

Sept. 10, 1935.

G. D. BARKER

2,014,306

BOWLING GAME APPARATUS

Filed April 27, 1933

5 Sheets-Sheet 1

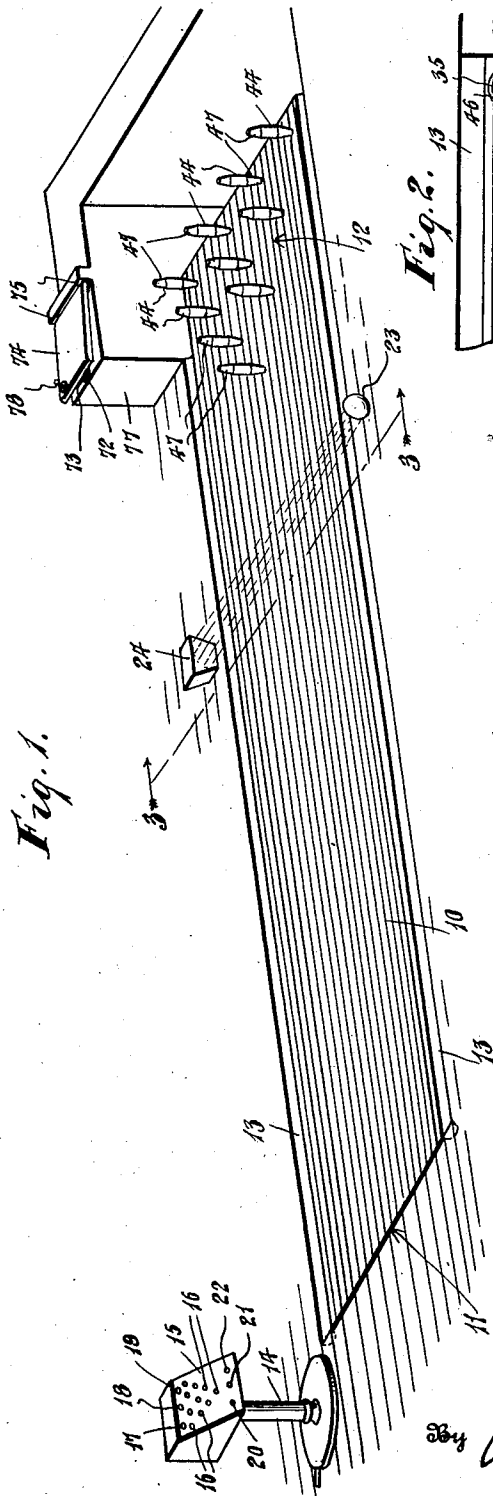


Fig. 1.

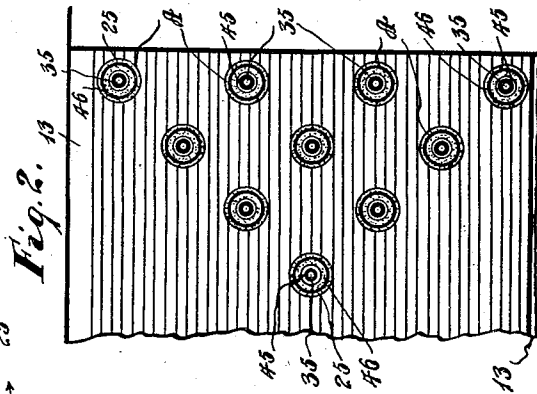


Fig. 2.

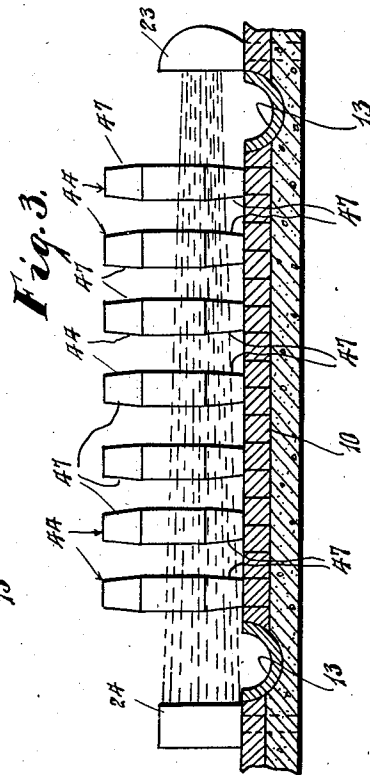


Fig. 3.

