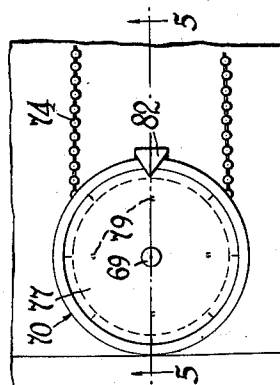
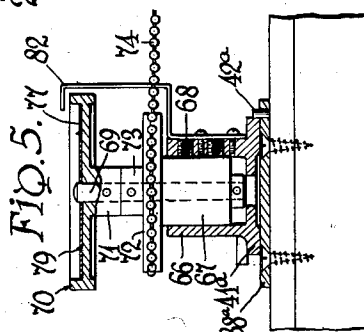
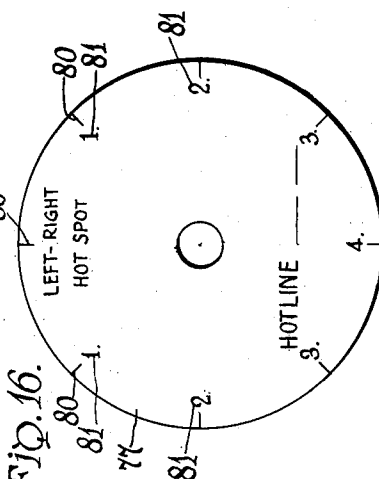


