Oct. 1, 1946. R. A. ASCHENBRENER 2,408,592

BOWLING PIN SETTING INDICATOR

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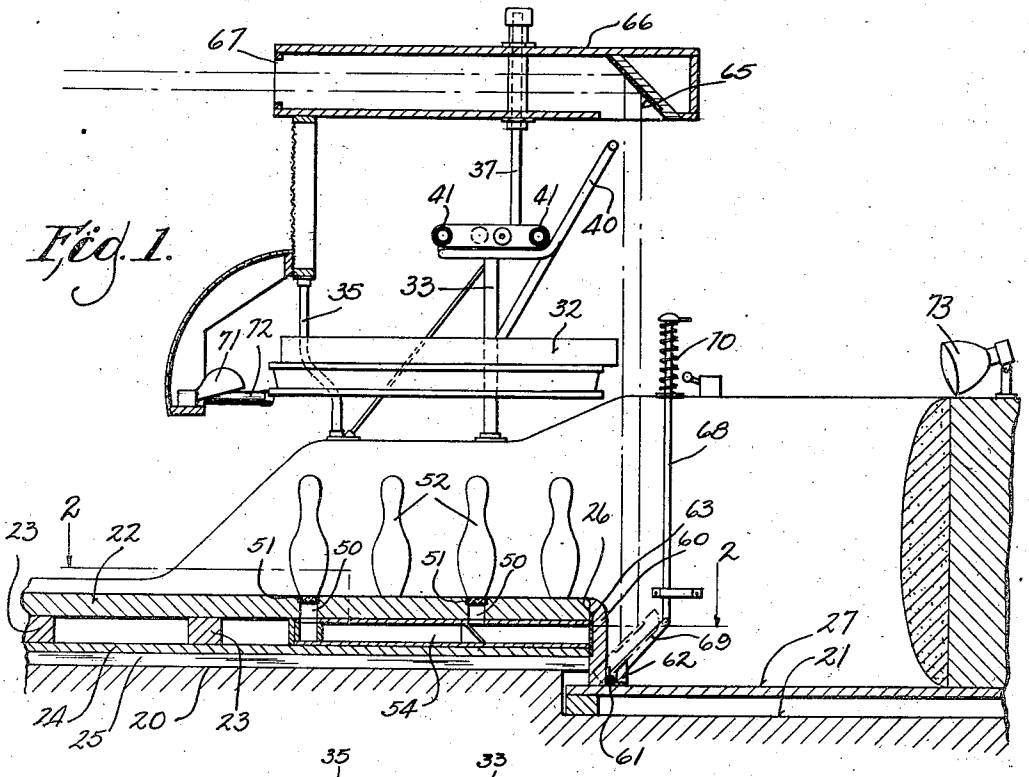


Fig. 1.

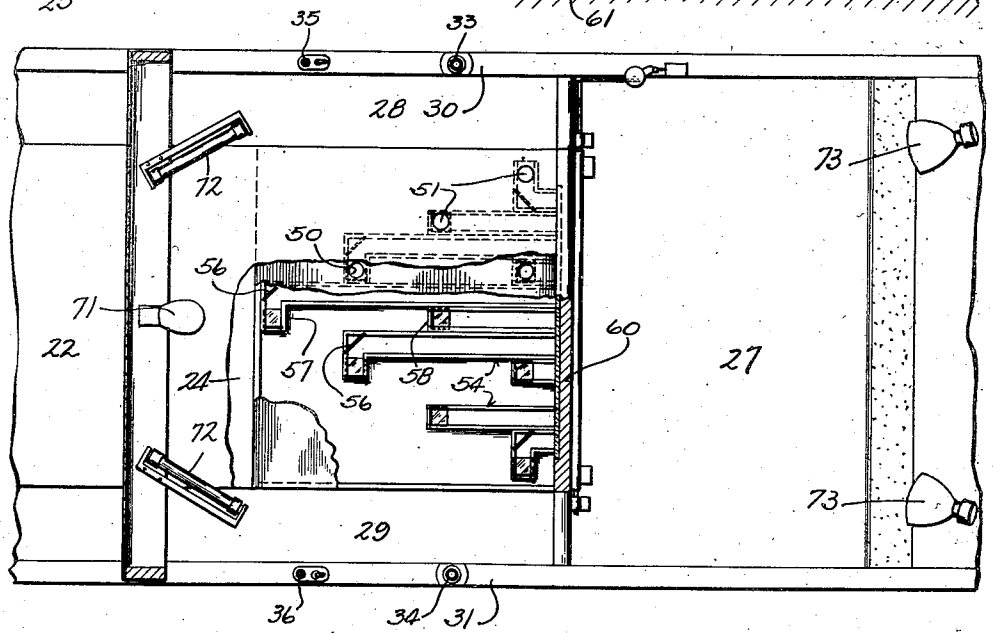


Fig. 2.

