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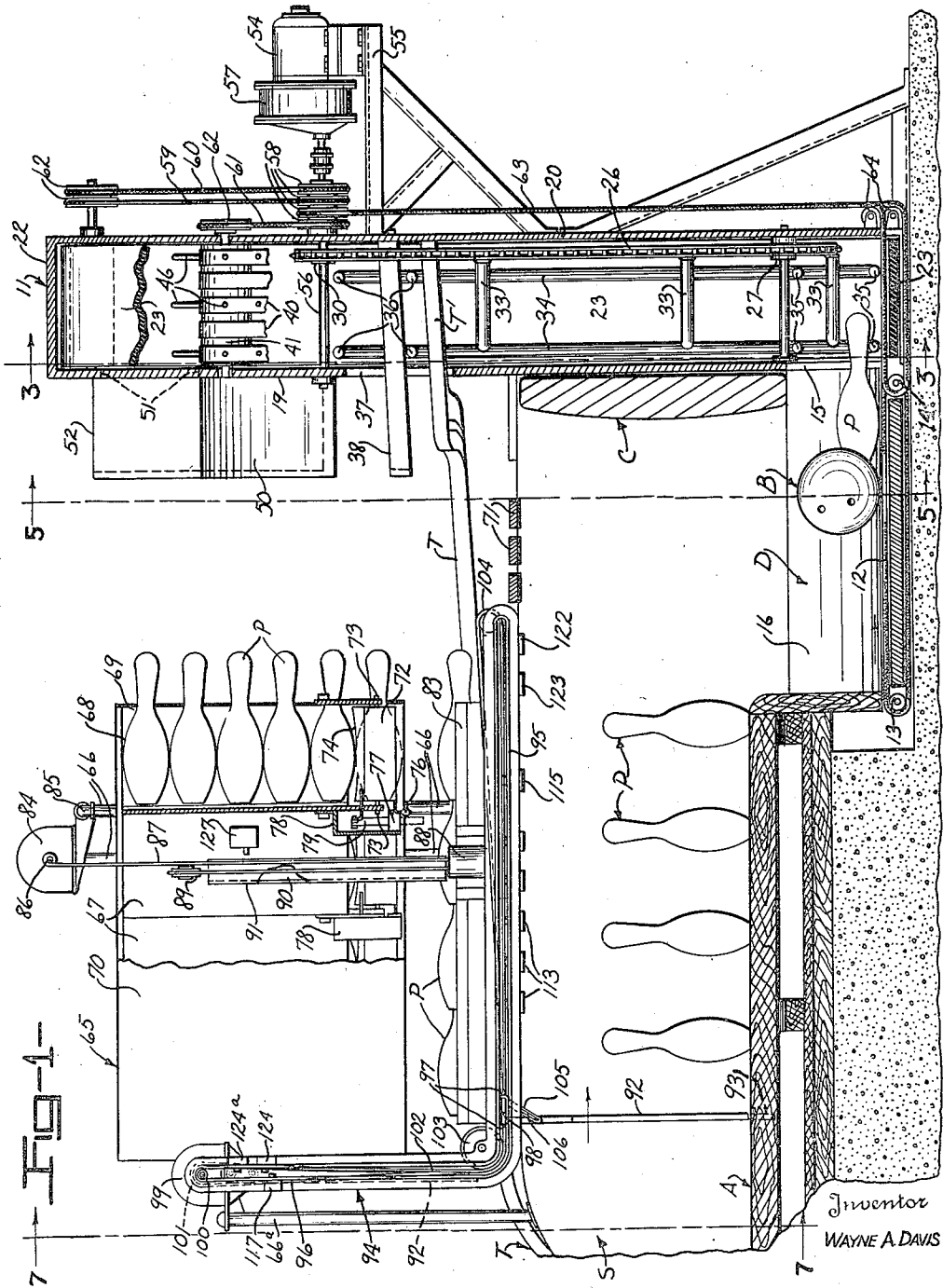
W. A. DAVIS

2,310,218

PIN SETTING APPARATUS

Filed Oct. 28, 1940

7 Sheets-Sheet 1



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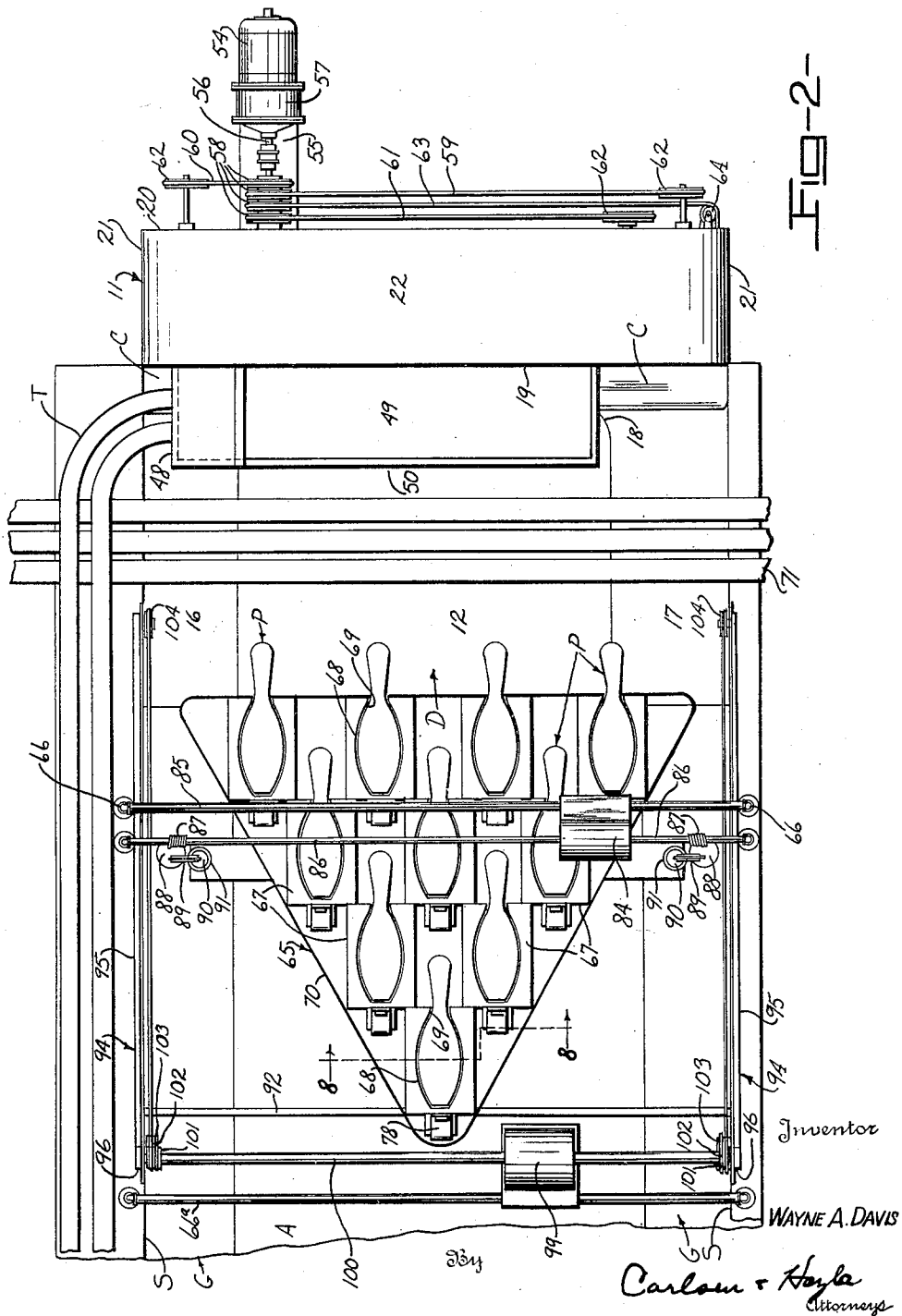
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PIN SETTING APPARATUS