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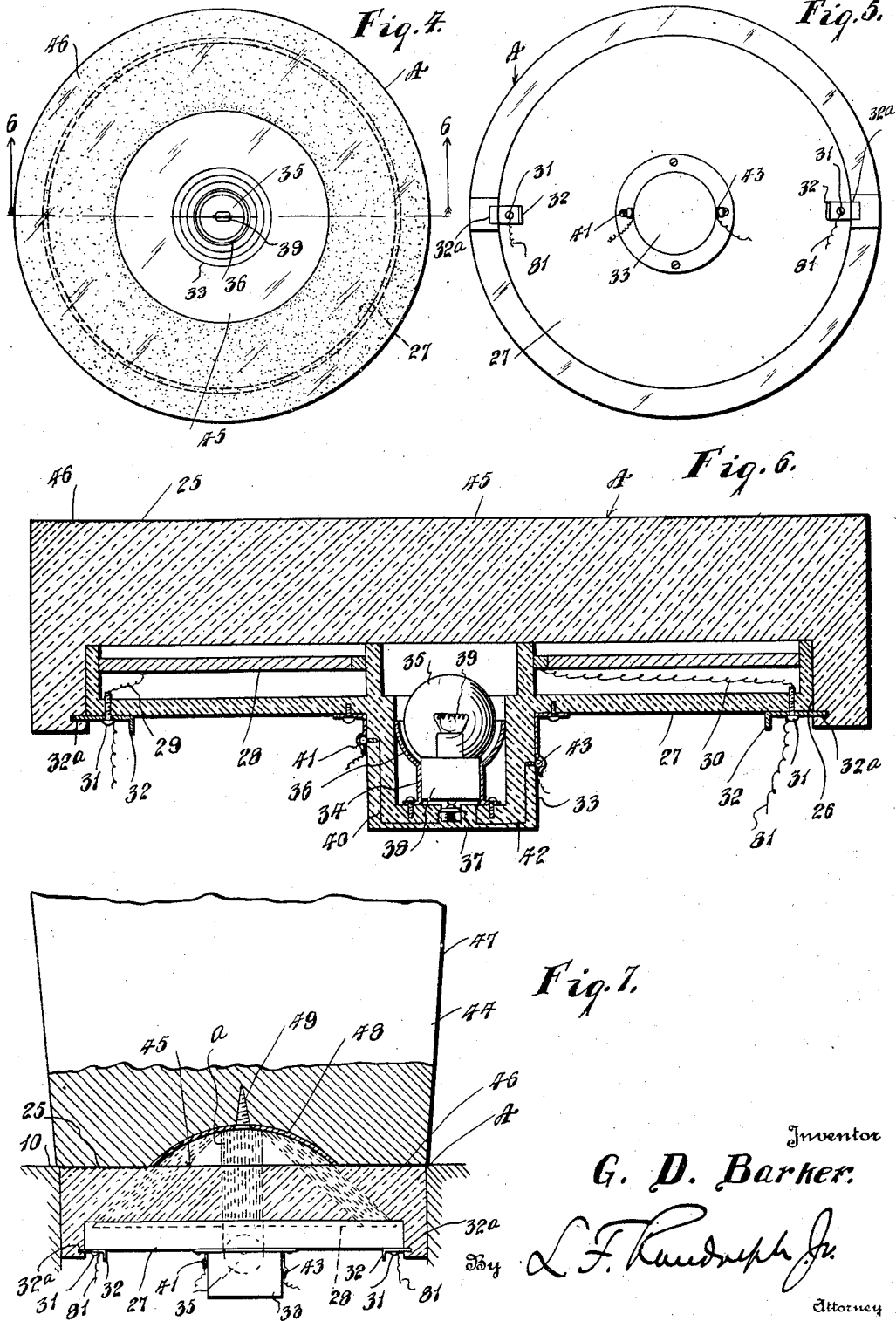
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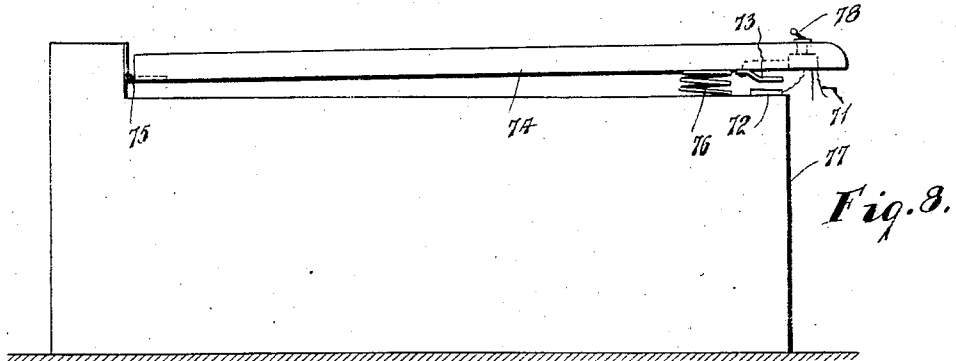


Fig. 8.

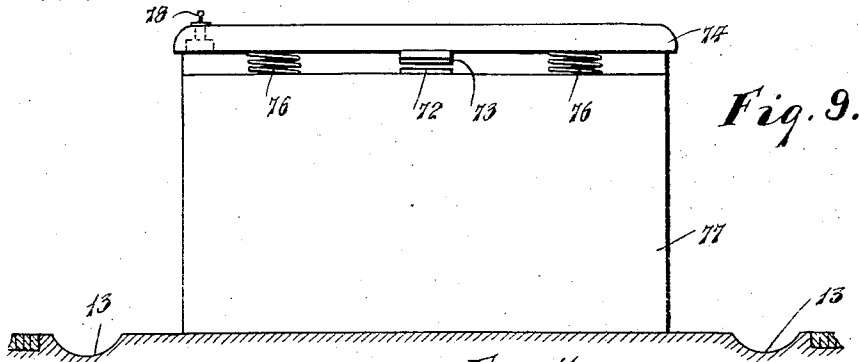


Fig. 9.