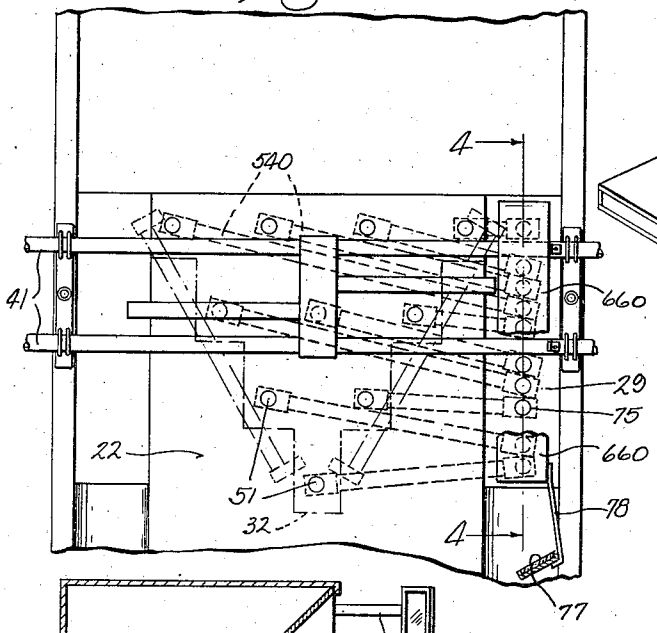
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Fig. 3.



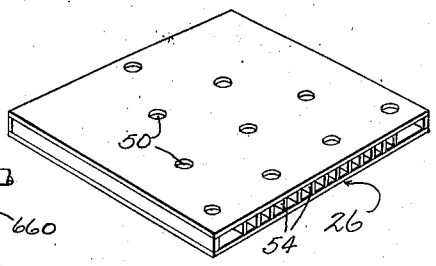


Fig. 13.

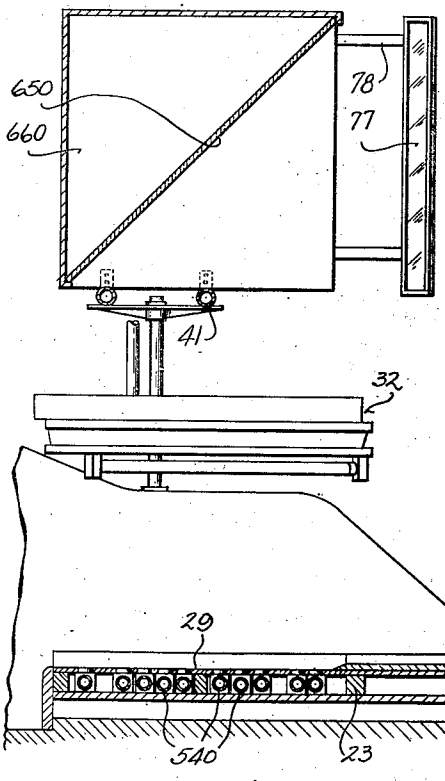


Fig. 4.

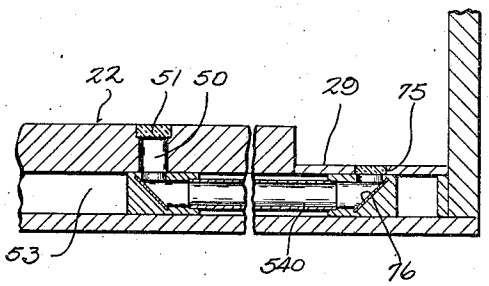


Fig. 5.