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Fig-3-

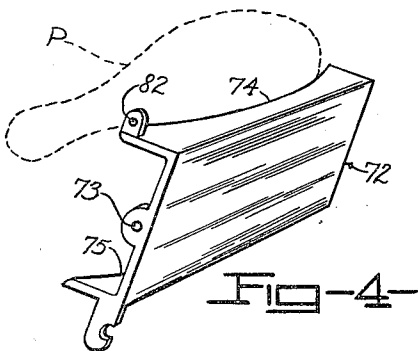
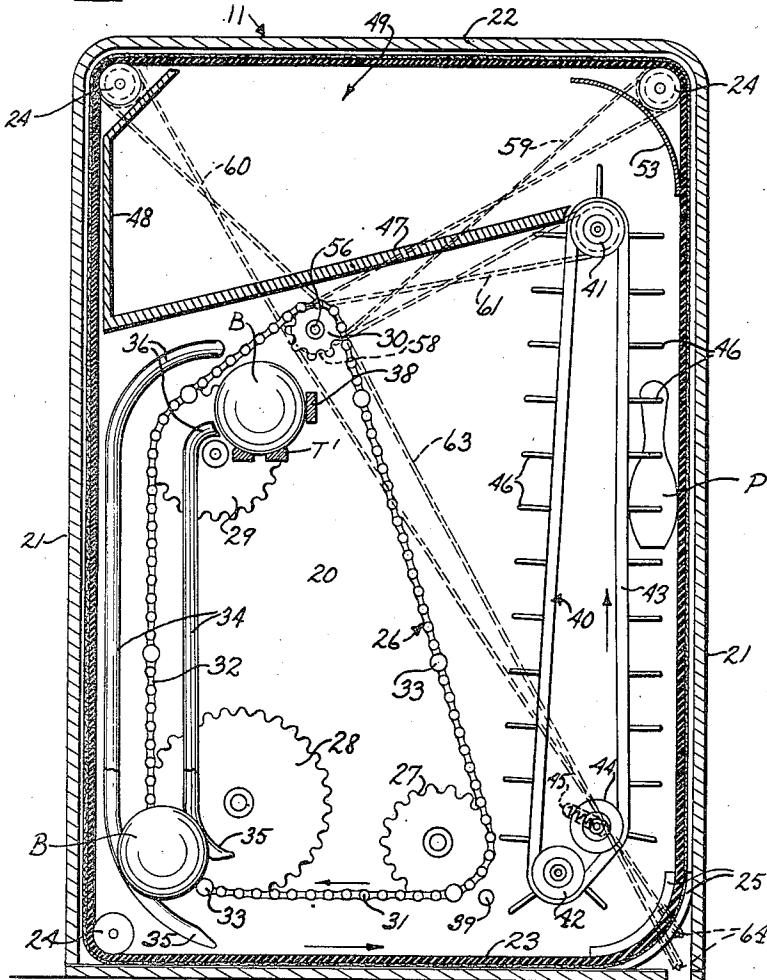