E. F. WOLFF
APPARATUS FOR INSTRUCTION AND PRACTICE
USE IN BOWLING WITH TENPINS

4 Sheets-Sheet 1

Filed Jan. 10, 1961



INVENTOR
Edwin F. Wolff,
John Powers
ATTORNEY

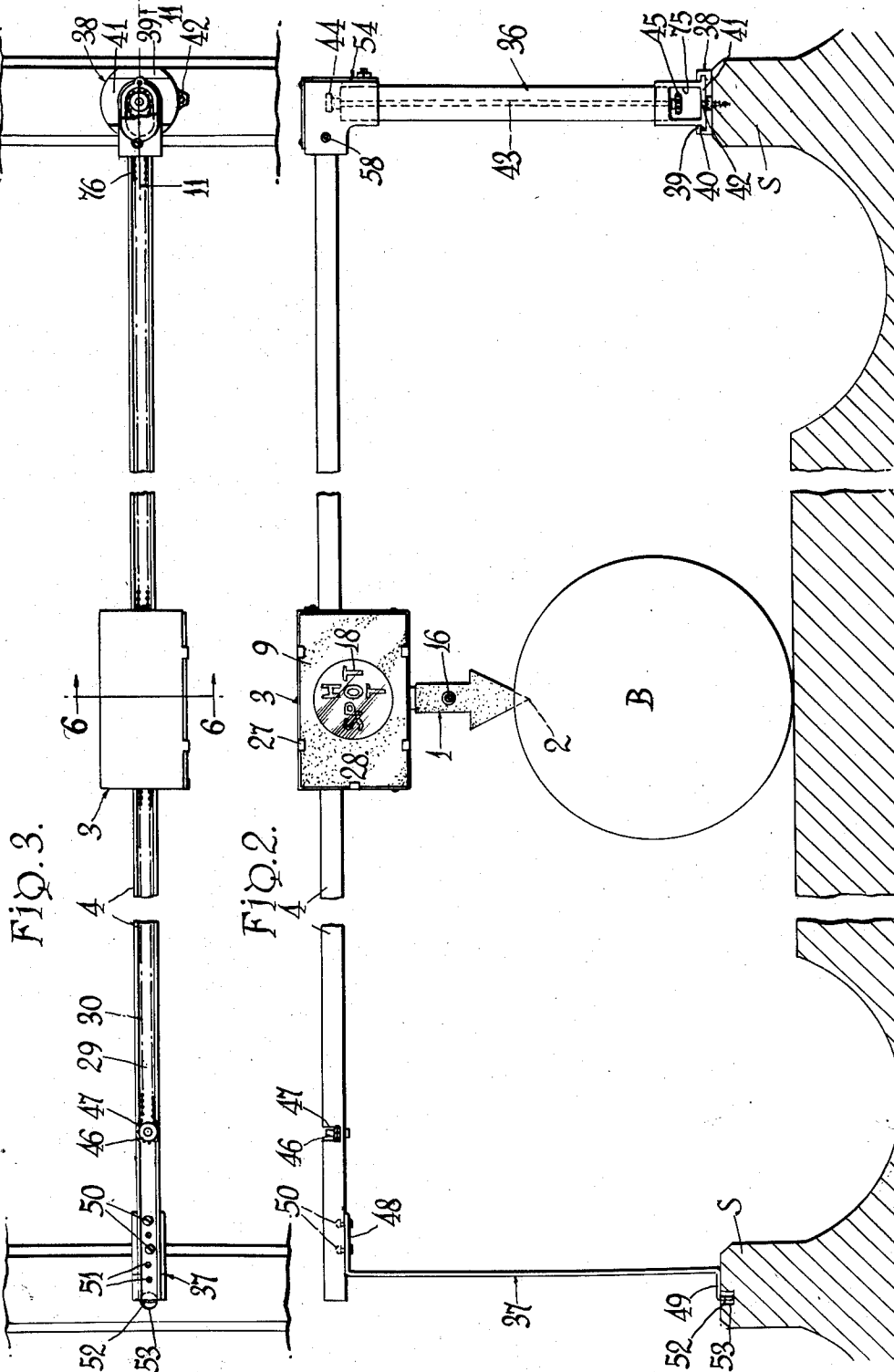
Feb. 5, 1963

E. F. WOLFF
APPARATUS FOR INSTRUCTION AND PRACTICE
USE IN BOWLING WITH TENPINS

3,076,652

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4 Sheets-Sheet 2



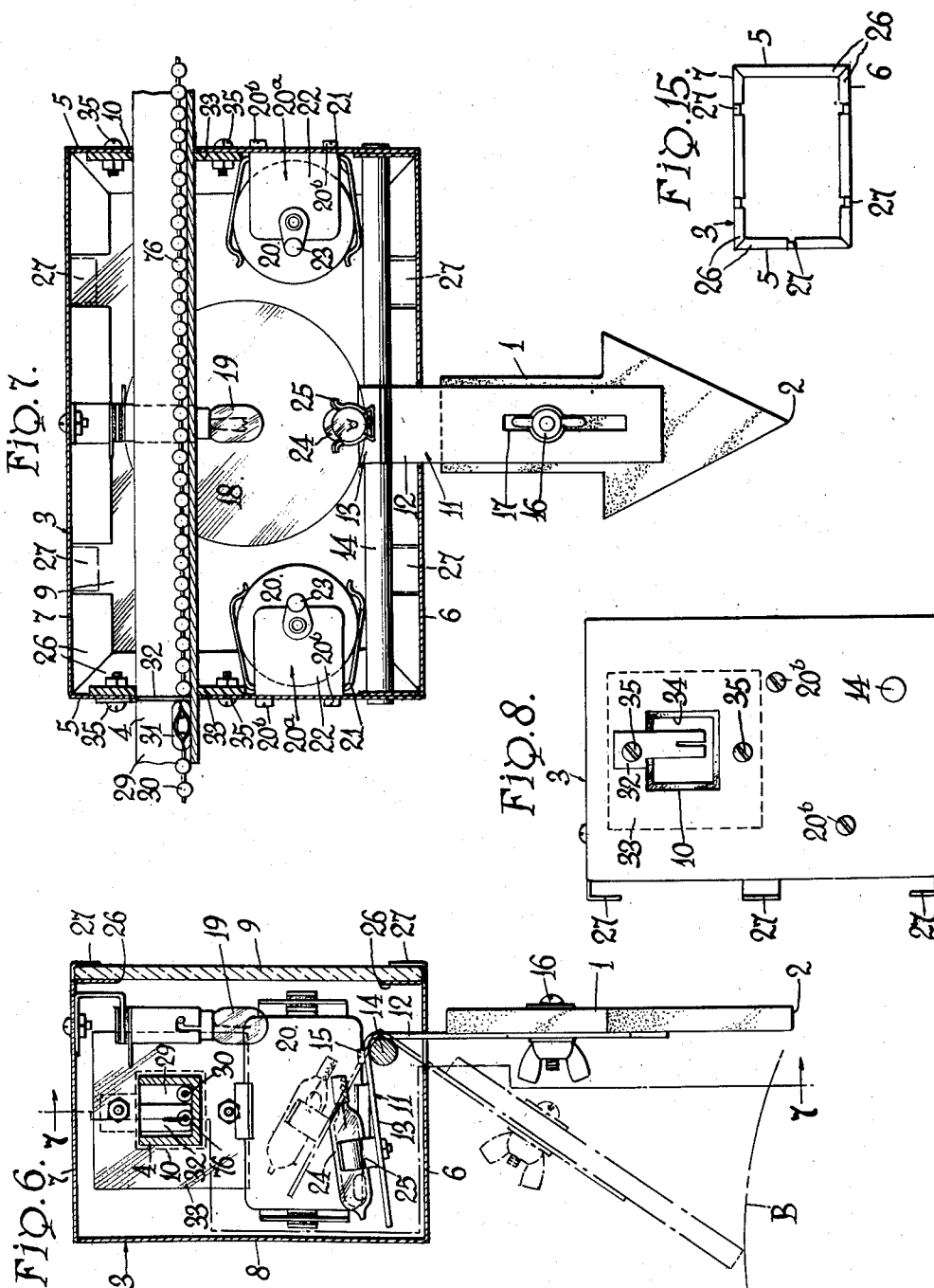
Feb. 5, 1963

E. F. WOLFF
APPARATUS FOR INSTRUCTION AND PRACTICE
USE IN BOWLING WITH TENPINS

3,076,652

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4 Sheets-Sheet 3



INVENTOR
Edwin F. Wolff,
BY *John C. Lowers*
ATTORNEY

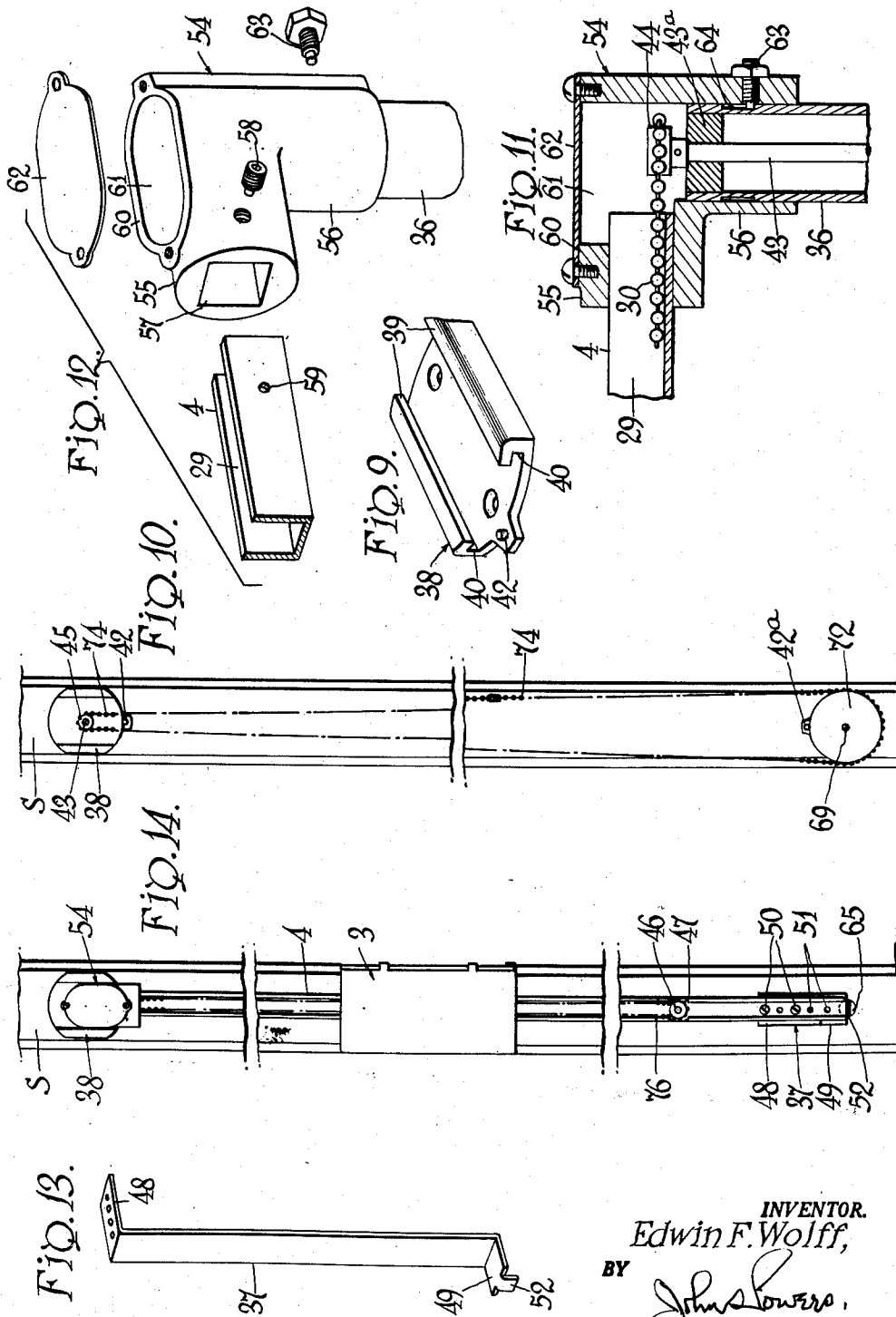
Feb. 5, 1963

E. F. WOLFF
APPARATUS FOR INSTRUCTION AND PRACTICE
USE IN BOWLING WITH TENPINS

3,076,652

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4 Sheets-Sheet 4



INVENTOR.
Edwin F. Wolff,
BY *John Sowers*,
ATTORNEY

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3,076,652 APPARATUS FOR INSTRUCTION AND PRACTICE USE IN BOWLING WITH TENPINS

Edwin F. Wolff, 2007 Green Rock Lane,
Indianapolis 3, Ind.