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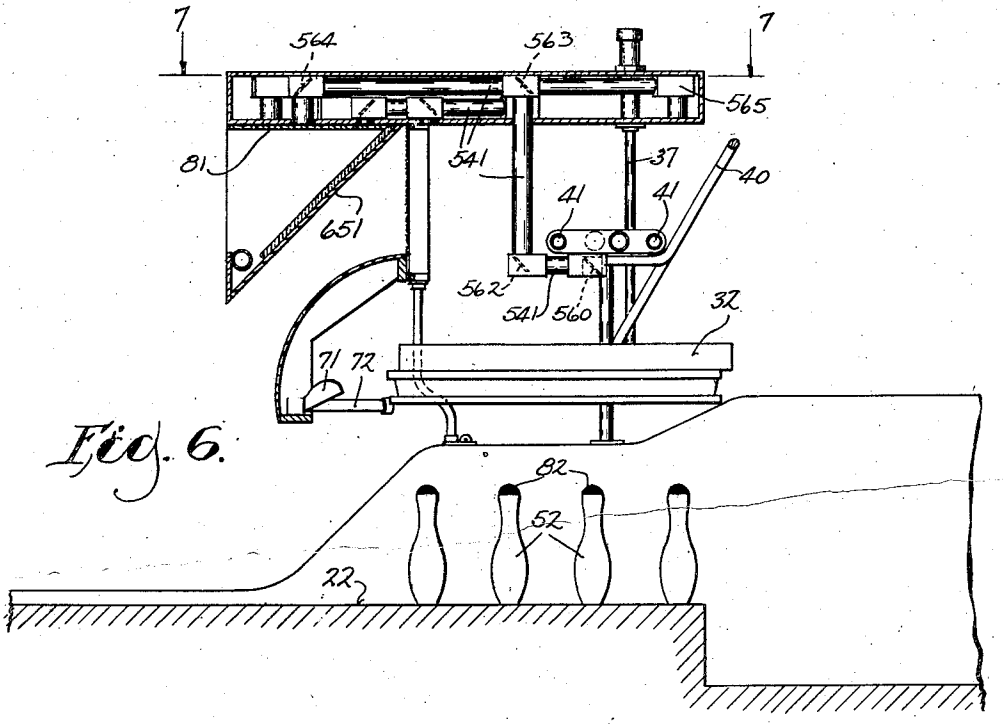


Fig. 6.

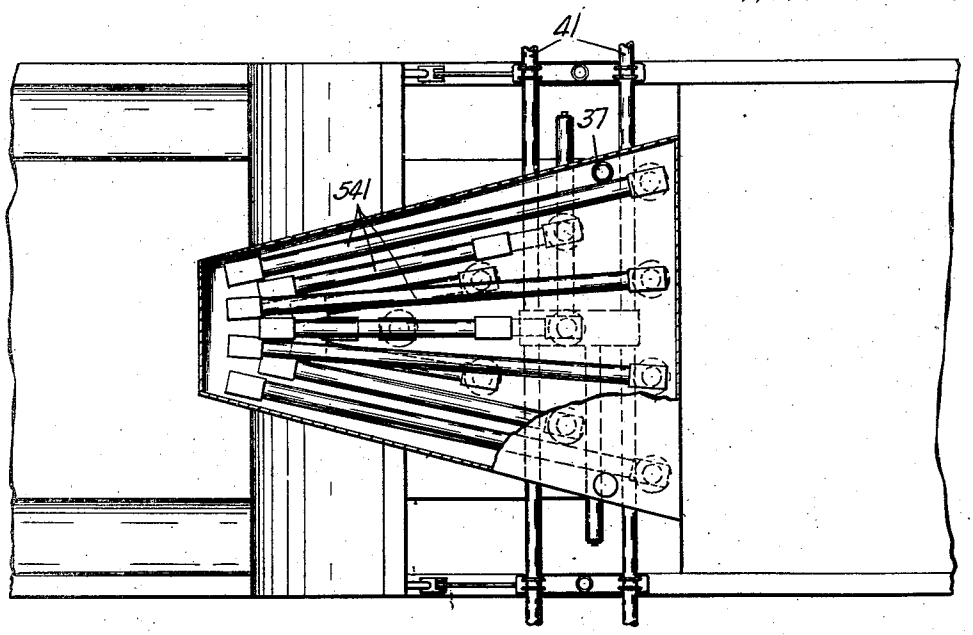


Fig. 7.

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BOWLING PIN SETTING INDICATOR

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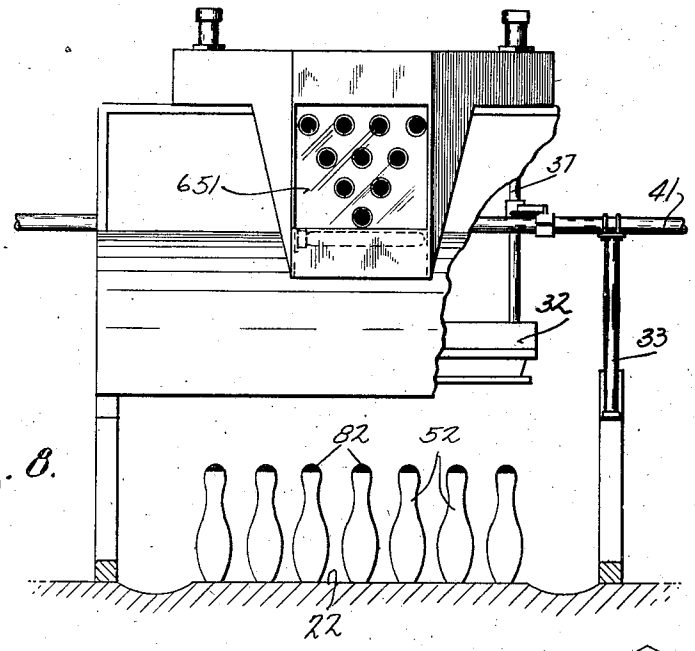


Fig. 8.