Fig-4-

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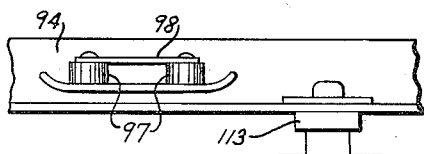
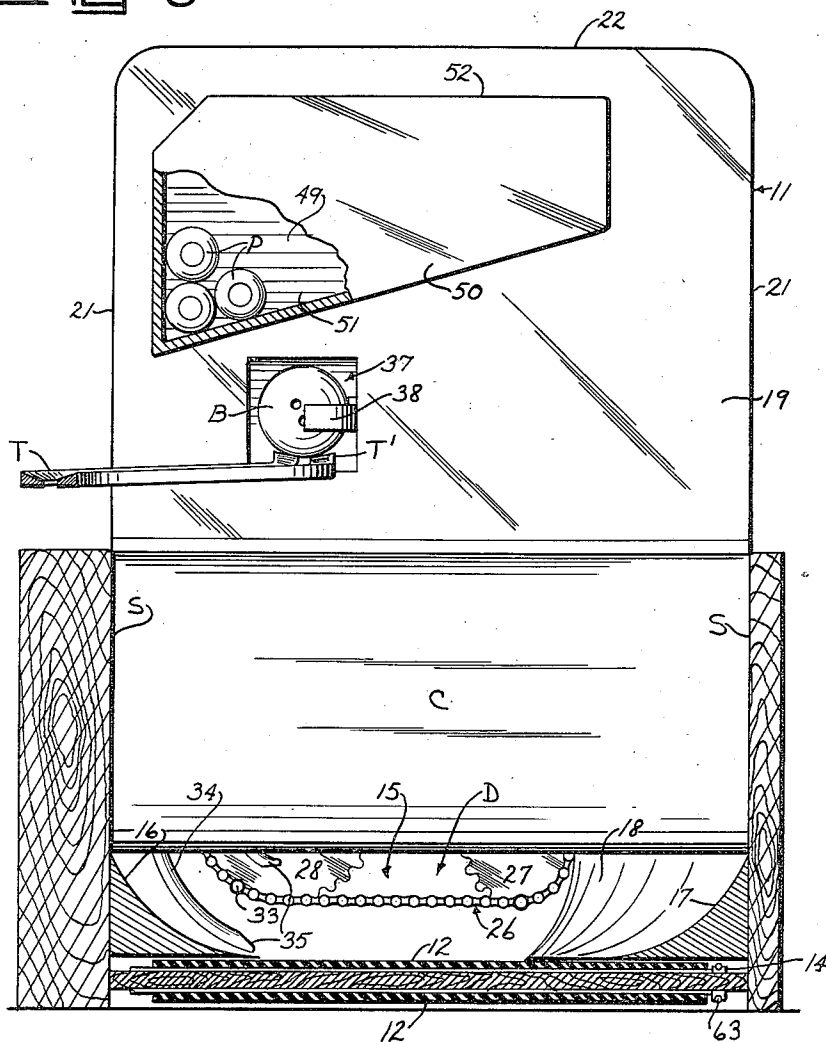
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PIN SETTING APPARATUS

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Fig-5-



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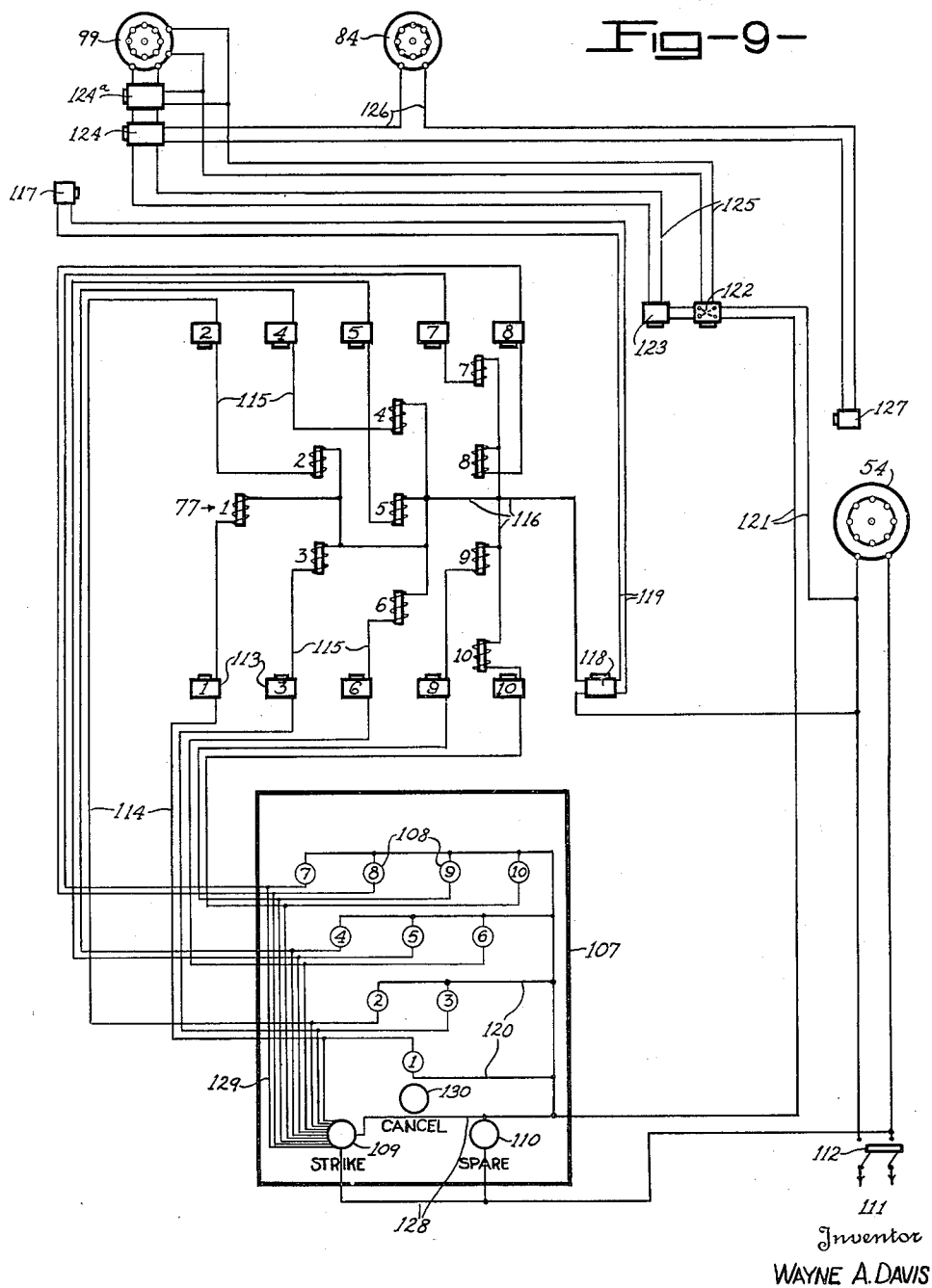
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PIN SETTING APPARATUS

