIN SETTING MACHINE

APPLICATION FILED OCT. 22, 1914. 8 Sheets-Sheet 7

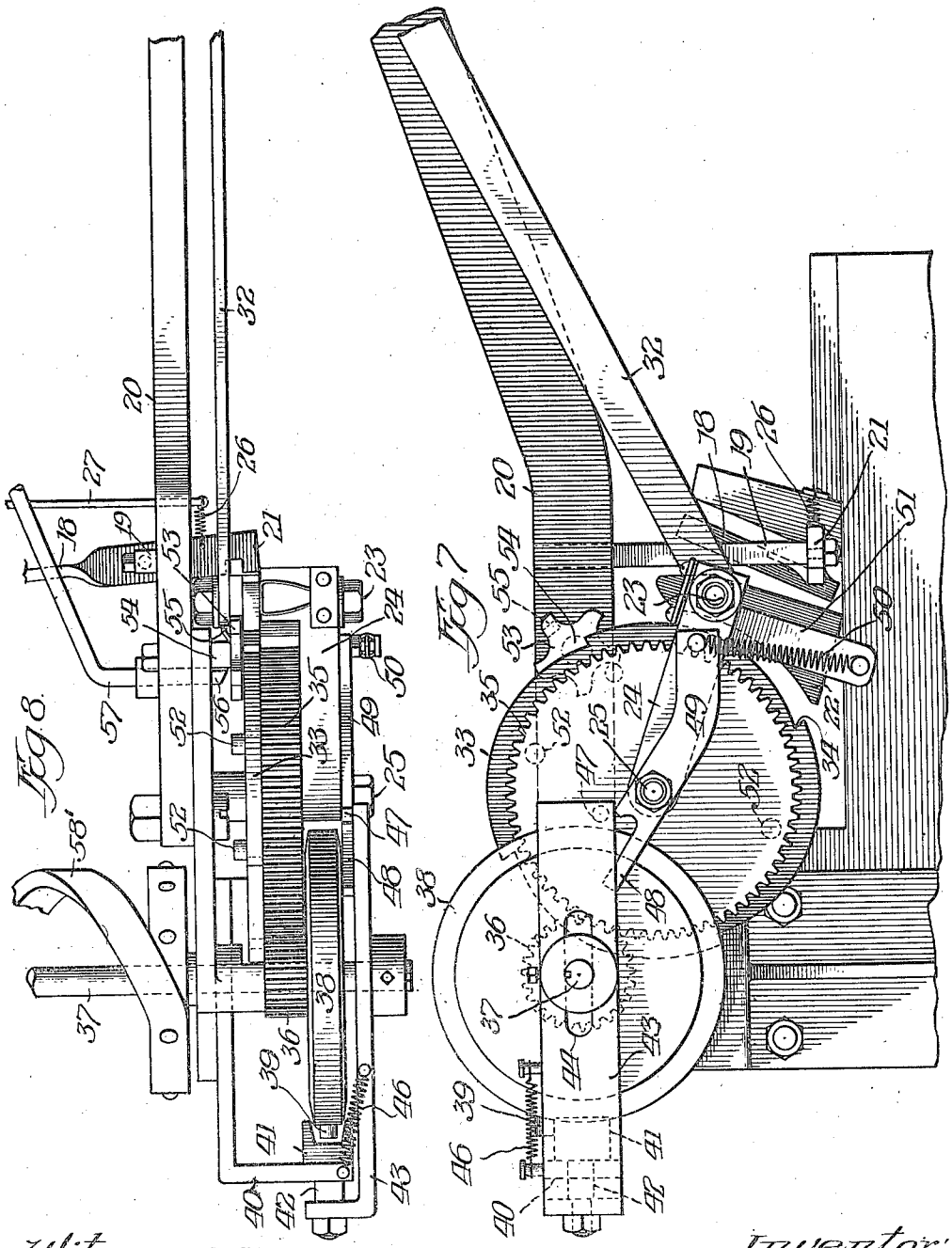


Fig 8.

Fig 7.

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Pat. July 11, 1916. E. HEDENSKOOG 1,190,649.