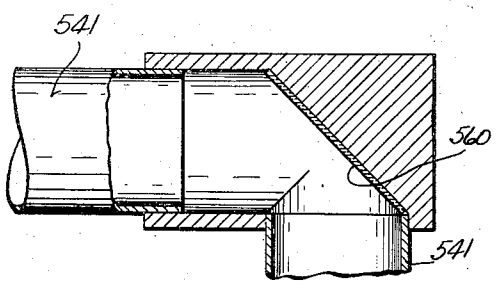


Fig. 10.

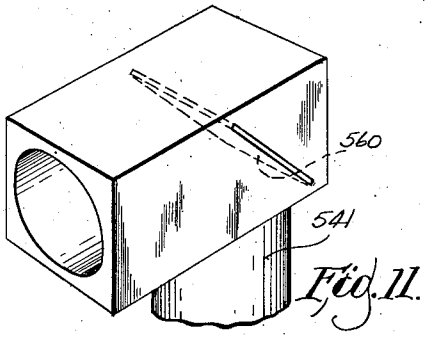


Fig. 11.

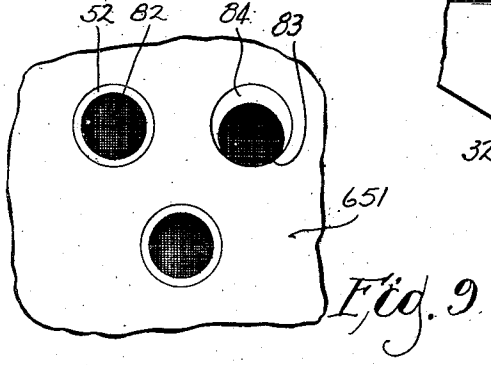


Fig. 9.

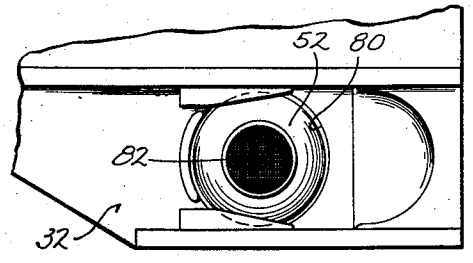


Fig. 12.

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UNITED STATES PATENT OFFICE

2,408,592

BOWLING PIN SETTING INDICATOR

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Application March 5, 1943, Serial No. 478,130

18 Claims. (Cl. 273—37)

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My invention relates to improvements in bowling pin setting indicators.

The object of my invention is to provide by means of light transmission a visual indication to a bowler of the preciseness with which bowling pins have been set upon a bowling alley.

More particularly stated, it is an object of my invention to indicate visually to a bowler by means of a viewer and light-transmission devices the precise position of each bowling pin as set upon the alley in readiness for the delivery of his bowling ball.

Another object of my invention is to provide a substantially transparent insert for a bowling alley in the location where a bowling pin is to be set whereby light from a nearby source may, by its passage through the insert and by its transmission to a viewer, indicate the accuracy with which the bowling pin has been "set."

Another object of my invention is to so build my equipment into existing bowling alley structures as to make it unnecessary to materially change the structure of such alleys and not to interfere with the playing of the game as it is naturally practised.

Another object of my invention is to use reflected light at relatively long distances from the pin supporting end of the bowling alley to indicate the accuracy of bowling pin setting without requirement for changing bowling alley inserts.

In the drawings:

Fig. 1 is a vertical, longitudinal section through a portion of a modern bowling alley and showing portions of the pin-setting frame in side elevation.

Fig. 2 is a section on line 2—2 of Fig. 1 with a portion of the maple bowling alley broken away to exhibit some of my light-transmitting apparatus.

Fig. 3 is a plan view of a portion of a bowling alley and a portion of a pit at the end of the alley with the pin-setting frame removed and an alternative form of light-transmitting apparatus beneath the alley shown in dotted lines.

Fig. 4 is a section on line 4—4 of Fig. 3.

Fig. 5 is a vertical section through a portion of a bowling alley and an individual set of light-transmitting equipment for one bowling pin in accord with the alternative construction in Fig. 3.