Filed Jan. 10, 1961, Ser. No. 81,821
21 Claims. (Cl. 273-54)

This application is a continuation-in-part of my application, Serial No. 17,152, now abandoned, for Apparatus for Practice Use in Bowling With Tenpins on Standard Bowling Alleys.

The invention of the present application relates to apparatus of such character and includes sundry features which are disclosed and claimed in my said application, Serial No. 17,152 and also includes a number of features which are new as compared with the apparatus of my said application and which have a number of substantial advantages.

Standard bowling alleys each have a foul line which limits the player's position in throwing the ball and include a "lane" along which the ball is rolled and which has a length from the foul line to the No. 1 pin of sixty feet and a width of between forty-one and forty-two inches. The lane terminates in a pin spotting area or "deck" having a lineal extent of approximately three feet beyond which is a pit having a floor a few inches below the pin deck and into which the balls fall, thence being returned to the bowler by the usual means. Gutters for wild balls are provided at each side of the lane and extend to the pit. A number of alleys are in parallel relation, adjacent alleys being separated by longitudinally extending division boards which project for a few inches above the gutters.

I have found that if a target, adjustably positionable transversely of the lane, be placed at approximately fifteen feet from the foul line, a bowler, delivering the ball back of the foul line, by repeated efforts in aiming at the target and checking the results will determine the optimum position of the target for a strike or any particular spare, accordingly as he may roll straight balls, reverse balls, hooks or curves. The bowler, in actual play, keeping the optimum target location in mind, will obtain substantially improved results, both as to strikes and spares. If he be practising for strikes where the ideal is a hit in the pockets between the No. 1 and No. 3 pins (for a right-handed bowler) or between the No. 1 and No. 2 pins (for a left-handed bowler) he will learn the position of the target which will improve his game in this respect. Similarly if he has encountered difficulties with some particular spare, he will learn the position of the target which will improve his game in making this spare.

The essential objects of the invention are set forth in the immediately following paragraphs which for convenience of identification and reference are numbered 1 to 6.

(1) The principal object of the invention is to provide an apparatus of simple structural character which is equally useful for practice or instruction and may be set up in operative relation to any particular alley, wherein the target, positioned to be hit by the ball, has a normal pendant position and has movement when hit and returns to its normal position when the ball has passed beyond it, wherein when the target is hit its movement results in a visible or audible signal which informs the bowler of the fact and when it returns to its normal position its movement results in the discontinuance of the signal, wherein the target is so mounted that it may be positioned at any point along a line transverse to the lane, and wherein a manually actuated device within easy reach of the bowler, that is to say, at or near the foul line or in the approach area, is utilized by the bowler to set the target at any predetermined position.

(2) A further object is to provide apparatus having

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novel mounting features such that it may readily and quickly, that is to say within two or three minutes, be placed in an operative position relative to the bowling lane for support by the division boards at the sides of the lane or, conversely, as readily and quickly be removed entirely from the bowling lane for transport to a place of storage.

(3) A further object is to provide apparatus which as supported by the division boards at the sides of the lane may, without removal, be readily and quickly swung to a position in which it overhangs one of the division boards as a support, thereby to enable the lane to be used for standard bowling games, and when the use of the lane is desired for practice or instruction purposes may as readily and quickly be swung into a position in operative relation to the lane, in which position it is supported by the division boards at the sides of the lane.

(4) A further object is to provide apparatus which includes a unit positionally adjustable transversely of the lane and comprising in cooperative relation a pendant pivotally movable target plate, a sensual signal and an electrically operated signal activating means under the control of the target plate, the signal preferably being of visible character.

(5) A further object is to provide apparatus wherein the manually actuated device for the adjustable positioning of the target is in operative combination with a removable chart having a determined initial position and which participates in the manually effected movement of parts of the device, the chart thereby being rotatable in either direction from its initial position and being provided with peripheral calibrations, preferably in inches, where are available for pencil markings to record the optimum position of the target plate for a particular shot and to identify that shot. When this record has been made the bowler may remove the chart and retain it, either for the purpose of memorizing the position of the target plate for that shot or for inspection when that shot is required in actual bowling.

(6) A further object is to provide apparatus which will promote accuracy in the delivery of the ball, alike as to whether the apparatus be used for practice or instruction.

Referring to object (1):

The invention, generally speaking, is a combination of elements generally characterized by a pair of vertical standards to be mounted in transverse alinement upon the division boards at each side of the lane and which at their upper ends carry a transverse supporting bar, a pendant target supported by the bar for swinging movement between a normal position and a displaced position and in its normal position having its lower end at an elevation such that it will be hit and displaced by the bowling ball, means for moving the target along the bar to any desired position and including a target positioning device, located adjacent the foul line and actuated by the bowler, the target being in operative association with means for the control of the circuit of a visible or audible signal, such means being operative when the target is hit to condition the circuit for the operation of the signal, and being operative when the target swings back to its normal position to condition the circuit to terminate the operation of the signal.

Referring to object (2):

For the ready and quick mounting of the apparatus upon the division boards at the sides of the lane and for its equally ready and quick removal from the division boards, the invention is characterized (1) by a pair of mounting plates for permanent attachment to one of the division boards, one of the mounting plates being adjacent the foul line and the other being at a distance along the lane of sixteen feet from the foul line, the provision of

a standard as a part of the actuating device, such standard and one of the standards required for the support of the target being provided at their lower ends with plinthlike flanges for articulate engagement with features of the mounting plates, the flanges being readily engageable and disengageable from the mounting plates; (2) by the second standard for the support of the target as resting upon the division board at the opposite side of the lane being provided at its lower end with a projection which has a loose fit in a recess formed in the upper surface of the division boards; and (3) by a chain which operatively connects vertical shafts, one of which is associated with the actuating device and the other with the target supporting standard, the chain being constructed for ready disconnection from the shafts. When the apparatus is to be removed entirely from the lane the chain is disconnected, the plinthlike projections are disengaged from the base plates, and the standard at the opposite side of the lane is lifted to disengage its projection from the recess. Thereupon the apparatus may readily be moved to any place of storage.