AUTOMATIC PIN SETTING MACHINE

APPLICATION FILED OCT. 22, 1914. 8 Sheets-Sheet 8

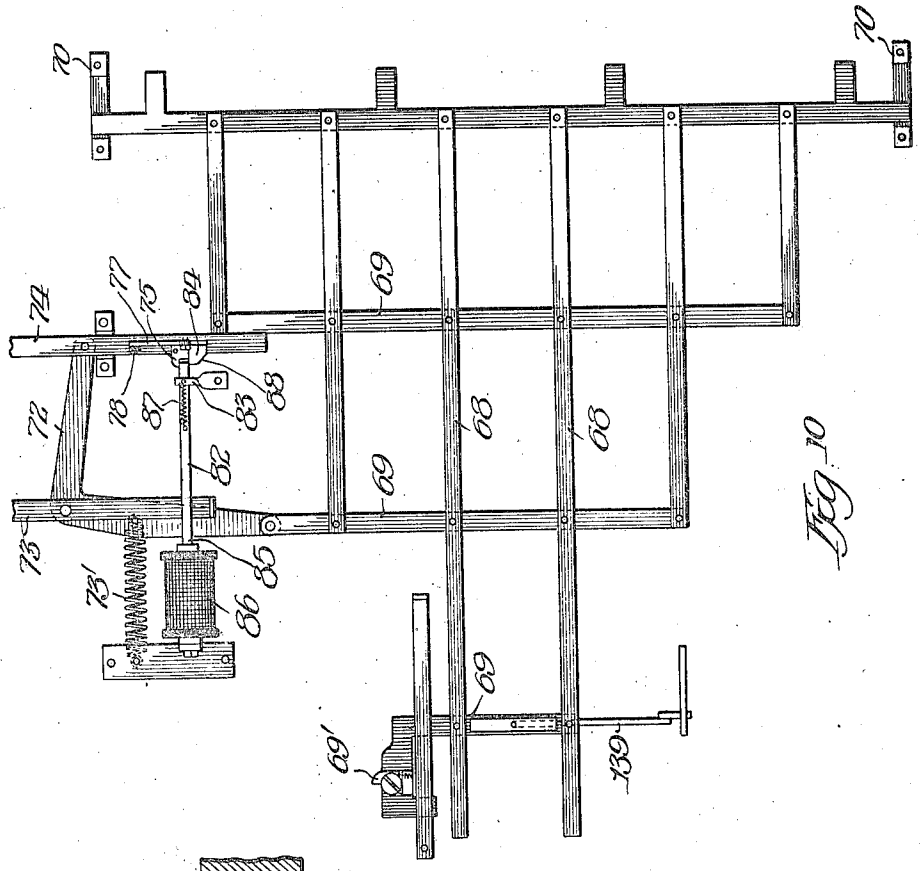


Fig. 10

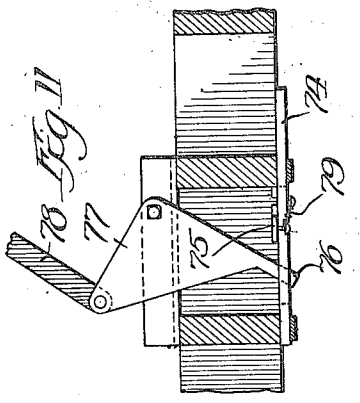


Fig. 11

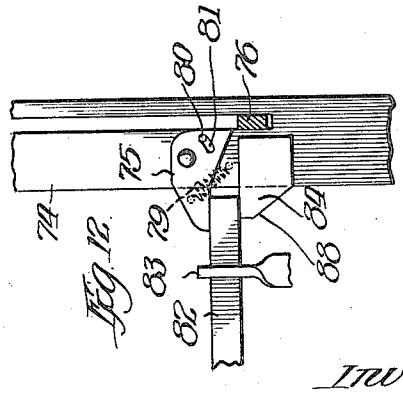


Fig. 12

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UNITED STATES PATENT OFFICE.

ERNEST HEDENSKOOG, OF MUSKEGON, MICHIGAN, ASSIGNOR TO THE BRUNSWICK-BALKE-COLLENDER COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

AUTOMATIC PIN-SETTING MACHINE.

1,190,649. Specification of Letters Patent. Patented July 11, 1916.

Application filed October 22, 1914. Serial No. 868,028.

To all whom it may concern:

Be it known that I, ERNEST HEDENSKOOG, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Automatic Pin-Setting Machines, of which the following is a specification.

This invention relates in general to machines for automatically setting pins upon a bowling alley and returning the balls to the player's position and more particularly to certain novel mechanism, devices, combinations and arrangements of parts which may be incorporated in the machine, which forms the subject-matter of my application filed June 6, 1914, Serial No. 843,372.

Among the objects of my present invention are the provision of novel means for arranging the pins upon and releasing them from the assembly shelf and a novel setter frame, and means for controlling the delivery of pins thereto, whereby the structure and mode of operation of my device, as previously disclosed, is materially simplified and improved.

Other objects and advantages of my invention will be apparent as it is better understood by reference to the following specification and the accompanying drawings in which—

Figure 1 is a plan view of the alley and the setter frame with the conveyer and supporting structure shown in section along the line 1—1 of Fig. 2; Fig. 2 is a vertical section through a portion of the device showing the setter and distributer frames in elevation; Fig. 3 is a vertical section on a somewhat enlarged scale taken on the line 3—3 of Fig. 5; Fig. 4 is a rear elevation of the device; Fig. 5 is a plan view of the device with the setter frame omitted; Fig. 6 is a side elevation of a portion of the device taken from the left of Fig. 5; Fig. 7 is a detail in elevation of the controlling means for the assembly shelf as shown in Fig. 6; Fig. 8 is a plan view of the structure shown in Fig. 7; Fig. 9 is a sectional detail of the assembly shelf; Fig. 10 is a detached plan view of the distributer frame and the releasing means therefor; Fig. 11 is a detail showing the operating finger for the distributer frame; Fig. 12 is a detail showing the latch for connecting the operating finger with the distributer frame, and Fig. 13 is a diagrammatic view of the various electric circuits.

In pin setting devices for bowling alleys two operations are essential. The first is the new-set operation in which all pins remaining on the alley are removed by a sweeper and a full set of pins is deposited upon the alley bed in their proper relative positions. The second operation is the "deadwood" removal operation and involves the lifting of the standing pins from the alley, the sweeping of any pins which have been overturned and of balls from the alley and the resetting of the lifted pins in their proper positions. In my application previously referred to I have disclosed a structure including a setter frame and a sweeper together with proper mechanism for conveying the pins to the setter frame and means for operating and timing the operation of the setter frame and sweeper, all controlled through electric circuits by proper circuit-closing means disposed adjacent the player's end of the alley.

I have found that the operating and timing means for the setter frame and the sweeper, as disclosed in my previous application referred to, are entirely satisfactory in practical use when applied to the mechanism about to be described and hence it appears to be unnecessary to further describe this mechanism. It is to be understood, therefore, that the present machine may be timed and operated through the mechanism described in my previous application or that other suitable mechanism for operating and timing the setter frame and sweeper may be substituted therefor.