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Fig-10-

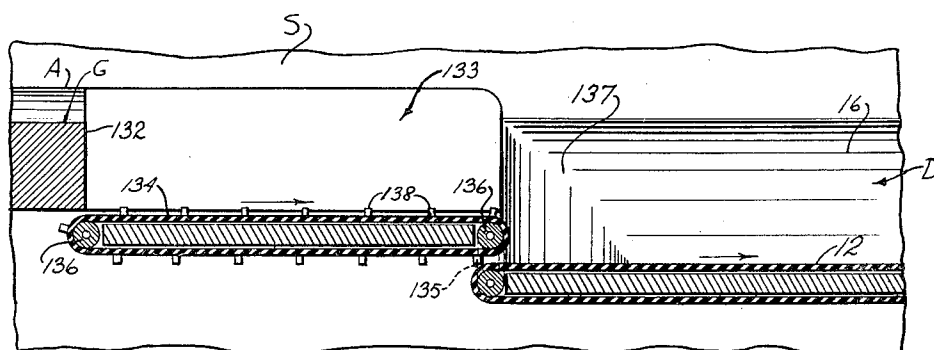
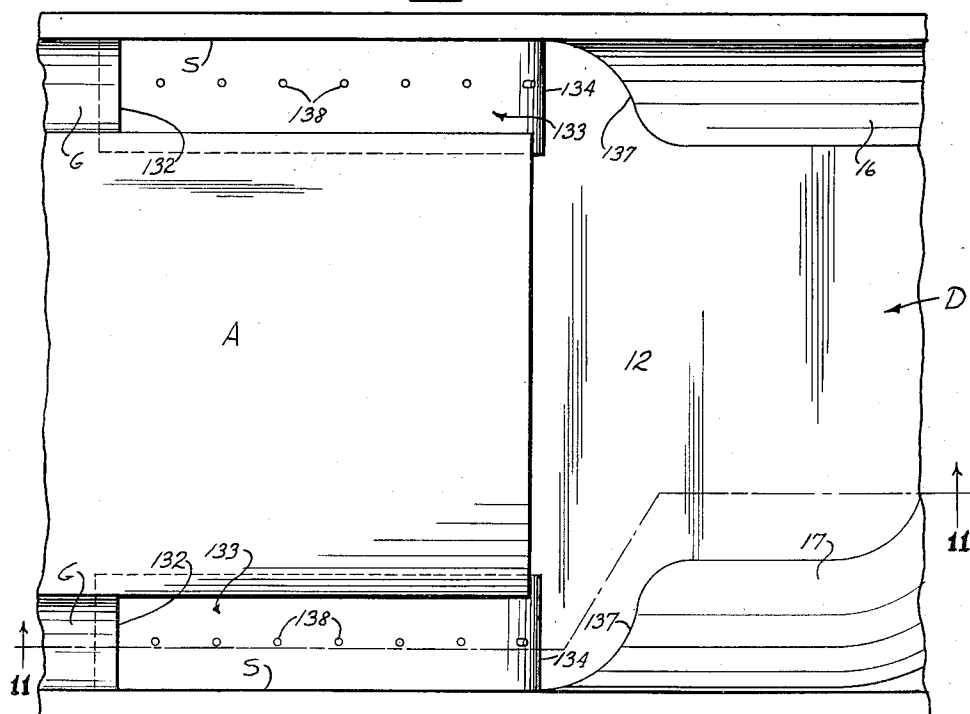


Fig-11-

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UNITED STATES PATENT OFFICE

2,310,218

PIN SETTING APPARATUS

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4 Claims. (Cl. 273-43)

This invention presents an automatic means for setting up the pins used in a bowling alley and for returning the balls to the bowler.

In the operation of bowling alleys it has heretofore been necessary to employ labor for resetting the pins after they are knocked down and for returning the ball to the bowler. This has represented a continuous and considerable expense to the operator of the alleys, not alone due to the wages involved, but also due to the cost of compensation and insurance to protect the employees against the hazards of flying pins and balls.

It is the primary object of my invention therefore, to provide a device or mechanism by means of which the pins may be reset and the ball returned solely under the control of the bowler and which will require the attendance of only one pin boy, as they are called, for a series of alleys, thus materially reducing the cost of operating the alleys. The pin boy is needed only to properly position the pins in magazines at each alley and he is not placed in a position in which he may be injured by the pins, thus reducing the cost of, or eliminating the necessity for, the insurance above mentioned.

Another and important object is to provide means of this kind which while subject to control by the bowler, will not be so complicated as to require extensive instruction in operation of the controls or interfere with the normal pleasure derived from playing the game.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, in which—

Fig. 1 is a vertical cross section through the rear or pit end of a bowling alley showing my invention applied thereto and with certain parts of my device also shown in section.

Fig. 2 is a plan view of the structure shown in Fig. 1.

Fig. 3 is a view taken substantially along the line 3-3 in Fig. 1 and showing the forward wall of the rear housing removed and certain parts in cross section.

Fig. 4 is a perspective view of one of the escapement members used for dropping the bowling pins.

Fig. 5 is a vertical cross section along the line 5-5 in Fig. 1.

Fig. 6 is an enlarged detail view of one of the sweep operated control switches and adjacent parts of the sweep structure.

Fig. 7 is a vertical cross section along the line 7-7 in Fig. 1.

Fig. 8 is an enlarged fragmentary vertical cross section taken along the line 8-8 in Fig. 2 through the lower portion of the pin magazine.

Fig. 9 is a schematic wiring diagram of the various electrical circuits and controls necessary in my invention.

Fig. 10 is a plan view of the rear or pin setting end of an alley showing a modification of my invention.

Fig. 11 is a vertical longitudinal section along the line 11-11 in Fig. 10.

Referring now more particularly to the drawings the reference character A indicates the bowling alley, only the rear, pit or pin setting end of which is shown, and which has the usual sides S, lateral gutters G, and terminates rearwardly in a pit D into which the pins and balls may be knocked or thrown. An upright elevator housing 11 is mounted transversely at the rear of the pit D and on the forward side of this housing the usual bumper or cushion C is arranged.