Referring to object (3):

According to the invention the mounting of the apparatus to enable the use of a particular lane for the purposes of practice or instruction does not require the removal of the apparatus when it is desired to use that lane for actual play. In this respect the invention is characterized by the connection of the transverse target supporting bar in a journalled manner to one of the standards which may be called a permanent standard in that it remains in its position on the division board as a support and by the fixed connection of the transverse bar at what may be called its free end to the standard supported upon the division board at the opposite side of the lane and which may be called the swingable standard, this standard preferably having a projection for engagement in, and for free disengagement from, a recess in such division board. The construction is such that the transverse bar may be lifted to the extent necessary to disengage the projection from the recess and may thereupon be swung, carrying with it the swingable standard, into a position above and in overlying relation to the division board which supports the permanently mounted standard, this latter division board being also formed with a recess to accommodate the projection on the swingable standard. When the use of the alley is again desired for practice or instruction purposes, the operations above described are carried out in reverse relation.

Referring to object (4):

The invention is characterized by a unit which includes the signal, its activating means, the target plate and a casing which provides support for the target plate and carries the signal and encloses its activating means. The casing, and with it the target plate, is positionally adjustable transversely of the lane and is supported by and movable along the transverse bar. The signal may be either visual or audible. In the construction shown and preferred the signal is visual and its operation involves the illumination of an area of the casing adjacent the target plate. Concerning this aspect of the invention and, as an instructor of the game of tenpin bowling, I have found that due to the rapidity of movement of the bowling ball, the small size of the target plate at a distance of fifteen feet from the foul line and the noiselessness and rapidity of its movement, and also due to the different characteristics of the throws, i.e., straight ball, reverse ball, hook or curve, the bowler, absent a signal when the target is hit, cannot with certainty determine the fact nor can he determine whether his ball passed to one side of the target plate. The signal gives definite and sensual indication that the ball has hit the target plate, also informs the bowler of the precise location of the target plate as optimum for the particular shot, and by its absence informs the bowler that his ball has missed the target plate.

Referring to object (5):

According to the invention: The manually actuated device for the adjustable positioning of the target includes a vertical shaft which is connected by sprocket and chain gearing to the positionally adjustable unit which includes the target plate; the shaft of the actuating device is provided with a hand wheel by which it may be turned in either direction and is in association with a fixed overhanging pointer; and a paper chart peripherally calibrated, preferably in inches, is fitted upon the hand wheel for ready removal, the chart having an initial determined position relatively to the pointer and participating in the movement of the hand wheel. When the position of the target plate is determined for a particular shot, i.e., a particular spare, by the successful execution of that shot, the chart is in a corresponding position relatively to the pointer and the number of the pin to be first struck by the ball in making that shot is marked by a pencil upon the chart in coincidence with the pointer. Thereby the bowler has a record of the position of the chart indicative of the optimum position of the target plate for that particular shot. By removing the chart from the hand wheel and taking note of the location of the pencilled pin number the bowler may memorize the optimum location of the target plate or if he prefers may refer to the chart when that shot comes up in an actual game.

Referring to object (6):

The invention is characterized by the suspension of the target plate from a bar which extends transversely across the lane. Thereby the degree to which the target plate extends below the apogee point of the ball may be determined and maintained with accuracy. The preference is that the target plate extend not more than one-eighth of an inch below the apogee point of the ball, the transverse zone of contact between the ball and the target plate being thereby sufficiently limited to promote accuracy in the delivery of the ball.

In the drawings:

FIGURE 1 is a plan view, partly broken away, of a bowling alley lane equipped with apparatus embodying the invention, the apparatus being shown in schematic plan.

FIGURE 2 is a cross sectional view on the line 2—2 of FIGURE 1.

FIGURE 3 is a plan view of that part of the apparatus which includes the positionally adjustable unit carrying the target plate and the transverse bar by which the unit is supported, these parts being shown as supported in operative relation to the lane of a bowling alley.

FIGURE 4 is a plan view of the actuating device for effecting the positional adjustment of the target plate, this figure also including a fragmentary plan view of the division board by which the actuating device is supported adjacent the foul line.

FIGURE 5 is a vertical sectional view on the line 5—5 of FIGURE 4.

FIGURE 6 is a vertical sectional view on the line 6—6 of FIGURE 3.

FIGURE 7 is a vertical sectional view on the line 7—7 of FIGURE 6.

FIGURE 8 is an end elevation (viewed from the left of FIGURE 7) of the casing which encloses the signal means.

FIGURE 9 is a perspective view of a mounting plate which as shown in this figure is for the support of the standard to which is connected the transverse bar upon which the target plate is mounted, a similar mounting plate being provided for the supporting standard of the actuating device. Both plates are mounted on the same division board.

FIGURE 10 is a schematic plan view showing the arrangement of the two mounting plates whereby a chain, operatively connected to the shaft of the actuating device and to a shaft associated with a supporting standard, both

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shafts being mounted on the same division board, is maintained under tension.

FIGURE 11 is a fragmentary vertical section on the line 11—11 of FIGURE 3.

FIGURE 12 is an exploded perspective view of an elbow and associated parts for the connection of the transverse bar to a supporting standard.

FIGURE 13 is a perspective view of a swingable supporting standard for the transverse bar upon which the positionally adjustable target plate unit is mounted.

FIGURE 14 is a fragmentary plan view showing the transverse bar which carries the target plate positioned in overhanging relation to a division board to enable the use of the alley for a bowling game.

FIGURE 15 is a front elevation of the casing which encloses the signal means but with the front wall of the casing removed and the signal means omitted.

FIGURE 16 (Sheet 1) is a plan view of the chart which is provided in association with the hand wheel of the actuating device for the positional adjustment of the target plate.

FIGURE 1 shows a standard bowling alley having a lane L along which the balls are rolled and which extends from the foul line F to the pit P and includes a deck D for the tenpins T. The lane has a width of between 41 and 42 inches and from the foul line F to the No. 1 pin T1 has a length of 60 feet, the center line of the lane extending through the spot for the pin T1. The deck D has a length of approximately three feet. The floor of the pit P is located a few inches below the level of the deck D. The alley includes gutters G, one at each side of the lane L to receive "wild balls," the gutters G extending for the full length of the lane L including the deck D and the balls which may be thrown into the gutters G falling into the pit P. Back of the foul line F there is an approach area A which is coplanar with the lane L. The bowling balls are returned from the pit P by the usual mechanism to positions in which they may be picked up by the bowlers within the area A. The alleys are adjacent in parallel relation and are separated from one another by division boards S which project a few inches above the gutters. Certain of the alleys are similarly separated by the casings of the ball return channels, these casings being the functional equivalent of the division boards. Each lane may carry the usual embedded floor targets E arranged in a pattern which may have an overall extent of from twelve to sixteen feet from the foul line F, the embodiments E being ideally arranged at intervals of five inches along the sides of an isosceles triangle and the base of the triangle subtending the area through which the balls are rolled.

The apparatus of the invention has as an essential feature a pendant target plate 1 of rigid or semi-rigid material such as vulcanized rubber. The plate 1 is mounted for swinging movement about a transverse axis and occupies a normal perpendicular position with its lower end 2, which is preferably pointed, extending slightly below the horizontal plane in which lies the uppermost or "apogee" surface point of the bowling ball B. The target plate 1 is ideally located at a distance of approximately fifteen feet from the foul line F and is so mounted that it may be positioned at any point along a line X (indicated by dot and dash lines in FIGURE 1), transverse to the lane L.