Referring to the drawings, 1 indicates the alley bed, 2 the gutters and 3 the alley pit. The bed and gutters are of usual construction and the pit is provided with a bottom sloping from the alley bed and with sloping sides, the sides and bottom converging toward an aperture 4 in the rear wall of the structure below the usual pad 5. Rearwardly of the pit 3 is a suitable casing 6 which partially incloses a chain conveyer 7 having flights 8 disposed at intervals thereon and adapted to be operated by a sprocket 9 mounted on the main shaft 10 of the machine, the shaft being driven by the motor (not shown) which furnishes power for all of the moving parts of the structure. At the lower end of the casing 6 suitable guid-

ing tracks 11 are provided, whereby the conveyer 7 moves in a wide arc adjacent the aperture 4. A padded shelf 12 is suspended from suitable rods 13 mounted in the supporting frame 14 and springs 15 embracing the rods 13 form a resilient mounting for the padded shelf 12. The object of the padded shelf 12 is to receive the impact of any balls or pins which may fall from the conveyer during the upward movement thereof and thus prevent injury to the pins or balls remaining at the bottom of the conveyer and eliminating noise in the operation of the machine. The specific structure of the conveyer 7 and the flights 8 has been described in my application previously referred to and it is believed that the structure will be sufficiently clear without further description. The balls and pins as they roll from the alley 1 or are removed therefrom by the sweeper pass into the pit 3 and roll down the sloping sides and bottom thereof through the aperture 4 into the bottom of the conveyer where they are individually picked up by the flights 8.

During the upward movement of the conveyer 7 the balls leave the conveyer through an opening in the side of the casing 6, which is too small to allow the pins to pass therethrough, and return to the player's end of the alley along the track 16. The pins are carried by the conveyer 7 to the top of the casing 6 and fall therefrom into a trough 17 with their butt ends foremost. The means for preventing the pins from leaving the conveyer otherwise than as stated forms no part of the present invention, such means being fully disclosed in my application previously referred to, and it appears sufficient for the present description to state that such means, involving among other things the specific form of the flights 8, is provided in my present structure.

The pins slide by gravity down the trough 17 until they engage a member 18 pivotally mounted on a rod 19 (Fig. 7) suspended from a bracket 20 which is connected to and supported by the frame of the machine. The member 18 is provided with an extension 21 (Fig. 8) having a nose adapted to engage with and actuate a pawl 22 pivotally mounted on a bolt 23 in a swinging arm 24 which is in turn pivotally mounted on the stub shaft 25 supported by the frame. The extension 21 is normally held in retracted position out of engagement with the pawl 22 by a spring 26 connected therewith and with a bracket 27 mounted on the frame. The main shaft 10 which is driven through suitable mechanism from the motor (not shown) is provided with a bevel gear 29 which meshes with a bevel pinion 29′ (Fig. 6) on the stub shaft 30 mounted in the bracket 20. A crank disk 31 is fixed to the stub shaft 30 and adapted to be driven thereby and a link 32 connects the crank disk with the bolt 23 whereby the arm 24 and the pawl 22 are swung about the stub shaft 25 when the main shaft 28 is in motion. Fixed to the stub shaft 25 is a ratchet disk 33 having a plurality of ratchet teeth 34, four being preferably provided in the present instance, adapted to be engaged by the pawl 22 when the latter is moved into engagement therewith by the extension 21, whereby the ratchet disk 33 is actuated. A gear 35 is fixed to the stub shaft 25 adjacent the ratchet disk 33 and meshes with a pinion 36 fixed to the conveyer shaft 37. The ratio between the gear 35 and pinion 36 is 4 to 1, so that upon each actuation of the ratchet disk 33 moving the gear 35 through one fourth of a revolution, the pinion 36 and the shaft 37 will make a complete revolution. A disk 38 is secured to the shaft 37 adjacent the pinion 36 and is provided on its periphery with a pin 39. A bracket 40 is mounted on the frame and a saddle 41 is slidably mounted in the end thereof on a shank 42 connected with a member 43 provided with a slot 44 which slidably engages an extension of the shaft 37. A spring 46 connected to the bracket 40 and the member 43 normally holds the saddle 41 in its rearmost position. At its forward end the member 43 is provided with a pin 47 which is positioned to be engaged by a nose 48 of a lever 49 pivotally mounted on the stub shaft 25 and connected through a spring 50 with an arm 51 securely mounted on the swinging arm 24. As the arm 24 is moved about its pivot by the link 32 during the operation of the machine the nose 48 will engage the pin 47 and move the member 43 forwardly to draw the saddle 41 into the path of the pin 39 on the disk 38. This provides a positive stop for the conveyer shaft and prevents the shaft from making more than a single revolution at each actuation thereof.

The ratchet disk 33 is provided with two oppositely disposed pins 52 and a star-wheel 53 is mounted on a stub shaft 54 secured to the frame, the arms of the star-wheel 53 being disposed in position to be engaged by the pins 52 on the disk 33. Preferably five arms are provided on the star wheel 53 and inasmuch as two pins 52 are provided on the disk 33 it will be apparent that the star-wheel will be actuated twice during the complete revolution of the disk 33 or once for every second movement thereof. The star-wheel 53 will accordingly make a complete revolution when the disk 33 has been actuated ten times and inasmuch as the pawl 22 engages the disk 33 whenever a pin falls from the conveyer 7 into the chute 17 and against the member 18 it will be readily understood that when ten pins have been received by the chute the star-wheel 53 will have made a com-

plete revolution. The star-wheel 53 is provided with a cam-nose 55 which engages at each complete revolution the end 56 of a rod 57 slidably mounted in the frame and extending transversely thereof as shown in Fig. 5. The rod 57 operates a latch 58 to release the assembly shelf and allow the pins to fall into the chutes leading to the distributer frame. A spiral conveyer 58′ is secured to the shaft 37 and revolves therewith. The conveyer 58′ extends into an opening 59′ (Fig. 5) in the chute 17 into the path of the pins (see Fig. 4) and is adapted to receive the pins as they fall in the chute 17, the heads of the pins resting on the conveyer 58′ and the bases thereof against the member 18 and upon which each actuation of the ratchet disk 33 a pin is moved a distance equivalent to its width transversely of the machine onto and along the assembly shelf 59, it being understood that when the member 18 is depressed by the weight of a pin it alines with the retaining wall 62.