The pins, designated generally at P, are adapted to be set up at the rear end of the alley A in usual triangular or pyramidal formation and are of the usual shape and form. When struck by the ball B the pins are contemplated to fall into the pit D, along with the ball, as shown in Fig. 1, although as a matter of fact it is usual for some of the pins to come to rest upon the alley or in the gutters G. Ordinarily then the "pin boy" removes all fallen pins and returns the ball along the track T to the bowler and if all pins have been knocked down (a strike) he resets the full complement of ten pins. If only a part of the pins are knocked down with the first ball he simply removes the fallen pins and leaves the others standing for the second ball.

The bottom of the pit D is constituted by a continuous apron conveyor 12 which fully spans the pit and is mounted over front and rear rollers 13-14 to move rearwardly at its upper side or flight as indicated. The pins or balls falling into the pit will thus be carried rearwardly toward the housing 11 as will be evident and they will enter the opening 15 therein beneath the cushion C which is shortened to clear such opening. The sides 16-17 of the pit curve and incline inwardly and downwardly (Fig. 5) to prevent the pins from lodging in lateral corners of the pit while the right hand side 17 (viewed from the bowler's position) is further curved inwardly in the horizontal plane as designated at 18 and for a purpose which will presently appear.

The housing 11 is of substantially rectangular box-like shape having front and rear walls 19—20 and the surrounding and enclosing sides 21 and top 22. Arranged immediately within these sides 21 and top 22 and across the bottom of the housing is a continuous ball and pin conveyor belt 23 which at its lower flight runs toward the right as indicated in Fig. 3. At three corners of the housing the belt 23 runs over rollers 24 while at the remaining lower, right hand corner the belt is carried around in a gradual and smooth curve by engagement at its margins with grooved guides 25 secured to front and rear walls 19—20 of the housing. The width of this belt is such that it just nicely fits between front and rear walls of the housing (Fig. 1) and it is made of a pliable material having considerable resiliency.

A ball elevator chain 26 is trained around lower horizontally and transversely spaced sprockets 27—28 and over an upper idler sprocket 29 and still further upwardly located drive sprocket 30 so that a lower, horizontal chain flight 31 and a substantially vertical flight 32 will be provided toward the left side of the housing 11 as shown. This chain moves in a direction opposite to that of the belt 23 as clearly indicated in Fig. 3. At spaced points along its length the chain 26 carries ball carrier pins or fingers 33 and the chain being disposed (Fig. 1) toward the rear of the housing, these fingers are forwardly turned to pass over the belt 23.

The vertical flight 32 of the chain 26 moves centrally through a ball cage or guide shaft constituted by four upright bars or members 34 arranged as the corners of a square and so spaced that a ball will just nicely roll between these members and be retained against falling thereby. At lower ends the members 34 are turned inwardly as at 35 to follow the contour of the chain as it passes around beneath the sprocket 28 and to terminate as an entrance way immediately over the belt 23 adjacent the left hand side of the housing. Upper ends of the members 34 are also turned inwardly at 36 to follow the chain partially around the upper sprocket 29 and constitute a discharge which is located immediately over and outwardly of an end 'T' of the ball return track T which is extended rearwardly into the housing 11 for this purpose. This track end 'T' extends forwardly through a ball outlet opening 37 in the front wall 19 of the housing and is curved around to one side to carry the ball to track T. A guide bar 38 is arranged to prevent the ball from falling from the track as it rolls thereonto from the ball cage. A forwardly directed ball stop pin 39 is provided on the rear wall of the housing 11 and is positioned just to the right of the lower sprocket 27 and substantially in line with the rear curved end 18 of the pit side 17, this pin and the curved pit side serving to prevent the ball from being carried by the belt 23 to the left beyond the chain 26. The stop pin 39 is, however, so located that a pin P lying on the belt 23 may pass freely therebeneath.

The sprocket chain 26 is so located that a considerable space at the right side of the housing is left clear and in this space is arranged the pin elevator or conveyor mechanism now to be described. This mechanism comprises a conveyor belt 40 (actually a series of narrow strips as shown in Fig. 1) which is made of flexible and resilient material and trained over upper and lower pulleys or rollers 41—42 so that one flight 43 of the belt will move upwardly alongside, and in spaced relation within, the right hand side 21 of

the housing. The lower roller 42 is offset inwardly from the vertical plane of the upper roller 41 but the operating flight 43 of the belt is yieldably urged outwardly at its lower end to parallel position with respect to the side 21 by a tightener roller 44 as shown. This roller is spring set as indicated at 45 for this purpose. The belt 40 carries a series of fingers or teeth 46 which project outwardly therefrom in closely spaced relation and are preferably formed of relatively pliable rubber or similar material.

At the upper end the belt 40 moves inwardly over the upper roller 41 adjacent the end of a partition member 47 which is supported substantially across the housing and inclines downwardly and laterally from this roller 41. This member 47 with its upstanding end 48 forms and defines a pin storage bin 49 in the upper part of the housing 11 and a further enclosure is provided by the casing 50 in the housing front wall 19 around an opening 51 in said wall which communicates with the bin. The upper side 52 of the casing 50 is open so that access may be had to the bin there-through. The roller 24 above the delivery end of the belt 40 is protected by a curved guide 53 as clearly seen in Fig. 3.

The various belts and chains thus far described are operated by an electric motor 54 supported at the rear of the housing 11 by a bracket 55 and driving a main shaft 56 through a speed reducer 57. The sprocket 30 is mounted directly upon this shaft 56 to operate the ball carrier or elevator chain 26 while four additional pulleys 58 are also mounted on the shaft and connected through drive belts 59, 60, and 61 to similar pulleys 62 connected to the upper rollers 24 and 41 respectively whereby to properly drive the ball and pin conveyor 23 and the pin conveyor belt 40. Another belt or drive cable 63 is trained over the remaining pulley 58 and carried downwardly and forwardly over sheaves 64 to the rear roller 14 for driving the pit conveyor apron 12.