Fig. 11.

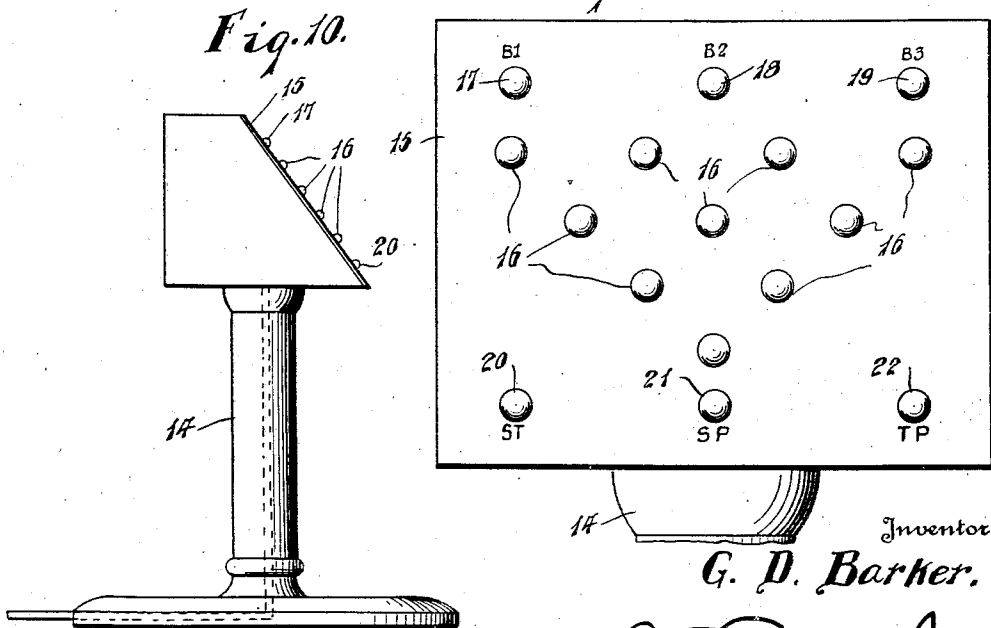
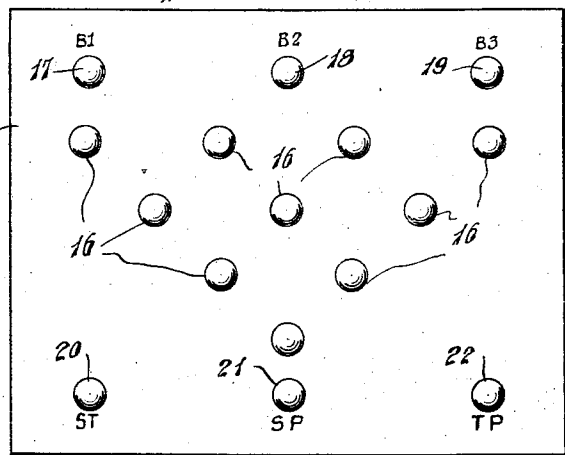


Fig. 10.