The plate 1 is carried by a casing 3 which is supported by and slidably mounted upon a bar 4 extending transversely of the lane L in overhanging relation when the apparatus is set up for use. The casing 3 is of box-like form and includes end walls 5, a bottom wall 6, a top wall 7, a rear wall 8, and a front wall 9. The end walls 5 are formed with rectangular openings 10 through which the bar 4 extends, the edges of the openings 10 being slightly spaced from the bar 4 to avoid metal-to-metal contact when the casing 3 is moved along the bar 4 from one position to another.

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The target plate 1 is carried by a hanger 11 of substantial L-shape which includes a vertical arm 12 and a horizontal arm 13 and is mounted upon a rod 14 within the casing 3 having its ends journaled in openings in the end walls 5. The rod 14 is located at the junction of the arms 12 and 13 and the hanger 11 is attached to the rod by screws 15. The target plate 1 is attached to the arm 12 by means of a bolt and nut fastening 16, the arm 12 having a slot 17 to accommodate the bolt of the fastener. Thereby the position of the target plate 1 along the arm 12 may be selected to accord with the particular distance of the bar 4 above the lane L, this distance varying with variations in the height of the division boards S as made by different bowling alley constructors.

According to the invention, the signal indicative of the hitting of the target plate 1 by the bowling ball is electrically controlled and mounted within the casing 3. The signal may be either audible or visual, a visual signal being preferred and herein shown. The signal includes a translucent window 18 incorporated with the front wall 9 of the casing 3 and an electric bulb 19 located behind the window. The signal activating means includes batteries 20 mounted within the casing, one adjacent to each of the end walls 5, the batteries supplying current for energizing the signal. Each battery is supported from an adjacent end wall 5 by the usual and well-known metal battery holding bracket 20a attached to the wall by bolt and nut fastenings 20b and provided with upper and lower spring clips 21 and end clips 22. The clips 22 carry the wire attachment fingers 23 which are in electrical connection with the pole pieces at the end of the battery and are insulated from the bracket. It is deemed unnecessary to show a wiring diagram for the lamp 19, the circuit having no features which require description. It will be sufficient to point out that the signal activating means includes a circuit closing switch under the control of the hanger 11. A mercury switch 24 is shown and preferred and is attached to the arm 13 of the hanger 11 by a spring clip 25. In the normal pendant position of the target plate 1 the circuit of the lamp 19 is broken at the mercury switch 24. When the target plate is hit by the bowling ball and thereby moved backward as shown by the dot and dash lines in FIGURE 6 the mercury switch is positioned to close the lamp circuit with the result of a visual signal. When the bowling ball, having hit the target plate 1, passes beyond it the target plate returns by gravity to its normal pendant position, returning the mercury switch to its normal position in which the lamp circuit is broken. Thus, when the bowling ball is thrown, the bowler will be informed of the results of this throw. If the ball hits the target plate the fact will be shown by the visual signal. If the ball passes to one side of the target plate the fact will be shown by the absence of the visual signal.

One of the walls of the casing 3 is utilized as a removable lid in order that ready access may be had to the parts within the casing when repair or substitution may be required. The front wall 9 is preferably utilized for this purpose and is mounted slidably in relation to the bottom and top walls 6 and 7. The walls 5, 6 and 7 at the front side of the casing are provided with inwardly projecting flanges 26 and one of the walls 5, i.e., the wall to the right, FIGURE 7 being considered, and the walls 6 and 7 beyond the flanges are provided with inwardly projecting clips 27 arranged at suitable intervals and which may be struck up from the flanges. The flanges 26 and the clips 27 of the walls 6 and 7 provide guiding and retaining elements for the wall 9.

FIGURE 7 being considered, the clips 27 are omitted from opposite wall 5, i.e., the wall at the left, which thus presents no obstruction to the removal of the wall 9 by a sliding movement to the left. Replacement of the wall 9 requires its movement to the right, the flanges 26 and clips 27 serving as guides, and the clips 27 of the opposite end wall 5, i.e., the wall at the left, serving as detents to

limit the inward and replacement sliding movement of the wall 9.

The wall 9 may be of any suitable construction to provide the translucent window 18 within an opaque field. It is preferred that the wall 9 be made of translucent glass or plastic and that its front face be covered by an opaque coating 28 except for the window 18.

The bar 4 is of U-shaped cross section to provide a channel 29 for a cable in the form of a sprocket chain 30 which rests in parallel relation to the bar 4 on the bottom of the channel 29 and by which the casing 3 is moved along the bar 4, the chain 30 including a joining link 31 of well-known form to which the end links of the chain are connected and being readily connected to or disconnected from the link 31 as occasion may require. For the operative connection of the casing 3 to the chain 29 a bifurcated finger 32 is attached to one of the walls 5 at its outer side and, projecting across the opening 10, extends between adjacent links of the chain 30, for example between the joining link 31 and an adjacent link. For the direct support of the casing 3 from the bar 4 rectangular frames 33 are provided, these having central openings 34 which are slightly smaller than the openings 10 with which they register. The frames 33 are adjacent the inner faces of the walls 5 and are secured by bolt and nut fastenings 35, one of which is also used to secure the finger 32. The upper walls of the openings 34 rest upon the edges of the side walls of the channel 29 and the side walls of the openings 34 are sufficiently close to the side walls of the channel to prevent any lateral play between the casing 3 and the bar 4. Compressed nylon is preferred as the material of the frames 33 in that it enables the sliding movement of the casing 3 to be effected noiselessly and with a minimum of frictional resistance.

The bar 4 extends between and is supported by transversely aligned upright standards 36 and 37 which are mounted upon the division boards S at the opposite sides of the lane.

For the mounting of the standard 36 a mounting plate 38 may be permanently attached, as by screw fastenings, to the division board S. In the construction preferred the plate 38 is provided at its sides with parallel overhanging flanges 39 which define parallel grooves 40. The standard 36 is of tubular form and at its lower end is provided with a circumscribing plinthlike flange 41 which is engaged by a sliding movement within the grooves 40. The plate 38 is provided at its front end with an upwardly projecting pin 42 which limits the sliding movement of the flange 41.

The standard 36 is provided with journals, only the upper journal 43a being shown, for a centrally located vertical shaft 43 which carries at its upper and lower ends annular gear elements in the form of sprocket wheels 44 and 45 respectively. The upper journal 43a cooperates with the sprocket wheel 44 to provide a support for the shaft 43. The wheel 44 drives the chain 30 which is trained over an idler sprocket wheel 46 located within the channel 29 at a point suitable for the limitation of the movement of the casing 3 toward the leg 37, the side walls of the channel 29 being formed with recesses 47 which provide clearances for the chain 30 as trained over the wheel 46.