In the operation of the mechanism thus far described the pit apron 12 will, of course, carry all pins or balls from the pit rearwardly to the opening 15 where they will meet and be deposited upon the ball and pin conveyor belt 23 in the housing 11. The motion of this belt tends to carry either the ball or pins toward the right but the oppositely moving fingers 33 on the ball carrier chain 26 will, while clearing the pins, engage the ball to roll it in the opposite direction and cause it to enter the lower end of the ball guide cage and be carried upwardly between the members 34. The ball is then discharged from the cage upon the track end 'T' by which it is carried by gravity out upon the ball return track T for return in usual manner to the bowler.

Any pins which may get in the way of the ball in this operation are simply pushed aside or, if carried upwardly into the cage, may fall back down between the members 34 without damage or jamming.

The width, front to back, of the housing is less than the length of the pins P and thus as these pins move upon the belt 23 they are necessarily pointed more or less at an angle to their direction of travel and as they move up the rounded left corner portion of the lower flight of the belt one end or the other is in position to enter between this belt and the lower end of the pin conveyor belt 40. The belts 23 and 40 move upwardly in the same direction and at substantially the same speed and the pins may therefore be carried upwardly and finally dumped into the bin 49.

The distance between adjacent vertical portions of the belts 23 and 40 is somewhat less than the greatest diameter of the pins P and as a result the pins will be slightly squeezed and gripped by the belts as they move upwardly. In addition the fingers or teeth 46 are so spaced that they will engage and embrace the pins as clearly shown and to aid in obtaining the proper firm grip upon the pins. The spring pressed roller 44 permits the lower "corner" portion of the belt 40 to move inward as may be necessary to clear a pin which may enter this lower end of the conveyor at an angle as will be clearly evident. Damage to either pins or belts is thus prevented and positiveness of operation secured.

A pin feeding mechanism designated generally at 65 is supported well above the pin setting end of the alley A upon any suitable mounting framework such as the pipe standards 66 secured atop the sides S. This composite mechanism 65 comprises ten individual magazines or pin holding units 67 each vertically extending and arranged in the triangular formation shown similar to the order in which the pins are to be set up on the alley. The magazines 67 have the hollow shafts or bores 68 shaped to nicely fit the bulging bases of the pins P and opening, in the form of coextensive slots 69, through rear ends of the magazines to clear the necks of the pins and allow said necks to project as shown. A housing 70 partially surrounds the ten magazines and holds them in proper position and alignment but provides clearance, as does the "staggered" arrangement of the magazines, for the convenient placing of the pins in stacked relation in the shafts 68.

Manual labor is employed to remove the pins from the bin 49 and place them in the magazines, and such operation, as will appear, needs but periodic attention in order to keep at least several pins in each magazine. For this purpose a single pin boy may be employed to take care of as many as eight adjacent alleys and thus the labor cost is greatly reduced. A cat walk 71 traverses the alleys atop the sides S and to the rear of the pin feeding mechanism 65 so that the boy may stand in position for conveniently withdrawing the pins from the bins 49 and may then, holding the pins by their necks, drop them into the several magazines 67. The operator, however, is at all times well above the path of flying pins or balls and the likelihood of his injury is exceedingly slight.

Arranged at the lower end of each magazine 67 is an escapement or dropping device which, as shown best in Fig. 8, comprises a pair of opposed rocker members 72 pivotally mounted at their center portions at 73 for movement about longitudinally and horizontally extending axes. Upper and lower margins 74—75 of these rocker members 72 are turned inwardly toward each other and at their lateral inner extremities are curved somewhat to fit the contour of the bases of the pins P. Retractable coil springs 76 stretched between lower forward ends of the rocker members 72 normally rock these members about their pivots 73 into such position that the upper margins 74 are moved apart to clear the lower end of the shaft 68 in the magazine so that one pin will drop down between the members and be retained upon the relatively closely positioned lower margins 75 of said members as clearly shown.

A solenoid 77 is secured within a housing 78 at the rear lower corner of each magazine 67 and receives a ferrous plunger 79 which at its

upper end is connected at 80 to links 81 outspread and pivoted at 82 to upper rear ends of the rocker members 72. This arrangement is such that energization of the solenoid 77 will attract and pull down the plunger 79 and the resulting pull upon the links 81 will draw the upper margins 74 of the rocker members together while correspondingly spreading lower margins 75. Relief of this pull upon the plunger will enable the spring 76 to reassert itself and return the rocker members to normal position.

When a pin is in position between the rocker members 72 the remaining pins above, stacked one on top of the other, will rest upon this lowermost pin. Therefore, as the solenoid 77 is actuated and the members 72 spread at their lower edges, this lower pin will drop clear between these edges while the remaining superimposed pins will be retained against downward displacement by movement of the upper margins 74 therebeneath. When the members 72 return to normal position another pin will drop therebetween ready for discharge.

As here shown each magazine 67 has a capacity of six pins but this may vary as may be desired or required.

As the pins are dropped from the magazines 67 they fall into the pin setter 83 arranged immediately beneath. This setter is in all essential respects identical with the setters now used and into which the pin boy has heretofore placed the pins by hand and from which the pins are discharged in set up relation when the device is lowered to, or near, the alleys A. In accordance with my invention, however, this lowering operation is carried out by an electric motor 84, instead of by hand, and this motor is supported in elevated position upon a cross member 85 of the frame 66. The motor drives a transversely extending shaft 86 upon the ends of which depending cables 87 are wound, the lower portions of the cables being passed through counterweights 88, back upwardly over pulleys 89 affixed to the sides of the housing 70 and finally secured to the upright guide posts 90 secured at each side of the setter 83. Said guide posts 90 are slidably received within upright tubular guides 91 secured at each side of the housing 70 and the structure is thus such that operation of the motor 84 will wind up the cables 87, raise the counter-weights 88 and allow the setter 83 to lower of its own weight. When the setter reaches its lower position the motor is stopped and the pins are erected in proper position upon the alley by return upward movement of the setter as the counter-weights again fall to their normal positions.

It is thus seen to be possible to drop any number of pins, up to ten, from the feeding mechanism 65 into the setter or spotter 83 by selective operation of the escapement mechanisms and then, by operating the motor 84, to lower the setter and dispose the pins on the alley. All of these operations being carried out electrically are subject to convenient remote control as will presently appear.