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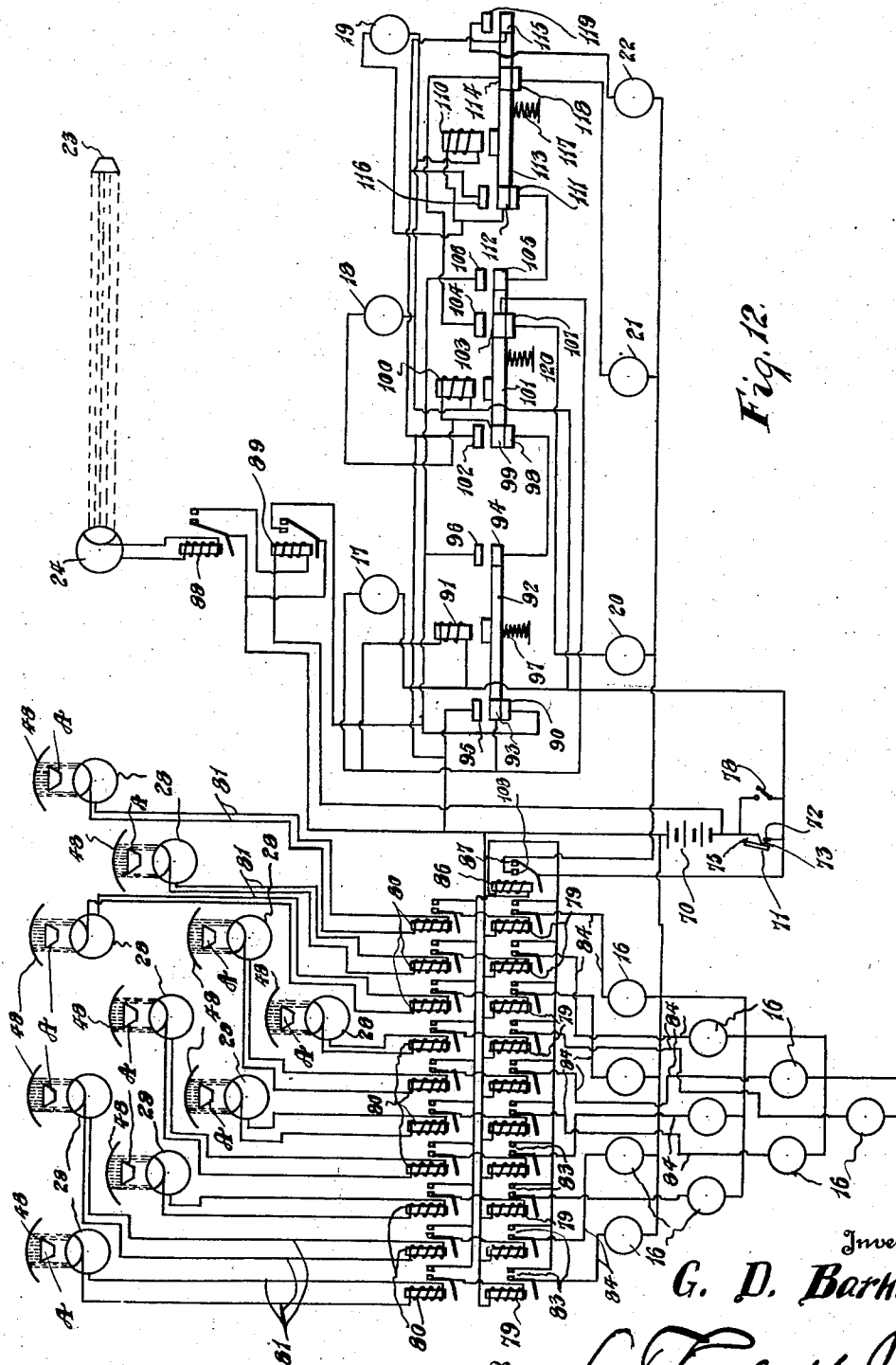


Fig. 12.

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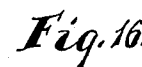
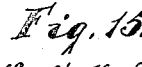
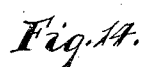
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BOWLING GAME APPARATUS

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Fig. 13.



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UNITED STATES PATENT OFFICE

2,014,306

BOWLING GAME APPARATUS

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Application April 27, 1933, Serial No. 668,261

15 Claims. (Cl. 273—37)

This invention relates to bowling game apparatus and generally aims to provide a means which will advance or increase the popularity of bowling, enabling the players and others present at the scene of play or others at a distance, even within the confines of their homes, to learn of and visualize the progress of the game play by play, the indicating means at the scene of the play particularly being susceptible to broadcasting of its indications by television to owners of television receiving equipment.

The invention further enables the visualizing of the result of a play or plays by remote control so as to eliminate the inconvenience of counting the standing pins from the rear end of the alley, to employ novel means which will indicate the rolling of a strike, spare or ten-pin play, as well as the number of balls rolled; to provide an accurate method of checking the proper spotting or setting up of the pins.

It is also aimed to provide for the transmission of the various signals, that is, incidental to the rolling of balls, and the falling of pins, under control of photo-electric cell means.

Still another object is to provide a novel construction wherein the conditioning of the electric circuit means is dependent upon a switch controlled by the seating of the pin boy.

The more specific objects and advantages will become apparent from a consideration of the description following taken in connection with accompanying drawings illustrating an operative embodiment.

In said drawings:—

Figure 1 is a perspective view illustrating the invention as applied to a bowling alley.

Figure 2 is a fragmentary plan view of the floor of the alley at the end upon which the pins are spotted.

Figure 3 is a detail cross sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a plan view of one of the devices upon which the pins are spotted.

Figure 5 is an inverted plan view of the device of Figure 4.

Figure 6 is an enlarged diametric sectional view taken on the line 6—6 of Figure 4.

Figure 7 is a view partly in elevation and partly in section showing a spotted pin.

Figure 8 is a side elevation of the seat for the pin boy.

Figure 9 is an end elevation of the seat of Figure 8.

Figure 10 is a side elevation of the indicating panel employed at the alley.

Figure 11 is a front elevation of the indicating portion of said panel.

Figure 12 is a diametric view showing the various electrical connections.

Figure 13 is a view partly in section and partly in elevation on an enlarged scale, of one of the pins.

Figure 14 is an end view of the pin of Figure 13.

Figure 15 is a view of a modified form of pin, partly in section and partly in elevation, and

Figure 16 is an end view of the pin of Figure 15.

Referring specifically to the drawings, the bowling alley is best shown in Figure 1 wherein 10 designates the floor, usually of wood, along which balls are rolled by the players from the foul line 11 towards the pins 12, which are spotted in the usual or any preferred location thereon. At the sides of the floor 10 are the usual gutters 13.

Suitably located at the players' end of the alley on an appropriate pedestal 14, for instance, is an indicating panel 15 having ten signal lamps 16 thereon corresponding to the position of the ten-pins 12. In addition, signal lamps are provided on the panel 15 as at 17, 18 and 19 to respectively indicate that one ball has been rolled, two balls have been rolled and three balls have been rolled. Along the bottom of the panel, indicating lamps 20, 21, and 22 are arranged to indicate the rolling of a strike, spare, or ten-pin, respectively.