Fig. 6 is a view comparable to that shown in Fig. 1 but disclosing a second alternative light-transmitting apparatus for disclosing bowling pin-setting position by means of light reflected from upon the upper surfaces of a bowling pin.

Fig. 7 is a section on line 7—7 of Fig. 6.

Fig. 8 is a section on line 8—8 of Fig. 6 and showing most of the apparatus in front elevation, a portion of the "screen" being broken away to show the relative location of the pin-setting apparatus.

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Fig. 9 is a detail enlarged view of a portion of the ground glass viewer used in the apparatus shown in Fig. 8.

Fig. 10 is a detail in median section longitudinally of the tubes at a right angle turn in the tubes used in my light-transmitting apparatus.

Fig. 11 is an isometric view of an elbow construction used in conjunction with my light-transmitting tubes.

Fig. 12 is a fragmentary view in plan showing a portion of a bowling pin-setting frame and a bowling pin viewed through said frame.

Fig. 13 shows my unitary construction of a complete group of tubes to underlie the end of an alley.

Like parts are designated by the same reference characters throughout the several views.

It is well known that even though a "perfect" ball may be rolled in the game of bowling, a strike may not be attained due to the fact that the bowling pins have been imperfectly set upon the spots intended to receive them. The pins, therefore, respond in ways unexpected by the bowler and fail to clear the alley. According to practices heretofore prevailing in bowling alleys and in accord with bowling alley construction heretofore known, the bowler has been at the mercy of the negligent or conniving pin setter who alone is close enough to the bowling pins to be aware of inaccuracies of pin setting. I have, therefore, provided the structure shown in the drawings as means for making available to the bowler an accurate chart or viewing frame in which the bowler, himself, may see for his own satisfaction that the pins which await his next ball are accurately set upon their respective spots so as to properly respond to a perfect ball if he is able to deliver it.

It may be said broadly of my invention that it contemplates any means for visually translating the position of a bowling pin so that the bowler may be aware of the precise pin position, and I have provided several means using light-transmission and reflection for making this information available to the bowler.

Modern bowling alley construction includes a foundation 20 depressed at 21 to form the pit. The usual maple alley surface 22 is supported above the foundation 20 upon cross pieces 23 which are in turn rested upon a false floor 24 and longitudinally disposed sleepers 25. The alley terminates at 26, and the usual pit floor and mat 27 is depressed approximately ten inches below the surface 22 of the alley 20. At either side of the alley 22 are conventional gutters 28 and 29, and flanking these gutters at either side of the entire structure are "kickback" boards 30 and 31.

Usually supported upon the kickback boards 30 and 31, the various makes of bowling alley equip-

ment for the setting of pins upon the alley include a pin-setting frame 32 which is carried by posts 33, 34, 35, and 36 with reference to which the pin-setting frame 32 is adjustably mounted upon vertical slides 37 and 38 in any conventional manner. A handle 40, for the manual operation of the pin-setting frame 32, is provided within easy reach of the pin "boy" who may be standing in the pit 27. Brace rods or tubes 41 usually overlie the pin-setting frame 32 and extend between posts 33 and 34.

The bowling alley construction thus far disclosed is conventional, and there may be variations thereof with which my bowling pin-setting indicator may be adapted as will become apparent from the following description.

It is common practice to inset into the surface of the maple alley 22 inserts of fiber or other suitable, long-wearing but replaceable material at each spot in the alley where a bowling pin is set by the setting frame 32. In keeping with this practice, I make a hole or bore 50 completely through the maple of the alley surface 22, and I counterbore the hole adjacent the surface to receive a transparent insert 51 which is exactly the same diameter as the bottom of a regulation size bowling pin 52. I thus provide means for transmitting light through the transparent insert 51 and through the bore 50 into space 53 beneath the maple alley surface 22, but if the bowling pin 52 is accurately positioned upon the insert 51, no light can be transmitted through the insert.

Beneath the maple alley surface 22 I remove such cross pieces 23 as may be necessary for the substitution of light tubes 54, each of which extends from beneath one of the inserts 51 to the end of the alley at 26, as shown most clearly in Fig. 2, but since the arrangement of these tubes is of importance and since their purpose is to transmit accurately a "picture" of the light pattern transmitted through each insert 51, I form the tubes, as indicated most clearly in Figs. 10 and 11, where it will be seen that each tube 54 in following a prescribed pattern is provided with an elbow 55 accurately constructed to receive a plane mirror 56 at an angle of 45 degrees to the axis of the tubes 54 which enter and are connected with it. Some of these tubes 54 are so disposed that their L-shape is laid horizontally, as at 57 in Fig. 2. Others are disposed with the L-shape of the angle 55 vertically disposed, as at 58 in Fig. 2.