It frequently occurs that all of the pins P are not thrown into the pit D when struck by the ball and this "dead wood" laying about on the alley, in the gutters G, will then be in the way of the next ball thrown where only a portion of the pins are knocked down by the first ball and an attempt at a "spare" is to be made. To clear off these pins I provide the sweep or clearing member 92 which is of such length (transversely)

as to nicely span the alley and at its lower edge travels just clear of the alley when carrying out its intended function. At the lower corners of the sweep rounded extensions or lugs 93 are formed to move in and follow the contour of the gutters G.

Tracks designated generally at 94 are provided at each side of the alley and have horizontal portions or ends 95 which extend rearwardly slightly beneath the plane of the (raised) setter 83 and upward extensions or ends 96 which turn upwardly ahead of the pin feeding mechanism 65. These tracks define correspondingly shaped guides or slots in which the rollers 97 of sweep carriages 98 are arranged to travel, the said sweep 92 being pivotally connected at upper corners and on transverse axes to one end of said carriages to travel therewith. An electric motor 99 is supported by a frame part 66a adjacent the forward end 96 of one track and operates a crosswise extended shaft 100 at each end of which pulleys 101 are provided. Cables 102 are trained over these pulleys and over idler sheaves 103 and 104 at the ends of the horizontal track portions 95 with the ends of the cables connected to the carriages 98 to draw the same in either direction along the tracks when the motor turns in proper direction.

Normally the sweep 92 is drawn to a point near the top of the forward ends 96 of the track where it hangs in downwardly extending position shown in dotted lines in Fig. 1, but when it is desired to sweep off pins from the alley the motor 99 is started to carry the sweep downwardly. As the sweep reaches the working position and moves around the junction between track portions 95 and 96 it is carried rearwardly along the alley and will sweep the alley clear of any pins (or ball) and drop same into the pit D. When the sweep reaches a position just clear of the rear end of the alley A and over the pit D the motor 99 is stopped and reversed to return the sweep forwardly and upwardly to its inoperative position.

The sweep 92 is restrained against forward swinging movement, as it contacts the pins, by means of link bars 105 which extend angularly between the sweep and the carriages 98 (Fig. 1) but which are slotted as at 106 to permit the sweep to swing clear in the opposite direction should it meet any obstacle in its return travel movement and to permit the sweep to hang in vertical position when not in use.

To control the pin feeding or dropping mechanism 65 and the various operating motors I provide the electrical circuit and controls now to be described. It will be understood that, while the motor 54 operating the various ball and pin handling conveyors may operate continuously, the pin dropping solenoids 77 and the two motors 84 and 99 must be under the selective control of the bowler from his usual position at the frontal end of the alley.

It will be further understood that, while all ten pins may be dropped at one time from the mechanism 65 for setting by the setter 83, there will also be circumstances under which the pins will be dropped or fed into the setter only in certain numbers. For instance if in throwing the first ball all of the pins are not knocked down (a strike) then an attempt may be made to knock down the remaining pins with a second ball. However, when the sweep 92 is run through its operation to clear off the fallen pins these yet standing pins will necessarily also be re-

moved and other pins of corresponding numbers must be reset before the second ball is thrown.

When the ten pins are set up in their triangular formation they are given numbers according to their position in formation, the head or apex pin nearest to the bowler being known as number 1 pin and so on in sequence through the succeeding rows of two, three, and four pins. This is conventional and too well known to require further comment.

It becomes necessary therefore for the bowler, having thrown the first ball, to note the number and position of any pins left standing and to drop pins of the same position from the feeding device 65 into the setter 83 before sweeping off all pins as will be evident.

To carry out these operations I provide near the bowler's end of the alley a control panel or board 107 upon which are arranged ten push button type switches designated generally at 108 and arranged in the same order as the bowling pins are set up and these switches are given numbers from 1 through 10 to indicate pin positions. Also on the board I provide a "strike" switch 109 to be operated when a strike is made and a "spare" switch 110 to be operated when a "spare" ball is to be thrown. These are all of the controls necessary of manipulation by the bowler.

A source of electrical energy at 111 is connected through a master switch 112 to each alley's setting mechanism and by closing this switch the motor 54 will be placed in operation and all of the various conveyors 12, 23, 26, and 40 will then run continuously until the switch is again opened. This switch may, of course, be located at any desired point for control by either the player or the alley operator.

Arranged along the horizontal portions 95 of the tracks 94 are pin control switches designated generally at 113 which are ten in number and preferably arranged five on each track in spaced relation as indicated. These switches are of the momentary contact type and their actuating buttons are located in the path of the sweep carriages 98 traveling the tracks. As the sweep carriages move rearwardly to carry the sweep over the alley, the carriages will strike the actuating buttons and close the switches 113 in succession.

The push button switches 108 are of the normally open type and they are connected to the various switches 113 by the wires 114 in proper sequence and order as shown. The switches 113 are in turn connected in proper order to the solenoids 77 of the pin dropping mechanism by wires 115 also in proper order and sequence. The solenoids 77 are then connected through wires 116 to two-way switches 117 and 118 located adjacent opposite ends of one sweep track 94 to be operated by the sweep as it reaches these positions, said switches 117-118 being connected by wires 119 in the usual manner.

The "spare" switch 110 is connected to all of the switches 108 by wires 120 and is arranged to complete the circuit to said switches all at one time. The circuit is thus such that by pressing and thereby closing any of the switches 108 the circuits to the corresponding switches 113 will be closed and then as the "spare" switch 110 is closed and the sweep operated (as will presently appear) the travel of the sweep carriages along the tracks 94 will close the switches 113 in succession and, through whichever of these switches has been connected in circuit by selec-

tive operation of the switches 108, the circuits will be closed to the corresponding solenoids 77 to drop the selected pins from the pin magazines.

The operation of the solenoids 77 is thus seen to be under the interlocked control of both the manually operated switches 108 and the mechanically operated switches 113. Thus, while the bowler is permitted to select the pins according to the number and position of these left standing after the first ball is bowled, the actual operation of the solenoid will be automatic and will be carried out at the proper time and over a sufficient time interval to permit the pins to properly drop clear of their escapement mechanism.