The operation of the signal lamps 16 to 22 is dependent upon apparatus to be presently more specifically set forth.

Along one side of the alley is a lamp, preferably electric, equipped with a suitable reflector, so as to cast its rays as shown in Figure 1 transversely across the alley or floor 10 to a photo-electric cell 24 located at the other side of such alley. The balls rolled along the alley intercept the light rays from the lamps or source 23, causing actuation of the photo-electric cell 24 to actuate the signals 17, 18, 19, 20, 21 and 22.

Suitably embedded or secured in the floor 10 at the usual pin spot or in any other desired arrangement, are photo-electric cell devices A best shown in Figures 4 to 7. Such devices include glass plates 25 whose upper surfaces are flush with the upper surface of the floor 10. The under surfaces of plates 25 are recessed as at 26 so as to removably accommodate a housing 27 which may be of wood, bakelite or any other desired material or construction sufficiently substantial to withstand the requisite heat in operation. The material of such housing, however, is

opaque, and within the housing are disposed light-sensitive disks 28, the circuit wires for which are shown at 29 and 30 leading from pins 31 carried by the housing and on which latches 32 are pivoted, such latches being engageable in slots 32^a of the plate. Said pins 31 also serve as conductors.

Each casing 27 has a central well 33 containing a socket 34 in which an electric lamp 35 is removably disposed, a reflector 36 being associated with such lamp. The lamp 35 has a central contact at 37 and a sleeve contact 38 insulated therefrom but both in circuit with the filament 39 of the lamp. A conductor 40 leads from a contact 41 to the contact 37 while a conductor 42 leads from a contact 43 to the socket 34 which is in metallic contact with the sleeve 38. The electric current for the lamp or lamps may be secured from any suitable source, for instance, the same source which supplies the electricity for the remainder of the apparatus. The lamp 35 projects its rays vertically upward against the under surface of a pin 44 removably spotted thereon. The pin 44 only covers a portion of the plate 25 and such portion adapted to be covered as designated 45 is highly polished and transparent while the portion outwardly thereof is preferably translucent, being frosted or roughened to prevent slippage of the pins from vibration in the alley. Said pins 44, as best shown in Figures 13 and 14, are substantially cylindrical, preferably being tapered slightly at opposite ends as at 47. The ends of the pins, however, are rendered highly reflecting in any suitable manner, usually by countersinking reflectors 48 into recesses in opposite ends of the pins, the reflectors being removably secured in place by means of screws or other fastenings 49. In lieu of the reflectors, the reflecting end surfaces of the pins may be attained by applying paint thereto or any other desired way.

All the lamps 35 are adapted to be continuously lighted and the rays ascending vertically as at *a* in Figure 7 strike the reflecting surfaces 48 and are reflected onto the light-sensitive members 28, energizing the photo-electric cells A and the corresponding signals on the panel 15. In the event a pin 12 is bowled over there is of course a lack of reflection onto the light-sensitive members 28 and corresponding signal at the panel 15 will be extinguished.

The modified form of pin shown in Figures 15 and 16 may be substituted for that at 44. This pin of Figures 15 and 16, designated 50, may be of the same shape as at 44 and of the same material, for instance, wood. In opposite ends of the pin 50 are lighting units 51. Such units are similar and in addition to enabling either end of the pin to be used, they balance the pin. Such units may consist of metal casings 51^a containing electric batteries 52 with an electrode 53 extending into a well 54 of insulating material. A socket 55 carried by the casing 51^a mounts a lamp 56 removably inwardly of the end of the pin. A central electrode 57 on the lamp extends into the well 54 and in such well is a quantity of conducting liquid such as mercury 58. When the pin is on its side, the mercury 58 does not engage the contacts 57 and 53 and hence the lamps 56 are not lighted. However, when the pin is upright, the lower lamp 56 is lighted while the upper lamp is not lighted since the mercury does not engage the contacts 53 and 57 thereof. The parts described constitute lighting units removably disposed within the pins 50, the circuit

being made from the mercury 58 through contact 57, the filament of the lamp, the screw shell 59 of the lamp, socket 55, casing 51^a, steel wool 60, casing of the battery 52, and contact 53. It will be noted that the steel wool or the like 60 also serves as a shock absorbing material. The said units are removably held in place by means of fingers or clamps 61 which are displaceable into the spaces 62 when it is desired to insert or remove the units.

Since the pin 50 will give a direct ray of light, it is especially useful as a substitute for the pin 44 in the event the lumps 35 in photo-electric cell devices A should fail to light or operate although such pin 50 may be used regularly if desired.