The standard 37 is preferably in the form of a flat vertical bar having an inwardly directed extension 48 at its upper end and an outwardly directed extension 49 at its lower end, the extension 49 resting for support upon the division board S at the side of the lane opposite the standard 36. The extension 48 is provided for the attachment of the standard 37 to the bar 4 and is formed with openings for fastening bolts 50 by which it is connected to the bottom wall of the channel 29. Since bowling lanes as constructed by different contractors vary in width between forty-one and forty-two inches the bottom wall of the channel 29 is formed along its length with a series of openings 51 to accommodate the bolts

50, the selection of the openings for the bolts being in accord with the particular width of the lane. The extension 49 is preferably provided with a downwardly directed terminal projection 52 which has a loose fit in a recess 53 formed in the upper face of the division board S.

The bar 4 is connected to the upper end of the standard 36 by an elbow member 54 which has a horizontal arm 55 and a downwardly directed arm 56. The arm 55 is formed with a central opening 57 of rectangular cross section, the end portion of the bar 4 adjacent the standard 36 having a close fit in the opening and preferably being secured by a screw 58, the inner end of which may bear in a recess 59 in the adjacent wall of the channel 29. The elbow 54 is formed with a flat upper face 60 to which an opening 61 extends and through which access may be had to the sprocket wheel 44, the opening 61 preferably being covered by a removable plate 62. The arm 56 fits conformably in a journalled manner over the upper end portion of the standard 36 and is secured against displacement by a fastening screw 63, the inner end of which projects into an annular groove 64 formed externally upon the standard 36 and having a width greater than the diameter of the screw 63 whereby the elbow 54 may be moved upward to a slight extent along the standard 36. Such upward movement of the elbow enables the ready disconnection of the projection 52 from the recess 53.

When the apparatus is to be removed from the lane and taken to a place of storage, all that is required is to disengage the flange 41 from the mounting plate 38 and the projection 52 from the recess 53. The removal of the apparatus from the lane is, however, not necessary when it is desired to use the lane for a bowling game. In such a case the standard 36 remains connected to the mounting plate 38 and the projection 52 is disengaged from the recess 53 whereupon, the elbow 54 being journalled upon the standard 36, the bar 4 is swung to a position above and parallel to the division board S upon which the standard 36 is supported and the projection 52 is engaged in a recess 65 (similar to the recess 53) in the upper face of the division board. When the use of the lane is desired for practice or instruction purposes the bar 4 is restored to its operative position as shown in FIGURE 2 in which it extends transversely of the lane and the projection 52 is re-engaged in the recess 53.

The actuating device, operated by the bowler, for effecting the positional adjustment of the target plate 1, is shown in FIGURES 4 and 5 and includes a tubular supporting standard 66 having at its lower end a plinthlike flange 41a, similar to the flange 41 and similarly articulated for removal and replacement relatively to a mounting plate 38a, similar to the mounting plate 38. The plate 38a is provided at its rear end with an upwardly projecting pin 42a similar to the pin 42 and serving to limit the sliding movement of the flange 41a in its articulated engagement with the mounting plate 38a, the pin 42a being located at the rear end of the plate 38a. The standard 66 carries a journal 67, fixed in position as by screws 68, for a vertical shaft 69 which is turned by a handle 70, preferably in the form of a disc-shaped knob which may be composed of suitable plastic material and has a downwardly extending hub 71 through which the shaft 69 extends and which is pinned or otherwise made fast to the shaft. The shaft 69 carries a sprocket wheel 72 located immediately above the upper end of the standard 66 and having a hub 73 which abuts the hub 71 and is similarly pinned to the shaft. The sprocket wheel 72 is in driving relation to a sprocket chain 74 which extends through an opening 75 in the standard 36 and drives the sprocket wheel 45 at the lower end of the shaft 42. When the handle 70 is turned the chain 74 via the sprocket wheel 45 effects the rotation of the shaft 43 which through the sprocket wheel 44 effects the movement of the chain 30 with the resultant transverse movement of the casing 3 and the target plate 1.

As above noted the pin 42 is at the front end of the plate 38 and the pin 42a is at the rear end of the plate 38a, the flange 41 being articulated with the mounting plate 38 by a forward sliding movement, the flange 41a being articulated with the mounting plate 38a by a rearward movement and the pins 41 and 41a serving to limit the sliding movement of the flanges. It is moreover to be noted that the pins 42 and 42a are so located that they limit the movement of the flanges to positions as shown in FIGURE 10, in which the chain 74 is held under suitable tension, the mounting plates 38 and 38a and the pins 42 and 42a thereby serving the additional function of a tensioning means for the chain 74. The chain 74 includes a joining link similar to the link of 31 of the chain 30 whereby it may be readily disconnected when the apparatus is to be removed from the lane for storage.

It is preferred that the casing 3 be moved in the same direction in which the knob 70 is turned, that is to say if the knob be turned to the left or counter-clockwise the casing 3 will be moved to the left along the bar 4 and if the knob 70 be turned to the right or clockwise the casing 3 will be moved to the right. For this purpose the finger 32 connects the casing with the rear length or run 76 of the chain 30.

The knob 70 carries on its upper face a paper chart 77 (FIGURES 4 and 16) which participates in the turning movement of the knob. For this purpose the disc of the knob may be formed with pins 79 projecting from its upper face and piercing the chart 77, thereby to key the chart to the knob. The chart 77 is formed with peripheral calibrations 80 preferably spaced an inch apart and identified by numerals 81.

The ratio of the sprocket wheels 72 and 45 (the sprocket wheels 44 and 46 being of the same diameter as the sprocket wheel 45) is such that the extent of movement of the casing 3 along the bar 4 will correspond with the extent of the peripheral movement of the chart 77 when the knob 70 is turned, that is to say the turning of the knob 70 to move the chart peripherally through the distance of an inch will result in the movement of the casing along the bar 4 for the distance of an inch. In the construction shown and preferred the peripheral extent of the chart is eight inches whereby a single revolution of the knob 70 will result in the movement of the casing 3 through a distance of eight inches.

The chart includes what may be called an unnumbered starting calibration 80a spaced an inch from adjacent calibrations 80, and the numerals 81 are duplicated at the left and right of the chart as far as the numeral "4" of the 81 series, this numeral being diametrically opposite the starting calibration 80a. It has been found convenient to place the word "left" at the left of the calibration 80a and the word "right" at the right of this calibration, these words being indicative of the direction of movement of the knob to effect the movement of the casing 3 in a corresponding direction. The actuating device carries a fixed pointer 82 which overhangs the peripheral portion of the chart 77 and is attached to the standard 66. In the construction shown and preferred the pointer 82 is located in coincidence with the rear-most peripheral point of the chart 77. The bowler, standing back of the foul line, when turning the chart to a particular desired position faces the pointer 82.