In the preferred form of construction in accord with my invention I may make my tubes 54 in square cross section and build a complete, strong unit as shown in Fig. 13 to indicate the alley. The tubes 54 are made of substantial material and of such dimensions as to comprise adequate substitute for the cross pieces 23 which I remove from beneath the maple surface 22 of the alley. Thus, they constitute a substantial support for the alley, and if they are arrayed therebeneath, they present an appearance at the end 26 of the alley of an aligned group of light-transmitting tubes.

The end of the alley at 26 is conventionally closed by a board 60 which I convert into a terminal gate, as shown most clearly in Fig. 1, the hinges 61 of this gate being provided at the lower margin thereof and a stop 62 being provided to accurately limit the opening movement of the gate whereby to dispose the gate at an angle of 45 degrees to the longitudinal axis of the alley. Upon the interior surface of the gate

60 I provide a mirror 63 which when disposed with the gate at the 45 degree angle referred to reflects vertically the pattern of light transmitted through the various tubes 54 from the inserts 51.

At a position sufficiently high upon the supporting structure above the pin-setting frame 32 to give a clear view for a bowler at his usual position at the other end of the alley, I provide a viewer 65 comprising a reflector or mirror set at an angle of 45 degrees with respect to the light rays thrown by the reflector or mirror 63 upon the gate 60, and about this viewer 65 I provide a viewer box 66 open at its front margin 67 so as to exclude extraneous light from the viewer 65. The conveyor 65 has the form of a panel or image receiving screen to which light rays from any one or more of the inserts may be transmitted if not blocked by accurately set pins.

To facilitate the use of my apparatus and to prevent the gate 60 from interfering with normal bowling operations, I provide a hand shaft 68 connected to a lever 69 disposed rigidly in connection with the gate 60. A spring 70 returns the shaft 68 to upper position whereby to close the gate 60 whenever pressure is removed from the shaft 68. It is, therefore, possible for the pin boy to open the gate 60 by pressure upon the shaft 68 whenever a bowler desires to see whether the pins are properly positioned upon inserts 51.

Thus, when a pin boy has operated the pin-setting frame 32 to set bowling pins 52 in their proper places upon the inserts 51, light from any source such as the usual pilot light 71 or any additional or auxiliary lights such as those at 72 or 73 may not pass through the insert, but if the pin boy has been inaccurate or careless in his work, or the pin-setting apparatus 32 is inexact in its operation, any pin 52 offset from its accurate position will permit a sector or crescent of light to pass through the insert 51 and be reflected by the mirrors 56, 63, and 65, so that a bowler at the other end of the alley would be immediately apprised of the improperly set pin.

Exactness of dimensions and accuracy in translating the light image may be enhanced by making the tubes in a unitary assembly for insertion beneath the maple alley, as shown in Fig. 2. Plywood or other large sheet materials have been found especially advantageous in building up such a unit.

While the above described preferred form of my invention constitutes a particularly simplified, mechanical embodiment of my fundamental concept and is a relatively economical adaptation of that concept to existing bowling alley equipment, I have provided an alternative form, as shown in Figs. 3 to 5, wherein mirrored and elbowed light tubes comparable to tubes 54 in Fig. 1 are installed beneath the alley surface 22 at 540, and it will be noted that in this construction the tubes 540 extend from the inserts and vertical bores 51—50 laterally of the alley to a point beneath gutter 29 where a hole 75 through the gutter is overlaid by a mirror 76 at an angle of 45 degrees to the axis of tube 540 whereby to pass light upwardly to a viewer 650 comprising a mirror in a box 660 positioned at some height above the gutter as shown in Fig. 4.

Each of the bowling pins 52 therefore functions in the same manner as the bowling pin 52 functions in the Fig. 1 and Fig. 2 construction to black out the passage of light through the transparent insert 51, and each insert and bore 50 beneath each pin is provided with its tube 540 and suitable

mirrors for passing any light rays from the insert 51 to the mirror or viewer 650.

In this construction, the tubes 540 are disposed in the space 53 beneath the alley surface 22, and the tubes 540 need not be of great structural strength, since the cross pieces 23 may be retained to support the maple alley.

It will be noted that whereas in the Fig. 1 and Fig. 2 construction it is relatively impractical to array the tubes 540 so as to maintain a continuous sequence from 1 to 10 in the appearance of the respective pin inserts in the viewer, it is possible in the Fig. 3 and Fig. 4 construction to so direct the tubes 540 that consecutive alignment from 1 to 10 of the viewed bowling pins 1 to 10 may be maintained for easy vision of the bowler.