The operation of the parts will now be traced more specifically with reference to the electrical diagram of Figure 12. The electric current is supplied from any suitable source, for instance, a battery as at 70 under control of a switch 71. The switch 71 comprises contacts 72 and 73, the latter being carried by a seat 74 hinged at 75 and normally urged by an expansion spring 76 away from a support 77 which carries the contact 72. The relation of the seat is shown in Figure 1 and the pin boy is adapted to sit thereon after the pins are spotted, his weight lowering the seat and engaging the contacts 72 and 73, such contacts being disengaged, however, automatically upon the pin boy leaving the seat 74. Adjacent to the seat, for instance, connected thereto is another switch 78 located in the same circuit as switch 71 adapted to remain normally open. Such switch is in parallel with the switch 71 and if the pin boy desires to leave the seat while maintaining the circuit in operative relation, he manually closes the switch 78. Said switch 78 is both manually closed and manually opened.

The closing of the switch 71 places an electromagnet or relay 79 one for each device A in readiness for operation, associated relays or electromagnets 80, however, being operated exclusively by light ray intensity as described, it being clear that the light rays reflected back by the pins 44 into the photo-electric cells A in turn generate electrical energy of sufficient quantity to actuate said sensitive relays 80, respectively. At the instant any or all of the pins are removed from the alley or toppled over, the photo-electric cell devices A cease to generate sufficient energy to hold the sensitive relays 80 involved closed and an opening of the corresponding relays 80 takes place. The light sensitive members 28 are connected to the relays by conductors 81 which lead to the pins 31. The relays 79 are so connected that current is allowed to flow in their coil systems which in turn pulls up or attracts their armatures and closes their contacts 83, the same being normally open.

The operation of the system, with the exception of the photo-electric cells used, is not restricted to a definite power supply.

Another current operative relay is shown at 86 in the circuit which is so wired that should a single pin remain standing in the alley, as well as any number of them, the current through such coil 86 is sufficient to hold its armature in the open position, preventing closing of contacts 87. Should no pin or pins remain standing in the alley, the current in relay 86 ceases to flow and its armature drops, causing the contacts 87 to close. When one or more pins remain standing in the alley after three balls have been rolled, the standing pins are indicated by their respective lamps 16 being lighted, together with lamps 17, 75

18 and 19. As long as any pin or pins remains standing in the alley, lamps 20, 21 and 22, cannot be lighted. This is because relay 86 cannot function to complete the lamp circuits.

With switch 71 closed and all relays in readiness for operation, and lamp 23 directing its light rays upon photo-electric cell 24, any interruption of such light rays causes a sensitive relay 88 to open its contacts which in turn deenergizes relay 89 closing its contacts which causes current to flow from the battery 70 through the contact of the relay 89 to a contact 90. The circuit includes a relay 91 and its armature 92 carries a contact 93 which rests on contact 90 in the "ready" position. Said contact 93 being connected to the magnetic coil 91 permits current to flow therethrough and back to the battery through switch 71. Said armature 92 is drawn up by the magnet 91, also carrying a contact 94. The contacts 93 and 94 being adapted to engage contacts 95 and 96, respectively, when the armature is attracted against the tension of a spring 97. The contacts 90, 93, and 95 are so adjusted that when the armature travels upwardly, or is attracted, contact 93 is instantly engaged with contact 95 before the current in magnetic coil 91 falls to zero value and contact 95 now becomes the current supplying contact for the relay 91 with current entering from the battery 70 directly.

Relays 88 and 89 and photo-electric cell 24 assume their stand-by condition immediately following the passing of a ball through the light rays projected by lamp 23. The relay 91 is now held in the "up" position by means of current passing from the battery through the contacts 95 and 93, through the coil 91 back to the battery through the switch 71. This causes current to flow from the battery to the contacts 95 and 93 through lamp 17 and hence through the switch 71 back to the battery. Contact 94 now makes connection with contact 96, with contacts 98 and 99 placing a relay 100 in "ready" condition. This condition is the result of the first ball having been rolled and indicator lamp 17 indicating this effect by its illumination.

The second ball is now rolled making the second interruption of the light rays projected by lamp 23. Relays 88 and 89 function as stated before but now current flows from the battery through the contacts of relay 89 to contacts 96 and 94 to contacts 98 and 99 of relay 100 through its coil and back to the battery through the switch 71. The armature 101 of coil 100 travels up under the magnetic influence of such coil and engages a contact 102 in time to maintain its "up" position, closing contacts 99 and 102, contacts 103 and 104, and contacts 105 and 106. With contacts 99 to 106 in closed position, the following circuits are engaged and energized. From contacts 93, via contact 103, and a contact 107, a voltage potential is available at contact 108 of pin relay 86 through contacts 103 and 107 via the filament of lamp 20. When relay armature 101 is in the "up" position, contacts 103 and 107 are opened releasing the voltage potential on lamp 20, prohibiting lamp 20 from becoming lighted.

Assuming the armatures 92 and 101 to be in the "up" position, indicating that two balls have now passed through the light rays projected by lamp 23, a relay 110 is now in a standby condition to receive energy from relay 89. As the third ball is passed through the light rays projected by lamp 23, photo-electric cell 24 and relays 88

and 89 function instantaneously causing current to flow to contacts 105 and 106 and hence to contacts 111 and 112 through the coil 110 to the battery via the switch.