The assembly shelf 59 comprises a supporting frame pivotally mounted at 60 in the frame of the machine and normally held in the position indicated in Fig. 9 by a spring 61 secured thereto and to the frame of the machine. This spring is of sufficient strength to move the shelf to normal position when empty but insufficient to hold the shelf in this position when pins are disposed thereon. A latch 58, previously described, is provided to hold the shelf in normal position until released. A retaining wall 62 (Fig. 5) is provided at the front of the assembly shelf 59 and prevents the pins from moving into the chutes 63 until the latch 58 has been released by the mechanism previously described. In order that the chutes 64, which convey the pins to the first two rows, may be disposed at a sufficient angle it is necessary that the pins corresponding preferably to the third, sixth and eighth positions be held in the position taken by the pins when the assembly shelf is in normal position while the remaining pins drop into the chutes 63. For this purpose I provide the supports 65 rigidly mounted in the frame and disposed through openings in the assembly shelf as indicated in Figs. 5 and 9. These supports 65 are disposed beneath the butt ends of the pins and gates 66 are mounted on arms 67 connected to the assembly shelf 59 and are adapted to drop therewith and allow the pins to pass into the chutes 64. It is to be understood, of course, that the pins intended for the first two rows may be taken from any position on the assembly shelf, the positions indicated being merely those which have been found entirely satisfactory in the practical operation of the machine.

The pins after being released from the assembly shelf as described slide down the chutes 63 and 64 and rest upon the distributer frame in their proper relative playing positions. The distributer frame comprises a plurality of fixed longitudinally extending members 67 secured to the frame of the machine and a movable frame comprising longitudinally disposed members 68 and transverse members 69 slidably mounted in the brackets 70 beneath the members 67. Rigidly secured between the members 67 in front of the position assumed by each of the pins is a block 71 of wood or other suitable material which forms a stop against which the pin rests as it leaves its chute. The transverse members 69 are normally disposed midway between the blocks 71 and the ends of the chutes 63 and 64 and are adapted to be moved rearwardly at the proper intervals to allow the pins to fall into the setter frame. The mechanism for moving the members 69 comprises a bell-crank lever 72 mounted on a bracket 73 secured to the frame of the machine. One arm of the bell-crank lever 72 is connected to one of the members 69 and a spring 73′, secured to the bell-crank lever 72 and to the frame, normally holds this arm of the bell-crank lever 72 in forward position so that the members 69 are disposed in their normal position to engage and hold the pins as they descend from the chutes 63 and 64. The other arm of the bell-crank lever 72 is connected with a slidable member 74 supported in the frame of the machine and a latch 75 is pivotally mounted on the member 74 and adapted to be engaged by a finger 76 of a lever 77 which is connected by a link 78 to an eccentric (not shown) on the main shaft 28 of the machine. The finger 76 on the lever 77 is reciprocated as the shaft 28 revolves.

The latch 75 is connected to the sliding member 74 by means of a spring 79 which tends to move it into position to be engaged by the finger 76, a pin 80 being mounted on the member 74 and disposed in a slot 81 of the latch 75 to limit the movement thereof. The latch 75 is normally held out of engagement with the finger 76 by means of a member 82 slidably mounted in a guide 83 and disposed between the end of the latch 75 and a stop 84 secured to the sliding member 74. The member 82 is provided at its opposite end with an armature 85 disposed within the solenoid coil 86 which coil, when energized, draws the armature forwardly to release the latch 75. A spring 87 connects the member 82 with its guide 83 and normally holds the member 82 in its rearward position. The stop 84 is provided with a cam-nose 88 so that when the sliding member 74 is returned to its normal position by the spring 73′ the member 82 will ride along the cam-nose 88 and will

engage the end of the latch 75, forcing it out of engagement with the finger 76 whereupon the spring 87 will force the member 82 between the latch 75 of the stop 84.

From the foregoing description it is thought that the operation of this portion of the device will be apparent without further description. The finger 76 is constantly reciprocated when the machine is in operation and when the solenoid 86 is energized, withdrawing the member 82, the latch 75 will be released and will move into position to be actuated by the finger 76. The member 74 will thereupon be moved by the finger 76 and will actuate the bell-crank lever 72 which will in turn move the slidably mounted frame comprising the members 68 and 69 rearwardly of the machine, whereby the pins which are resting thereon will be released and will fall into the setter frame mechanism.

The setter frame comprises a frame work composed of angle irons 90 preferably arranged in triangular form, as shown in Fig. 1, upon which are supported the transverse members 91 supporting the magnet coils 92 which are loosely suspended in said members by means of bolts 93, whereby a small amount of the vertical play is allowed when the magnets descend and engage the tops of the pins. The setter frame is preferably suspended from its corners by means of chains 90′ passing over suitable pulleys and attached to a counterweight, this mechanism not, however, being shown for the reason that it is fully disclosed in my application previously referred to, the structure disclosed having been found to be entirely satisfactory in the practical use of the device. At the rear corners of the setter frame vertical members 94 (Fig. 2) are secured having at their upper extremities rollers 95 which engage the gate-cam plates 96 secured to the frame of the machine at either side thereof. Each gate-cam plate 96 is provided with two vertical slots 97 and two oblique slots 98, spring actuated gates 99 pivoted at 99′ being further provided to limit the movement of the rollers 95 in the slots.