My invention is based on my experience as an instructor in bowling in which I have established the following facts: (1) Bowlers, when throwing the ball, are prone to look at the No. 1 pin as a target, this pin being at a distance of sixty feet from the foul line; (2) it is easier to hit a target fifteen feet from the foul line than to hit a target sixty feet from the foul line; (3) that as to form, in throwing the ball the bowler's head should be kept down (as in golfing) and that it is easier to keep the head down for a target fifteen feet from the foul line than for a target sixty feet from the foul line; (4) that differ-

ent bowlers throw different balls just as different baseball pitchers throw different balls; (5) that the position of the bowler at one side of the center line of the lane is important; and (6) that the position of the target at one side of the center line of the lane may vary for a particular shot in accordance with the kind of ball thrown by the bowler, namely a straight ball, a reverse ball (which behaves somewhat like a cue ball in billiards when sharply hit at a point below its horizontal diametrical plane), a hook ball (having a sharp break), or a curve ball, i.e., a ball which travels in a rather wide curve before it hits the particular pin required for the execution of the shot.

In my work as an instructor in bowling I have also found it convenient to use certain non-generic designations which I have coined, namely, "Hot Spot," "Foul Line Spot" and "Hot Line." The notation "Hot Spot" is also the trademark under which I advertise and sell the apparatus which forms the subject of my invention and it will be understood that my use of this notation in this description is without waiver of my trademark rights. The above terms may be explained as follows: The notation "Hot Spot" is indicative of the position of the target for a particular shot (strike or spare) and is preferably, as shown in FIGURE 2, marked upon the window 18. The notation "Foul Line Spot" is indicative of the spot where the bowler drops his ball at or around the foul line and at a certain distance in inches from one side of the bowling lane. The notation "Hot Line" is indicative of the line which extends from the "Foul Line Spot" to the "Hot Spot" location of the target plate 1 in rolling for strikes.

Assuming that the bowler is right-handed, as in the great majority of cases, and that the ball is rolled for a strike (the ideal being that the ball hit squarely in the pocket between the No. 1 and No. 3 pins) the bowler's "Hot Line" is in accordance with the following tabulation based on the type of ball which the particular bowler may roll, the "Hot Line" being measured in inches to the left of the right edge of the bowling lane:

Type of Ball	Hot Line, Inches	
	"Foul Line Spot"	"Hot Spot"
The Straight Ball.....	3 to 4.....	4 to 6.
The Reverse Ball.....	3 to 4.....	5 to 7.
The Hook Ball.....	6 to 10.....	5 to 10.
The Curve Ball.....	12 to 20.....	3 to 12.

When the position of the target plate 1 best calculated for making a strike has been determined (in accordance with the particular ball which the bowler may roll) the "Hot Line" may be marked upon the chart adjacent the notation "Hot Line." For example, if the marking be 3"-4" its meaning is that when throwing the ball the ball should be laid at or around the foul line three inches to the left of the right side of the bowling lane, and the target plate 1 should be four inches to the left of the right edge of the bowling lane. On the chart 77 I have found it convenient to place the notation "Hot Spot" adjacent the starting calibration 80a. The bowler, having determined the position of the target plate best calculated for making a strike, places the chart 77 upon the knob 70 with the starting calibration 80a in coincidence with the pointer 82. If the result of his roll should be a spare, the pins constituting the spare will usually be at the left of the center line of the lane and for making the spare the ball should hit the most advanced pin, for example, the No. 2 pin, in which case the "Hot Spot" location of the target plate 1 will be to the left of its original position for a distance in inches of three-fourths to one and one-half inches. The "Hot Spot" location of the target plate for the particular spare should now be marked by a pencil on the chart 77 by placing the num-

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ber of the pin first to be hit for that spare upon the chart at a point in coincidence with the pointer 82. The pin number so marked will inform the bowler of the "Hot Spot" position (distance in inches) of the target plate for that particular spare from its "Hot Spot" position for a strike. If, perchance, the pins constituting the spare should be at the right side of the center line of the lane, the "Foul Line Spot" of the bowler will be at the left of the center line of the lane and at an appropriate distance from the left side of the lane.

Of course, in the case of left-handed bowlers, rolling for a strike involves hitting the pocket between the No. 1 and No. 2 pins and the directions as to the location of the "Foul Line Spot" and the "Hot Spot" are reversed from those above given.

Generally speaking, with sufficient practice in directing the ball to the particular "Hot Spot" location of the target plate 1, the bowler will learn how to make any spare, including splits, that may be encountered in the actual game.

I claim:

1. For use in the practice of bowling with tenpins by means of a standard bowling ball and a standard bowling alley having a foul line, a bowling lane including a deck for the tenpins, gutters for wild balls at each side of the lane and upright division boards adjacent the gutters and which project to an elevation above the lane, apparatus which comprises, in combination: a pair of transversely aligned upright standards mounted upon the division boards at the opposite sides of the alley, a transverse bar extending between the standards, supported by them and connected to their upper ends, a target plate supported by and normally pendant from the bar and pivotally movable about a transverse axis, the target plate being engageable by the bowling ball with resultant pivotal movement from its normal position and returning by gravity to its normal position when the bowling ball passes beyond it, the target plate being mounted for slidable positionally adjustable movement in either direction lengthwise of the bar and in any position thereof overhanging the bowling lane, means for effecting the slidable movement of the target plate to any desired position and including a cable in parallel relation to the transverse bar, annular gear elements adjacent the ends of the transverse bar over which the cable is trained, and a vertical shaft carried by one of the upright standards, one of the gear elements being mounted at the upper end of the shaft, signal means for giving a sensual indication of the movement of the target plate as struck by the bowling ball, the signal means including a sensual signal and having two phases of operation severally in the control of the operation and the discontinuance of the operation of the signal, one phase of operation of the signal means being a normal phase in which the signal is inoperative and the second phase being an operative phase in which the signal is operative, the target plate controlling the operation of the signal means in its normal and operative phases and in its normal pendant position providing for the normal phase of the operation of the means and in its pivotal movement by the bowling ball cooperating with the signal means to effect the second phase of its operation in which the signal is operative, the standards and the bar being positionable at a selected location remote from the foul line and the tenpin deck, a manually actuated target plate positioning device located in adjacency to the foul line and having a finger-piece for its operation by the bowler, and means of operative connection between the target plate positioning device and the vertical shaft for effecting its turning movement with resultant adjustment of the position of the target plate.

2. Apparatus as set forth in claim 1 wherein one of the upright standards for the support of the transverse bar is of tubular form and the target plate positioning device includes an upright standard also of tubular form,

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both standards of tubular form being supported by the same division board and each being formed at its lower end with a plinthlike projection, mounting plates for the standards of tubular form are secured to the division board and are formed along their sides with overhanging flanges with which the plinthlike projections may be articulated by a sliding movement, the standards of tubular form being disengaged from the mounting plates by a sliding movement in the opposite direction, and wherein the second upright standard for the support of the transverse bar is supported in a detachable manner by the division board at the opposite side of the lane.