The armature of relay 110, designated 113, carries said contact 112 and also carries contacts 114 and 115 and travels upward under the influence of the magnetic effect of magnet 110 permitting contacts 112 to engage a contact 116 thereby holding the armature in the "up" position against the tension of spring 117. Current now flows from the battery to contacts 112 and 116 through lamp 19 and back to the battery through the switch. Under this condition contact 114 is released from a coacting contact 118 removing the voltage potential from lamp 21. Three ball indicating lamps 17, 18, and 19 are now passing current indicating that three balls have been passed through the light rays projected by lamp 23. To return all control relays 20 to their normal stand-by positions for the next play, switch 71 is opened and when again closed, relay 91 is ready to receive current from the battery through the relay 89 as soon as another ball is passed through the rays projected by lamp 23.

Circuit changes during various plays will now be explained. When the player rolls one ball and clears the alley of all standing pins, the effect upon the electrical circuit begins with the interruption of light rays from lamp 23. Relay 88 loses its holding properties and drops its armature causing the contacts to open. The opening of relay 88 likewise interrupts the current flowing through relay 89 and releases its magnetic hold on its armature thus closing the contact thereof. With the contacts of relay 89 closed, current is permitted to flow from the battery through the contact of the relay 89 to contact 90 and contact 93 through the magnetic coil 91 and back to the battery. At the same instant contacts 93 and 94 are pulled up engaging contacts 95 and 96. Contacts 93, 99 and 95 are so adjusted that any magnetic influence placed upon the armature 91 permitting it to rise, causes contacts 93 and 99 to become broken but immediately contact 93 comes in contact with contact 95 and the armature 92 is held up against the contacts 95 and 96. Coil 91 remains in the holding position until the player has completed the play and it returns to the stand-by position when the switch 71 is opened by the pin boy. One ball having been thrown and the alley cleared of standing pins, current ceases to flow in the magnetic coil of relay 86. The armature of said pin relay 86 now drops closing the two contacts thereof and permitting current to flow from the battery to contacts 93 and 95, hence to contacts 103 and 107, through lamp 20 and back to the battery by way of relay 86 and switch 71. Lamp 17 is also lighted by current flowing from the battery to contacts 93 and 95 through the lamp 17.

When the player throws two balls before clearing the alley of standing pins, the following electrical condition exists:

Relays 88, 89 and 91 and 100 function in their usual manner but lamp 20 cannot become lighted because its supply contact 107 has become interrupted. In this play, lamps 17, 18 and 21 become lighted receiving their current from the battery through contacts 93 and 95, contacts 99 and 102, contacts 103 and 104, contacts 114 and 116, through lamp 21. The contacts of relay 86 are of course closed permitting current to flow

through lamp 21 by the contacts 114 and 118 back to the battery through the switch 71.

In the case of a ten-pin play, that is, where it was necessary for the use of three balls to clear the alley of all standing pins, relays 88, 89, 91, 100, 110 and 86 function as stated before but now lamps 17, 18, 19 and 22 become lighted. Lamps 20 and 21 are disconnected from their supply contacts and rendered inoperative. Lamp 22 receives its supply from contacts 115 and 119 and the current is permitted to flow through the contacts of relay 86 back to the battery through the switch.

The armatures 92, 101 and 113 are composite in that they have metallic parts attracted by the respective electro-magnets and part of insulation mounting the various contacts, springs 97, 120 and 117, normally urging the armatures to lowered or open position.

It will be realized that the signals remotely controlled on the panel 15, may be readily televised so as to be received by individual television sets.

The various electrical connections are given by way of example and it will be clear that various changes may be made therein as well as in the apparatus generally within the spirit and scope of the invention.

I claim as my invention:—

1. In game apparatus, a support, an element spotted thereon, indicating means, photo-electric cell means energized by the presence of the game piece to operate the indicating means, a light-penetrable plate disposed over said cell in the support on which the element is spotted, said photo-electric cell means being inactive when the game piece is displaced, whereby it functions as a means for detecting any inaccuracy in the spotting of said element.

2. In combination with a bowling alley floor, game pins thereon, photo-electric cell means, means to direct light rays onto said cell means across the floor whereby the light rays are intercepted by a rolled ball, result-indicating means operable through the interception of said light rays through said photo-electric cell means including indicators, individual pin switch means for controlling the indicators for "strike", for "spare", and for "ten-pins", mechanism operable by the pins and operatively connected to said indicators, and means operable by said photo-electric cell means to control the operation of said mechanism.

3. In game apparatus, a spot device for a pin or the like comprising a light-penetrable plate, a light-sensitive means carried by said plate, illuminating means carried by the plate to direct light rays upwardly therethrough, and indicating means controlled by said light-sensitive means, in combination with a pin or the like adapted to be spotted on the plate, and said pin having means to reflect the light rays passing through the plate back through the plate onto the light-sensitive means.

4. In game apparatus, a spot device for a pin or the like comprising a light-penetrable plate, a light-sensitive means carried by said plate, illuminating means carried by the plate to direct light rays upwardly therethrough, indicating means controlled by said light-sensitive means, in combination with a pin or the like adapted to be spotted on the plate, and said pin having means to reflect the light rays passing through sensitive means, said plate having a recess in its the plate back through the plate onto the light-

under surface, an opaque casing in said recess carrying said light-sensitive means and said illuminating means, and means removably securing the casing in the recess also constituting conductors in the circuit to the light-sensitive means.