The operation of the machine requires two distinct movements of the setter frame. In the new-set operation the setter frame descends until the bottom thereof nearly rests upon the alley floor whereas in the deadwood-removal operation the setter frame descends merely until the magnet coils 92 contact with the tops of the pins standing on the alley. The setter frame is actuated to carry out the movements indicated through suitable connections with an operating and timing mechanism previously referred to as not shown in the present application and the gate-cam plates 96 are provided to guide the movements of the setter frame in carrying out these operations. In the new-set operation the rollers 95 descend in the vertical slots 97 at the right of Fig. 2 and passes into the lower oblique slots 98 through the lower gates 99 and into the vertical slots 97 at the left in Fig. 2 and continue to descend in the vertical slots 97 until the setter frame is disposed adjacent the alley bed. Upon the upward movement of the setter frame the gates 99 prevent the entrance of the rollers 95 into the lower oblique slots 98 and hence the rollers pass upward in the vertical slots 97 at the left in Fig. 2 into the upward oblique slots 98 and through the upper gates 99 into the vertical slots 97 at the right of Fig. 2 and thence upward to the normal position of the setter frame. In the deadwood-removal operation the rollers 95 descend merely in the vertical slots 97 at the right in Fig. 2 which are of sufficient length to allow the magnet coils 92 to engage the tops of the pins and then move upwardly in the same slots without passing into the oblique slots. It will be readily understood that the gate-cam plates 96 allow the setter frame a combined vertical and forward movement in the new-set operation and a vertical movement only in the deadwood-removal operation. The forward movement has for its object the placing of the pins in position directly beneath the normal position of the magnet coils 92 when the setter frame is in its upper position in order that as the frame descends in the deadwood-removal operation the pins will be disposed to be engaged and picked up by the magnet coils which are energized through suitable electrical connections and attract the iron cores 100 disposed in the heads of the pins.

Disposed beneath the frame work composed of members 91 are longitudinally extending members 101 and 101′ having slots 92′ engaging the supporting bolts 91′. Transverse members 102 and 103 are secured at intervals on members 101 and 101′ respectively and carry the complementary sections 104, 105, respectively, forming cup-shaped members adapted to hold the pins, when disposed adjacent each other, as indicated in full lines in Fig. 2. The sections 104 and 105 are mounted directly behind the magnet coils 92 so that the pins carried therein will be deposited on the alley bed directly beneath the magnet coils, as previously described during the new-set operation.

Pivotally mounted at 117 in the bracket 106 on the setter frame is a bell-crank lever 107 having an arm 108 connected to a link 109 which extends through a stop 110 on the frame of the machine. Two abutments 111, 112 are mounted on the link 109 and are adapted to contact with the stop 110 when the setter frame reaches either of its extreme

positions. The bell-crank lever 107 is provided with two arms 113, 114, the arm 113 being connected by means of a link 115 to the rearmost transverse member 102 while the arm 114 is connected by a link 116 to the corresponding transverse member 103 forming the supports for the sections 104, 105, respectively, of the cup-shaped members adapted to support the pins. When the setter frame is in the upper position indicated in full lines in Fig. 2 the abutment 112 will have engaged the stop 110 as indicated and the bell-crank lever 107 will be turned to draw the members 102 and 103 and hence the sections 104 and 105 together, whereby these members will form a cup for the reception of the pins in upright position. As the setter frame is lowered and guided by the gate-cam plates 96 to the position indicated in dotted lines in Fig. 2 the abutment 111 will engage the stop 110 and turn the bell-crank lever about its pivot 117, thereby moving the members 102 and 103 and hence the sections 104 and 105 in opposite directions whereby the pins are released from the cups and upon the vertical movement of the setter frame guided by the vertical slots 97 at the left in Fig. 2 the pins will be left standing upon the alley bed.

The circuits involved in the electrical control of my present invention are substantially identical with those disclosed in the prior application. I have, however, devised an improved switch-operating means for controlling the circuit of the solenoid coil 86. The switch comprises a base 120 of suitable insulating material secured to one of the longitudinal members 67 and provided with contact points 121 and 122. A contact arm 123 is pivotally mounted at 124 and a bell-crank lever 125 is secured to the contact arm 123 and comprises the operating means therefor. Upon one arm of the bell-crank lever 125 the finger 126 is pivotally mounted and normally held in the position indicated in Fig. 3 by a spring 127 attached thereto and to the arm of the bell-crank lever. A rod 128 is secured to the setter frame and is provided at its upper extremity with a finger 129 which is adapted, as the setter frame descends, to engage and pass the finger 126 without actuating the bell-crank lever 125. On the upward movement of the setter frame, however, the finger 129 engages the finger 126 and inasmuch as the finger 126 is held from turning in this direction by a pin 130 on the bell-crank lever 125 the finger 129 will turn the bell-crank lever 125 about its pivot and move the contact arm 123 to engage the contact 122. As will be later explained the circuit is thereby closed through the solenoid coil 86 which controls the operation of the distributer frame and it will be readily understood that since the contact arm 123 is actuated only after the setter frame has been lowered to deposit pins on the alley bed the distributer frame can only be actuated to supply pins to the setter frame when the latter is empty. Upon the forward movement of the transverse members 69 which support the pins in the distributer frame the member 69 corresponding to the foremost pin of the set will through a finger 69′ connected thereto engage the other arm of the bell-crank lever 125 and will thereby move the contact arm 123 to engage contact 121. The finger 69′ is pivotally mounted so that it will actuate the bell-crank lever 125 only upon the forward movement of the distributer frame.

The electrical circuits which are required in the operation of my device are diagrammatically shown in Fig. 13 in which 130 and 131 indicate the source of current for operating the various devices; 132 indicates a blow-out coil for preventing sparking at the various contacts; 133 is a solenoid coil for operating the main clutch; 134 and 135 are solenoid coils controlling the timing mechanism for retarding the operation of the sweeper or the setter frame, respectively, in the new-set and deadwood-removal operations; 136 and 137 are contact makers adapted to be disposed adjacent player's end of the alley for controlling the machine; 138 is a safety device, including a magnet coil, for preventing the starting of a new operation before the preceding one has been completed, and 139 is a contact maker adapted to be closed by the weight of the foremost pin in the distributer frame. All of the foregoing mechanism is fully described in my previously noted application. The solenoid coil for controlling the operation of the distributer frame is indicated at 86; 121 and 122 are the contact points and 123 the coöperating contact arm.