In the Fig. 3 and Fig. 4 construction, means must be provided for a view by the pin boy, and I, therefore, dispose a back view mirror 77 bracketed at 78 from the box 660 at such an angle as to be within easy vision of the pin boy from his position in the pit. It will be noted that the angular disposition of the back view mirror 77 is such that it does not block the line of vision of the bowler when he attempts to "read" the viewer 650.

A second alternative construction using the transmission of light as a fundamental concept for the purposes of my invention is shown in Figs. 6, 7, 8 and 12 where it will be seen that I have used the principle of light transmission without perforating the maple alley and without changing the usual fiber disks upon which the pins 52 are set.

In this alternative construction, all of my equipment is installed above the pin-setting frame 32, and the light picture ultimately to be seen by the bowler at his end of the alley is that which is picked up by light tubes 541 in which the angularly disposed mirrors, to initially pick up the view of the pin 52, are disposed directly above the hole 80 in the pin-setting frame 32 above each pin. Fig. 12 illustrates the area of the pin setter 32 above each pin 52. It will be understood that the view of each pin 52 as picked up by mirrors and transmitted through tubes 541 ultimately reaches a ground glass 81 above a mirrored viewer 651, but to illustrate a particular light-transmission sequence, I shall refer particularly to bowling pin No. 5. Each pin has a blackened circular tip at 82, and the side walls of the pin are light colored as is the usual practice. The picture, therefore, as seen by mirror 560 directly above pin No. 5, is that of the darkened spot 82 surrounded by a band of light reflected by the light-colored side walls of the pin 52. This picture is transmitted horizontally through a tube 541 to a second mirror 562 set parallel to mirror 560 whereby to transmit the light through the extended tube 541 to mirror 563 and thence to mirror 564 above the ground glass 81. The angular transmission of light thus directed is necessary because of the standard equipment such as the brace rods or tubes 41 which would interfere with direct, straight, light transmission for this particular pin No. 5.

Other pins such as pin No. 10 are not overlaid by any standard equipment, and a straight initial light transmission to the first mirror in the elbow at 565 requires no angular transmission up to that point.

Each of the pins numbered from 1 to 10 is, therefore, overlaid by initial mirrors such as the one at 560. Suitable light-transmitting mirrors and tubes are provided to carry the picture of the

black top of the pin and a surrounding band of light reflected from the side walls of the pin to the ground glass 81 where the pattern of light made thereby appears as indicated in Fig. 9. If a pin is offset from its correct position, as indicated at 83 in Fig. 9, the black spot indicating the position of the top of the pin does not appear centrally of a light band but appears offset in a crescent of light 84, and the ground glass picture at 81 is reflected in the mirror or viewer 651 for easy vision by the bowler.

I claim:

1. In bowling equipment provided with bowling pins and an alley having a pit at one end thereof, a mirror disposed to reflect light from beneath the alley and means built into the alley for transmitting light to the space beneath the alley through the area for supporting bowling pins, whereby the pins block out areas of light-transmitting means to indicate the position of said pins.

2. A bowling alley having space therebeneath and a hinged closure member at the end of the alley to close said space, light-transmitting inserts in the alley whereby to admit light to the space and bowling pins to be spotted on the inserts whereby to block passage of light to the space, an image receiving viewer within the sight of a player at the other end of the alley and an optical system for separately directing a beam of light from each unblocked insert to the viewer when the closure member is in a specific open position, said optical system including light reflecting means carried by the closure and adjustable thereby into and out of operative relation to the viewer.

3. A bowling alley having space therebeneath and a hinged closure member at the end of the alley to close said space, light-transmitting inserts in the alley whereby to admit light to the space and bowling pins to be spotted on the inserts whereby to block passage of light to the space, said closure member having reflective means thereon whereby in certain positions thereof to give evidence of stray light entering said space.

4. In equipment of the character described an alley and pins to be set thereon at precise locations, transparent inserts at each of said locations whereby to pass light to the space below the alley where a pin is inexactly positioned with respect to the insert, and means for picking up and transmitting said passed light to a viewer, said viewer being positioned to be viewed by a player at one end of the alley.

5. In a construction of the class described, an alley with space beneath an end thereof, a closure member for said end, and light-transmitting means in said space and through the alley to indicate the position of bowling pins on said alley, and light-reflective means positioned to exhibit said light-transmitting means when the closure is opened.

6. In a construction of the class described, an alley having an end section thereof provided with a space therebeneath, light-transmitting means for said section whereby to indicate the positions of objects on the alley, and light-transmitting tubes of substantial structural strength positioned in said space beneath the alley whereby to constitute a support for said end section.