5. In game apparatus, a photo-electric cell, means to project light rays onto the same, adapted to be intercepted by movement of a game piece, indicators corresponding to the positions of elements adapted to be spotted, a plurality of relay means for said indicators controlled by said photo-electric cell, a relay means maintained open while any of the first mentioned relay means are closed, and adapted to close upon the opening of all of the first mentioned relay means, and indicator means operable through the closing of the last specified relay means.

6. In game apparatus, a pin or the like having electric illuminating means in an end thereof for the purpose specified, and circuit closing means for said illuminating means movable by gravity to automatically assume an inoperative position when the pin is out of vertical position.

7. In game apparatus, a pin or the like having electric illuminating means in an end thereof for the purpose specified, and circuit closing means for said illuminating means, including a cell having a liquid conductor therein, and contacts extending into said cell and liquid when the pin is vertical, said liquid being movable out of circuit closing relation to said contacts when the pin is out of the vertical.

8. In game apparatus, a pin or the like having electric illuminating means in an end thereof for the purpose specified, and circuit closing means for said illuminating means consisting of a removable unit having a casing, a lamp within the casing, a battery within the casing, shock absorbing and conductor means between the battery and casing, a cell of insulating material within the casing containing a liquid conductor, a contact on the lamp extending into the cell, and conductor means leading from the socket of the lamp to the casing, said liquid being movable out of circuit closing relation to the contacts when the pin is out of the vertical.

9. In game apparatus, a floor, pins spotted on said floor, photo-electric cell means, said photo-electric cell means having individual association with each pin through the floor to indicate at a point remote therefrom, the spotting or displacement of the pins.

10. In game apparatus, a photo-electric cell, means to project light rays onto the same, adapted to be intercepted by movement of a ball, a ball counter operable by said photo-electric cell, indicators corresponding to the positions of spotted pins, a plurality of photo-electric cell members, a plurality of relay means for said indicators controlled by said first mentioned photo-electric cell, a relay means maintained open while any of the first mentioned relay means are closed, and adapted to close upon the opening of all of the first mentioned relay means, and indicator means operable through the closing of the last specified relay means including additional relay means to successively indicate the number of interceptions of the said light rays by the ball.

11. In game apparatus, a photo-electric cell, means to project light rays onto the same, adapted to be intercepted by movement of a ball, a ball counter operable by said photo-electric cell, indicators corresponding to the positions of spotted pins, a plurality of photo-electric cell members, a

plurality of relay means for said indicators controlled by said first mentioned photo-electric cell, a relay means maintained open while any of the first mentioned relay means are closed, and adapted to close upon the opening of all of the first mentioned relay means, and indicator means operable through the closing of the last specified relay means including additional relay means to successively indicate the number of interceptions of the said light rays by the ball and also to indicate in game terminology the number of spotted elements displaced.

12. In game apparatus, a photo-electric cell, means to project light rays onto the same, adapted to be intercepted by movement of a ball, a ball counter operable by said photo-electric cell, indicators corresponding to the positions of spotted pins, a plurality of photo-electric cell members, a plurality of relay means for said indicators controlled by said first mentioned photo-electric cell, a relay means maintained open while any of the first mentioned relay means are closed, and adapted to close upon the opening of all of the first mentioned relay means, indicator means operable through the closing of the last specified relay means including additional relay means to successively indicate the number of interceptions of the said light rays by the ball and also to indicate in game terminology the number of spotted elements displaced, and a control switch in the circuit normally urged to open position and closable under the weight of an operator.

13. In combination with a bowling alley floor, game pins thereon, photo-electric cell means, means to direct light rays onto said cell means across the floor whereby the light rays are intercepted by a rolled ball, ball counter devices operable through the interception of said light rays

through said photo-electric cell means, second photo-electric cell means, said second photo-electric cell means being controlled by said pins and including fallen pin counters, and means electrically interconnecting the first and second mentioned photo-electric cell means so that operation of the fallen pin counters influences operation of the ball counter devices.

14. In combination with a bowling alley floor, game pins thereon, photo-electric cell means, means to direct light rays onto said cell means across the floor whereby the light rays are intercepted by a rolled ball, ball counter devices to indicate the number of balls rolled and to indicate a "strike" operable through the interception of said light rays through said photo-electric cell means, second photo-electric cell means, said second photo-electric cell means being controlled by said pins and including fallen pin counters, and means electrically interconnecting the first and second mentioned photo-electric cell means so that operation of the fallen pin counters influences operation of the ball counter devices.

15. In combination with a bowling alley floor, game pins thereon, photo-electric cell means, means to direct light rays onto said cell means across the floor whereby the light rays are intercepted by a rolled ball, ball counter devices to indicate the number of balls rolled, a "strike" and a "spare" operable through interception of said light rays through said photo-electric cell means, second photo-electric cell means, said second photo-electric cell means being controlled by said pins and including fallen pin counters, and means electrically interconnecting the first and second mentioned photo-electric cell means so that operation of the fallen pin counters influences operation of the ball counter devices.

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