When the new-set operation is desired the proper contact maker 137 is closed whereby the circuit is closed from the positive source of current 131 through blow-out solenoid 132 to the main clutch operating solenoid 133 which starts the operating of the machine; through solenoid 135 of the timing mechanism to retard the operation of the setter frame until the sweeper has been actuated to clear the alley of pins, etc.; through contact maker 137, contact point 121, contact arm 123, and thence back to the negative source of current 130.

When the deadwood-removal operation is desired the contact maker 136 is closed, whereby the circuit is closed from the positive source of current 131 through blow-out solenoid 132 to the main clutch solenoid 133; through solenoid 134 of the timing mechanism to retard the operation of the sweeper until the standing pins have been lifted from

the alley by the setter frame; through contact maker 136, magnet coil 138, contact point 121, contact arm 123, and thence back to the negative source of current 130.

The circuit for controlling the distributer frame whereby it is actuated to supply pins to the setter frame only when the latter is empty and a full complement of pins is held in the distributer frame will now be described. The solenoid 86 and the circuit closing means comprising the contact point 122 and the contact arm 123 has previously been described. The contact arm 123 is actuated to close the circuit only after the setter frame has moved to its lowermost position to deposit pins and is hence empty. A contact maker 139 is disposed in the distributer frame in position to be closed by the weight of the foremost pin of the set resting thereon. It will therefore be readily understood that when a set of pins is held in the distributer frame and the setter frame ascends after depositing its pins the circuit will be closed from the positive source of current 131 through the solenoid 86 which controls the mechanism for supplying pins to the setter frame, through contact maker 139, contact point 122, contact arm 123, and thence to the negative source of current 130. The circuit is broken by the return of the members 69, which hold the pins in the distributer frame, to normal position through the finger 69′ as has previously been described.

The circuits and contact mechanism for controlling the magnet coils 92 whereby the standing pins are removed from the alley bed during the deadwood-removal operation and whereby any particular combination of pins may be selected from a set and lifted from the bed while the remaining pins are swept from the alley bed, are identical with those disclosed in my application previously referred to and form no part of my present invention. Hence the contact mechanism and circuits are not specifically described in the present application.

It is thought that my invention will be readily understood from the foregoing and it will be obvious that various changes may be made in the devices, mechanisms and circuits described without departing from the spirit and scope of the invention or sacrificing any of its material advantages, the forms hereinbefore disclosed being merely preferred embodiments.

I claim:

1. A pin setting machine for a bowling alley, the combination of means for elevating pins from the alley pit, and means disposed in juxtaposition to said first-mentioned means to break the fall of pins which may become disengaged therefrom.

2. In a pin setting machine for a bowling alley, the combination of a conveyer for elevating balls from the alley pit, and a shelf disposed in juxtaposition to said conveyer to break the fall of balls which may become disengaged therefrom.

3. In a pin setting machine for a bowling alley, the combination of a conveyer for elevating pins and balls from the alley pit, and means resiliently mounted in juxtaposition to said conveyer to break the fall of pins or balls which may become disengaged therefrom.

4. In a pin setting machine for a bowling alley, the combination of a conveyer for elevating pins and balls from the alley pit, and a padded shelf resiliently suspended in juxtaposition to said conveyer to break the fall of pins or balls which may become disengaged therefrom.

5. In a pin setting machine for a bowling alley, the combination of a frame, an endless conveyer for elevating pins and balls from the alley pit, and a padded shelf resiliently mounted on said frame within said conveyer and adapted to break the fall of pins or balls which may become disengaged therefrom.

6. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a spiral conveyer disposed on said assembly shelf, and means controlled by the delivery of pins to said assembly shelf for actuating said conveyer.

7. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a spiral conveyer disposed on said assembly shelf and extending longitudinally thereof, and means controlled by the delivery of pins to said shelf for causing said conveyer to make a single revolution as each pin is delivered.

8. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a shaft extending longitudinally thereof, means mounted on said shaft adapted to engage the pins, and means controlled by the delivery of pins to said shelf for causing said shaft to revolve as the individual pins are delivered, whereby the pins are moved longitudinally of the assembly shelf.

9. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a shaft extending longitudinally thereof, means mounted on said shaft adapted to engage the pins, means adapted to be constantly actuated, and means connected to said shaft adapted to be intermittently actuated by said constantly actuated means as individual pins are delivered to the assembly shelf.

10. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a spiral conveyer disposed on said assembly

shelf, means controlled by the delivery of pins to said assembly shelf for actuating said conveyer, and means for releasing the pins from said shelf when a full set of pins has accumulated thereon.

11. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a shaft extending longitudinally thereof, means mounted on said shaft adapted to engage the pins, means controlled by the delivery of pins to said shelf for causing said shaft to revolve as the individual pins are delivered, whereby the pins are moved longitudinally of the assembly shelf, and means for releasing the pins therefrom when a full set of pins has accumulated.

12. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a spiral conveyer extending longitudinally thereof, means adapted to be constantly actuated, means for driving said conveyer adapted to be intermittently actuated by said constantly actuated means, and means actuated by the delivery of a pin to said shelf for connecting said constantly and intermittently actuated means.

13. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a spiral conveyer extending longitudinally thereof, means adapted to be constantly actuated, means for driving said conveyer adapted to be intermittently actuated by said constantly actuated means, means actuated by the delivery of a pin to said shelf for connecting said constantly and intermittently actuated means, and means for limiting the movement imparted to said conveyer.

14. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a shaft extending longitudinally thereof, a conveyer mounted on said shaft, a ratchet disk operatively connected with said shaft, a constantly actuated member adapted to intermittently engage and actuate said ratchet disk, and means actuated by the delivery of individual pins to said shelf for controlling the actuation of said ratchet disk by said constantly actuated member.

15. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a shaft extending longitudinally thereof, a conveyer mounted on said shaft, a ratchet disk operatively connected with said shaft, a constantly actuated pawl adapted to intermittently engage and actuate said ratchet disk, and means actuated by the delivery of individual pins to said shelf for forcing said pawl into engagement with said ratchet disk.

16. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a conveyer mounted thereon, a ratchet disk operatively connected with said conveyer, a continuously actuated swinging arm, a pawl mounted thereon and adapted to engage and actuate said ratchet disk, and means disposed in the path of the pins as they are delivered to said shelf for moving said pawl into engagement with said ratchet disk.

17. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a conveyer mounted thereon, a ratchet disk operatively connected with said conveyer, a continuously actuated pawl adapted to intermittently engage and actuate said ratchet disk, means disposed in the path of the pins as they are delivered to said shelf for moving said pawl into engagement with said ratchet disk, and means for limiting the movement of said conveyer at each actuation thereof.

18. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a conveyer mounted thereon, a ratchet disk operatively connected with said conveyer, a continuously actuated pawl adapted to intermittently engage and actuate said ratchet disk, means disposed in the path of the pins as they are delivered to said shelf for moving said pawl into engagement with said ratchet disk, and means for releasing the pins from said shelf when a full set has accumulated thereon.

19. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a conveyer mounted thereon, a ratchet disk operatively connected with said conveyer, a continuously actuated pawl adapted to intermittently engage and actuate said ratchet disk, means disposed in the path of the pins as they are delivered to said shelf for moving said pawl into engagement with said ratchet disk, a pin disposed on said ratchet disk, a star-wheel adapted to be actuated thereby, and means controlled by said star-wheel for releasing the pins from said shelf.

20. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a shaft extending longitudinally thereof, a spiral conveyer mounted on said shaft, a stub shaft disposed adjacent said first-mentioned shaft, a ratchet disk mounted on said stub shaft, means operatively connecting said ratchet disk and first-mentioned shaft, a pivoted arm mounted adjacent said ratchet disk, means adapted to continuously swing said arm about its pivot, a pawl mounted on said arm adapted to intermittently engage

and actuate said ratchet disk, and means controlled by the delivery of pins to said assembly shelf to force said pawl into engagement with said ratchet disk.

21. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a shaft extending longitudinally thereof, a spiral conveyer mounted on said shaft, a stub shaft disposed adjacent said first-mentioned shaft, a ratchet disk mounted on said stub shaft, means operatively connecting said ratchet disk and first-mentioned shaft, a pivoted arm mounted adjacent said ratchet disk, means adapted to continuously swing said arm about its pivot, a pawl mounted on said arm and adapted to intermittently engage and actuate said ratchet disk, means controlled by the delivery of pins to said assembly shelf to force said pawl into engagement with said ratchet disk, and means for limiting the movement of the conveyer at each actuation thereof.

22. In a pin setting machine for a bowling alley, the combination of an assembly shelf, means for delivering pins thereto, a shaft extending longitudinally thereof, a spiral conveyer mounted on said shaft, a stub shaft disposed adjacent said first-mentioned shaft, a ratchet disk mounted on said stub shaft, means operatively connecting said ratchet disk and first-mentioned shaft, a pivoted arm mounted adjacent said ratchet disk, means adapted to continuously swing said arm about its pivot, a pawl mounted on said arm and adapted to intermittently engage and actuate said ratchet disk, means controlled by the delivery of pins to said assembly shelf to force said pawl into engagement with said ratchet disk, and means controlled by said ratchet disk for releasing the pins from the assembly shelf when a full set of pins has accumulated thereon.

23. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, independent means automatically actuated to deliver pins in sets to said setter frame, and automatic means for supplying pins in sets to said independent means.

24. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, independent means automatically actuated to deliver pins in sets to said setter frame, automatic means for supplying pins in sets to said independent means, and means for depositing said pins upon said alley bed.

25. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, automatic means for delivering pins to said setter frame, magnets upon said setter frame, and means for depositing the pins in position directly beneath the normal positions of said magnets when said setter frame is in pin-receiving position.

26. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame for delivering pins to said setter frame, and means for actuating said distributer frame only when said setter frame is empty.

27. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame for delivering pins to said setter frame, means for actuating said setter frame to deposit pins upon the alley bed, and means preventing the delivery of pins from said distributer frame to said setter frame except when the latter is empty.

28. In a pin setting machine for a bowling alley, the combination of a vertically movable setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame for delivering pins to said setter frame, means for actuating said distributer frame including an electric switch and magnetic means controlled thereby, and means disposed on said setter frame for moving said switch to the distributer frame actuating position upon the upward movement of said setter frame.

29. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame automatically actuated to deliver a set of pins to said setter fame when the latter is empty, and automatic means for supplying pins in sets to said distributer frame.

30. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame for delivering pins to said setter frame when the latter is empty, an assembly shelf for supplying pins in sets to said distributer frame, and automatic means for releasing the pins from said assembly shelf when a full set of pins has accumulated thereon.

31. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame for delivering pins to said setter frame when the latter is empty, means on said setter frame for controlling the delivery of pins thereto, and automatic means for supplying pins in sets to said distributer frame.

32. In a pin setting machine for a bowlin

alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, means for releasing the pins therefrom, a distributer frame adapted to deliver pins to said setter frame when the latter is empty, an assembly shelf, means for supplying pins thereto, and automatic means for releasing the pins from said assembly shelf when a full set of pins has accumulated thereon.

33. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame adapted to deliver pins to said setter frame when the latter is empty, an assembly shelf, a spiral conveyer thereon, means for delivering pins to said assembly shelf, and means for actuating said conveyer to move the pins longitudinally of said assembly shelf as the individual pins are delivered thereto.

34. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame adapted to deliver pins to said setter frame when the latter is empty, an assembly shelf, a spiral conveyer thereon, means for delivering pins to said assembly shelf, means for actuating said conveyer to move the pins longitudinally of said assembly shelf as the individual pins are delivered thereto, and means for releasing the pins from said assembly shelf when a full set has accumulated thereon.

35. In a pin setting machine for a bowling alley, the combination of a setter frame adapted to receive and hold pins in upright position above an alley bed, a distributer frame adapted to deliver pins to said setter frame when the latter is empty, an assembly shelf, a spiral conveyer thereon, means for delivering pins to said assembly shelf, and means for actuating said conveyer comprising means adapted to be continuously actuated, means operatively connected to said conveyer and adapted to be intermittently actuated, and means controlled by the delivery of pins to said assembly shelf for connecting said continuously and intermittently actuated means.

36. In a pin setting machine for a bowling alley, the combination of a vertically movable frame adapted to receive and hold pins in upright position above an alley bed, means for lowering said setter frame to deposit pins on the alley bed, a distributer frame adapted to deliver pins to said setter frame, means on said distributer frame for normally holding the pins thereon, magnetic means for controlling said holding means, a switch for controlling said magnetic means, and means on said setter frame coöperating with said switch to close the circuit to said magnetic means and release the pins from the distributer frame when said setter frame moves upwardly from its pin depositing position.

37. In a pin setting machine for a bowling alley, the combination of a setter frame reciprocable above an alley bed, and means disposed in operative relation with said setter frame to guide it in a combined vertical and forward movement.

38. In a pin setting machine for a bowling alley, the combination of a setter frame reciprocable above an alley bed, and means disposed at either side thereof in operative relation therewith to guide said setter frame in a combined vertical and forward movement.

39. In a pin setting machine for a bowling alley, the combination of a setter frame reciprocable above an alley bed, cam plates having vertical and oblique slots, disposed at either side thereof, and means on said setter frame and coöperating with said slots to guide said setter frame in a combined vertical and forward movement.

40. In a pin setting machine for a bowling alley, the combination of a setter frame reciprocable above an alley bed, cam plates, each having a pair of vertical and a pair of oblique slots, disposed at either side thereof, and means on said setter frame coöperating with said slots to guide said setter frame.

41. In a pin setting machine for a bowling alley, the combination of a setter frame reciprocable above an alley bed, cam plates disposed at either side thereof, each of said cam plates being provided with a pair of vertical and a pair of oblique slots, means secured to said setter frame and coöperating with said slots, and means disposed in said slots to cause said coöperating means to follow a predetermined course of travel in said slots as said setter frame is reciprocated.

42. In a pin setting machine for a bowling alley, the combination of a setter frame reciprocable above an alley bed, cam plates disposed at either side thereof, each of said cam plates being provided with a pair of vertical and a pair of oblique slots, means secured to said setter frame and coöperating with said slots to guide said setter frame, and gates disposed in said slots to cause said coöperating means to follow a predetermined course of travel in said slots as said setter frame is reciprocated.

43. In a pin setting machine for a bowling alley, the combination of a setter frame reciprocable above an alley bed and adapted to deposit pins thereon, magnetic means secured to said setter frame, and means for guiding said setter frame as it descends whereby said setter frame is moved forwardly to deposit the pins directly beneath the normal position of said magnetic means when said setter frame is in its uppermost position.

44. In a pin setting machine for a bowling

alley, the combination of a setter frame, and means for automatically delivering pins thereto, said setter frame comprising complementary members normally adapted to receive and hold pins in upright position.

45. In a pin setting machine for a bowling alley, the combination of a setter frame, and means for automatically delivering pins thereto, said setter frame comprising complementary members normally adapted to receive and hold pins in upright position, and means for separating said members to release the pins therefrom.

46. In a pin setting machine for a bowling alley, the combination of a movable setter frame, means for automatically delivering pins thereto, said setter frame comprising complementary members normally adapted to receive and hold pins in upright position, and means for separating said members to release the pins therefrom.

47. In a pin setting machine for a bowling alley, the combination of a movable setter frame, means for automatically delivering pins thereto, said setter frame comprising complementary members normally forming cup-shaped receptacles adapted to receive and hold pins in upright position, and means controlled by the movement of said setter frame for separating said members to release the pins therefrom.

48. In a pin setting machine for a bowling alley, the combination of a reciprocable setter frame comprising a support, complementary members mounted therein and normally adapted to receive and hold pins in upright position and magnetic means disposed on said support, means for guiding said setter frame in a combined vertical and forward movement until the pins are disposed directly beneath the normal position of said magnetic means when the setter frame is in its uppermost position, and means for releasing the pins from said complementary members.

49. In a pin setting machine for a bowling alley, the combination of a setter frame comprising a support, members slidably supported thereon, complementary members mounted on said slidably supported members and normally adapted to receive and hold pins in upright position, a bell-crank lever pivoted on said support, means connecting the arms of said bell-crank lever with said slidably supported members, and means for actuating said bell-crank lever whereby said complementary members are separated to free the pins therefrom.

50. In a pin setting machine for a bowling alley, the combination of a reciprocable setter frame comprising a support, complementary members slidably mounted thereon and normally adapted to receive and hold pins in upright position, and magnetic means disposed on said support, means for automatically delivering pins to said setter frame, means for guiding said setter frame in a combined vertical and forward movement until the pins are disposed directly beneath the normal position of said magnetic means with the setter frame in its pin-receiving position, and means for releasing the pins from said complementary members.

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