The pin dropping circuit is further under control of the position of the sweep through the switches 117 and 118 which are so arranged that, with the sweep in the inoperative raised position, the switch 117 will close one side (wires 116—119) of the circuit to solenoids 77 so that the sweeping movement of the sweep will then close the other side of the circuits through the selected switches 113 as has been described. Then as the sweep passes (rearwardly) beyond all of the switches 113, the switch 118 will be actuated to open the solenoid circuit until the sweep has returned past switch 117. The operation of the solenoids on return movement of the sweep will thus be prevented.

The "spare" switch when operated also completes the circuit through wires 121 to a reversing switch 122 located near the rear end of one sweep track 94 and connected to a stopping switch 123 arranged forwardly thereof on the track. Similar stopping and reversing switches 124 and 124a are located near the upper end of the track and connection through wires 125 completes the circuit between these switches and the sweep motor 99. As the spare switch 110 is operated then the sweep motor 99 is started to carry the sweep downwardly and rearwardly to sweep off the fallen pins from the alley and drop any selected pins as described heretofore. When the sweep has completed its rearward movement it engages and operates the switches 122—123 to reverse the motor 99 which then returns the sweep forwardly to raised, inoperative position reversing and stopping the motor by switches 124 and 124a. As this action occurs the circuit through wires 126 is closed to the setter motor 84 which then pulls up the counterweight 88 to lower the pin setter and deposit the selected pins upon the alley. As the setter reaches its lowermost position the counterweight (or other part) may engage a switch 127 to stop the motor 84 and allow the counterweight to return the setter to elevated position ready again to receive pins from the pin dropping mechanism.

When a strike is made, or it is otherwise desired to set all ten pins at one time, the bowler presses the "strike" push button switch 109 which through wires 128 completes the same circuits as the "spare" switch 110 to operate the sweep and setter. This switch 109, however, is of the multi-point type and at the same time as the above circuits are completed a circuit through wires 129 to all of the switches 108 is closed so that all ten of the switches 113 are rendered operative, or are set up, at one time. Then as the sweep is made ten pins will fall from the magazines and as the sweep is completed all ten pins will be set up on the alley.

In any case, of course, the pins and balls swept

into the pit D will be carried upwardly and the pins stored while the balls are returned in the manner hereinbefore pointed out.

When the "strike" button 109 is operated it also "cancels," or opens, all previously closed switches 108 and 110 by any well known mechanical or electrical means. A cancel button 130 may also be provided to cancel or open any of the switches when they are actuated by mistake when selecting the pins to be set up for a spare.

By observation it has been noted that in a large percentage of cases the pins which are knocked down roll either into the pit or into the gutters alongside the alley and no fallen pins remain on the alley itself. Of course when all pins are knocked into the pit, except those left standing on the alley, there is no need of going through the sweeping and resetting operations and the next ball may be thrown without further ado.

Further in accordance with my invention I may, as in Figs. 10 and 11, remove rear portions of the gutters G as indicated at 132 leaving lateral cavities 133 into which the fallen pins, which otherwise would remain in the gutters, may pass. I then extend conveyor belts 134 from the forward end of the pit apron 12 forwardly beneath these open ends of the gutters, said belts 134 being driven by cables 135 at one end and being run around rollers 136 at each end. The belts 134 of course run rearwardly on their upper sides to carry the pins to the apron 12 where they are then elevated and stored as previously described. The sides 16 and 17 of the pit are cut off angularly at 137 to permit the pins to clear as will be clearly evident.

By the above construction all pins knocked into the gutters or the pit will be cleared away and if no fallen pins are left upon the alley the bowler may then bowl his next ball at any pins left standing.

The belts 134 may carry extended fingers or teeth 138, similar to those on the pin elevator belt 40, if necessary, in order to straighten out the pins and prevent them from jamming against the sides of the alley.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. Pin setting apparatus for a bowling alley, comprising a pin setter for setting pins upon the alley, a pin dropping mechanism for dropping pins in selected numbers into the said pin setter, a movable sweep member for sweeping fallen pins from the alley, electrically operated means for dropping pins from the dropping mechanism, switches arranged to be operated by movement of the sweep member, and remote control means for selectively completing circuits between the said switches and the electrically operated dropping means as the sweep member moves over the alley.

2. Pin setting apparatus for a bowling alley, comprising a pin setter for setting pins upon the alley, a pin dropping mechanism for dropping pins in selected numbers into the said pin setter, a movable sweep member for sweeping fallen pins from the alley, electrically operated means for dropping pins from the dropping mechanism, switches arranged in position to be operated by

movement of the sweep member over the alley, remote control means for selectively connecting the said switches in complete circuits with the said electrically operated pin dropping means for dropping selected pins as the sweep member operates the switches, and means operated by the sweep member at the completion of each sweeping movement for rendering the circuit to the dropping means temporarily inoperative.

3. Pin setting apparatus for a bowling alley, comprising a pin setter, electrically operated escapement mechanisms for dropping selected numbers of pins into the said pin setter, a pin sweeping member supported for movement from an inoperative position over the alley and return, switches arranged for successive operation by the sweeping member as it moves over the alley, remote control means for completing circuits between any selected switches and escapement mechanisms whereby movement of the sweeping member will control the operation of the said escapement mechanisms, means for remotely controlling the operation of the sweeping member,

and means responsive to return movement of the sweeping member for operating the pin setter to set the selected dropped pins upon the alley.

5 4. Pin setting apparatus for a bowling alley, comprising a pin setter, electrically operated escapement mechanisms for dropping selected numbers of pins into the said pin setter, a pin sweeping member supported for movement from an inoperative position over the alley and return, switches arranged for successive operation by the sweeping member as it moves over the alley, remote control means for completing circuits between any selected switches and escapement mechanisms whereby movement of the sweeping member will control the operation of the said escapement mechanisms, means for remotely controlling the operation of the sweeping member, and an electrical switch arranged to be operated by return movement of the sweeping member to lower the pin setter and deposit the selected pins upon the alley.

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