7. The combination with a bowling alley provided with a set of bowling pins to be positioned at one end of the alley, of an optical system

for enabling a player at the other end of the alley to visually determine the setting of the pins, said system including mirrors each mounted in an individual housing having a light receiving opening in a position of alignment with a properly centered pin in playing position on the alley floor, and reflecting means for transmitting images from said mirrors to the eyes of the player at the other end of the alley.

8. The combination with a bowling alley, of an associated viewing chamber open to the view of a player in normal playing position at one end of the alley, an image receiving viewer panel in said chamber, and an optical system for directing rays of light from portions of improperly set pins at the other end of the alley to said image receiving viewer panel, said system being so arranged that rays of light from the same portions of the pins when accurately set will be excluded from said system by the pins.

9. The combination with a bowling alley having apertures in the alley floor provided with light transmitting pin supporting inserts at their upper ends, each insert having a top surface substantially equal in diameter to the base of a bowling pin, and sets of mirrors arranged to direct individualized beams of light passing through the respective inserts to the eyes of a player at the other end of the alley.

10. The combination with a bowling alley provided with pin centering spots at one end of the alley floor, a panel-like viewer within sight of a player at the other end of the alley and adapted to receive and display to the player images of pins on said spots, open ended light transmitting passageways provided with opaque side walls, each passage having a receiving end portion in line with one of the pin centering spots and another portion extended at an angle thereto, light reflecting mirrors for directing beams of light from the vicinity of said spots axially through the angularly extended portions of said passageways and ultimately to the viewer whereby a player can visually determine the setting of the pins with reference to said spots.

11. The combination with a bowling alley having one end portion of the alley floor provided with pin centering spots, open ended passageways each having a light receiving end portion axially aligned with one of the spots and another portion extending at an angle thereto along a line parallel to the corresponding portions of the other passageways, mirrors mounted in said passageways for directing rays of light from the receiving portion axially through successive portions of each passageway and cooperating means for directing images from such mirrors to the eyes of a player at the other end of the alley.

12. The combination with a bowling alley having one end portion of the alley floor provided with pin centering spots, an image receiving viewer panel disposed within sight of a player at the other end of the alley, and an optical system for transmitting images of the bowling pins to said viewer panel, said system including open ended passageways having opaque side walls supported above the alley floor with light receiving end portions axially aligned with the centers of the respective spots and other portions extending at an angle thereto, and angularly placed mirrors for directing beams of light from the receiving portions axially of the other portions and to the viewer panel.

13. The combination with a bowling alley having an alley floor provided at one end portion with pin centering spots, of optical systems individual to the respective spots and each including a light receiving end portion having a mirror positioned co-axially with one of the spots, each such mirror being angularly disposed to receive light from a particular pin position and to direct such light along the respective optical system toward the eye of an observer.

14. The combination with a bowling alley having a floor provided at one end portion with pin centering spots, said spots comprising transparent means above which the respective pins are adapted to be centered, of at least one optical system comprising means for indicating to an observer at a remote point whether the several pins are centered above their respective spots, said system including reflecting means below the transparent portions of the spots, reflecting means above the said alley end portion, and reflecting means for transmitting from the first reflecting means to the second reflecting means light penetrating the transparent portions of the spots, together with means above the spots for the illumination of the pins and spots.

15. The combination with a bowling alley floor having at one end portion a set of pin centering spots with transparent portions normally covered by pins when the pins are properly set, of individual optical systems comprising means for directing the light from respective spots toward a common observation point, said alley being provided with means for illuminating from above the pins the respective transparent spot portions not covered by the pins.

16. The combination with a bowling alley having a spot with which a pin is to be centered, of an optical system for indicating to a remote observer whether the said pin is centered with respect to its respective spot, said system comprising at least one mirror means disposed adjacent the projected axis of the properly positioned pin, said mirror means being angularly disposed to reflect light from the vicinity of such pin.

17. The combination with a bowling alley provided at one of its ends with means defining predetermined locations for pins, of a detector system individual to the respective pins for indicating to an observer at a remote point whether the respective pins are properly centered at their respective locations, each such detector system comprising a light ray receiver centered with respect to the proper pin, together with source means for light rays arranged to deliver light to the respective receivers when any of the respective pins is displaced from its proper location.

18. The combination with a bowling alley having a floor portion provided with designated areas with which the respective pins are to be located of indicating means for showing to a remote observer whether the respective pins are properly located with regard to their respective areas aforesaid, said indicating means comprising light means at one side of the respective areas, light receiving means at the other side of the respective areas, the pin being adapted to intercept at least a part of the light passing from the source means to the receiving means of each area, and means for rendering apparent to the remote observer whether the light intercepted by each pin is in accordance with a predetermined arrangement.

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