3. Apparatus as set forth in claim 2 wherein the second standard for the support of the transverse bar is in the form of a flat vertical bar having an angular extension at its lower end which rests upon the division board and which is provided with a downwardly directed terminal projection, the division board upon which the extension rests being formed with a recess in which the projection is loosely fitted.

4. Apparatus as set forth in claim 2 wherein the mounting plate for the standard of tubular form which supports the transverse bar is provided at its front end with a pin which limits the sliding movement of the plinthlike projection in its articulation with the overhanging flanges and the mounting plate for the standard included in the target plate positioning device is provided at its rear end with a pin which limits the sliding movement of the plinthlike projection in its articulation with the overhanging flanges.

5. Apparatus as set forth in claim 2, wherein a vertical shaft is mounted in the standard of tubular form for the support of the transverse bar, the target plate positioning device includes a vertical shaft provided with a knob for effecting its turning movement, sprocket wheels are mounted on the vertical shafts, a chain operatively connects the sprocket wheels, the mounting plate for the standard of tubular form for the support of the transverse bar is provided at its front end with a pin which limits the sliding movement of the plinthlike projection in its articulation with the overhanging flanges and the mounting plate for the standard included in the target plate positioning device is provided at its rear end with a pin which limits the sliding movement of the plinthlike projection in its articulation with the overhanging flanges, the pins also serving to maintain the chain under tension.

6. Apparatus as set forth in claim 1 wherein the transverse bar is connected to one of the upright standards for pivotal movement about a vertical axis to a position in which it overhangs in parallel relation the division board upon which said standard is supported, and the second upright standard connected to the transverse bar participates in the pivotal movement of the bar and is supported in detachable relation by either of the division boards, accordingly as it may be positioned transversely of the lane or as it may be positioned in overhanging relation to the division board which supports the first named upright standard.

7. Apparatus as set forth in claim 6 wherein the upright standard to which the transverse bar is connected for pivotal movement is of tubular form and the pivotal connection between the transverse bar and said standard includes an elbow having a journalled mounting upon the standard and to which the transverse bar is rigidly connected.

8. Apparatus as set forth in claim 6 wherein the upright standard to which the transverse bar is connected for pivotal movement is of tubular form, the pivotal connection between the transverse bar and said standard includes an elbow having a journalled mounting upon the standard and to which the transverse bar is rigidly connected, the standard is formed with an annular external groove and the elbow carries a screw which extends into the groove, the width of the groove being greater than the diameter of the screw to enable upward movement of

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the elbow and the transverse bar relatively to the standard and as limited by the groove.

9. Apparatus as set forth in claim 6 wherein the second upright standard is formed at its lower end with an extension to rest upon either of the division boards, and with a projection extending downwardly from the extension, the division boards each having a recess to receive the projection.

10. Apparatus as set forth in claim 6 wherein the upright standard to which the transverse bar is connected for pivotal movement is of tubular form, the pivotal connection between the transverse bar and said standard includes an elbow having a journalled mounting upon the standard and to which the transverse bar is rigidly connected, the standard is formed with an annular groove, the elbow carries a screw which extends into the groove, the width of the groove being greater than the diameter of the screw to enable upward movement of the elbow and the transverse bar relatively to the standard and as limited by the groove, and the second upright standard is formed at its lower end with an extension to rest upon either of the division boards and with a projection extending downwardly from the extension, the division boards each having a recess to receive the projection.

11. Apparatus as set forth in claim 1 wherein the target plate is immediately supported by and pendant from a casing, the casing is supported by and is slidably mounted upon the transverse bar, the sensual signal is carried by the casing, and the signal means includes electrical means for activating the signal enclosed within the casing, the electrical means including a battery in circuit with the signal, a circuit controlling switch, and a movable part operated by the target plate for effecting the circuit opening and circuit closing operations of the switch, the switch having its circuit closing operation when the target plate, as struck by the bowling ball, is moved backward about its pivotal axis and having its circuit opening operation upon the return of the target plate to its normal pendant position.

12. Apparatus as set forth in claim 11 wherein the casing includes end walls, a rod is journalled in the end walls, the hanger for the target plate includes a vertical and a horizontal arm and at the junction of the arms is attached to the rod, the target plate is connected to the vertical arm, and the switch is a mercury switch and is mounted on the horizontal arm.

13. Apparatus as set forth in claim 11 wherein the casing has a front wall provided with a translucent window and the sensual signal is an electric bulb mounted behind the window.

14. Apparatus as set forth in claim 11 wherein the casing has top, bottom, front and rear walls, the front and rear walls extending longitudinally of the casing and one of them being removably mounted to give access to the enclosed signal and the enclosed electrical means for activating the signal.

15. Apparatus as set forth in claim 11 wherein the casing has end walls provided with rectangular openings, the transverse bar has a cross sectional outline which defines a vertical channel and extends through the openings in the end walls, plates of anti-friction and noise eliminating material are attached to the end walls and are formed with rectangular openings which register with the openings in the end walls but are of smaller dimensions, the transverse bar extending through the openings in the plates and the upper walls of the openings in the plates resting upon the transverse bar as supports for the casing, the side walls of the openings in the plates cooperating with the transverse bar to prevent loose play of the casing.

16. Apparatus as set forth in claim 11 wherein the casing has end walls provided with rectangular openings, the transverse bar has a cross sectional outline which defines a vertical channel and extends through the openings, one of the standards for the support of the transverse bar

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carries a vertical shaft, and the means of operative connection between the target plate and the means for effecting the slidable movement of the target plate along the bar includes a driving sprocket wheel carried by the shaft, an idler sprocket wheel mounted within the channel, and a chain connecting the sprocket wheels, operating within the channel adjacent to the base thereof, and connected to the casing.

17. Apparatus as set forth in claim 1 wherein the target plate positioning device includes a supporting standard and a vertical shaft carried by the standard, a handle for turning the shaft in either direction, the handle being in the form of a horizontally located disc shaped knob, a pointer is fixed to the standard and overhangs the knob, and a removable paper chart is fixed to the knob for turning movement therewith, the chart having uniformly spaced peripheral calibrations, one of which is a starting calibration and the others of which are distinguished by numbers, the chart being placed upon the knob in an initial position in which its starting calibration is alined with the pointer, and the shaft directly cooperates with the means of operative connection.

18. Apparatus as set forth in claim 17 wherein the means of operative connection and the means for effecting the movement of the target plate consist of sprocket wheel and chain gearing and the ratios of the sprocket wheels are such that the movement of the target plate corresponds in inches with the peripheral movement of the chart whereby a movement of the chart through the peripheral distance of an inch produces a movement of the target plate along the transverse bar for the distance of an inch.

19. Apparatus as set forth in claim 17 wherein the means of operative connection and the means for effecting the movement of the target plate consist of sprocket wheel and chain gearing, the ratios of the sprocket wheels are such that the movement of the target plate corresponds in inches with the peripheral movement of the chart whereby a movement of the chart through the peripheral distance of an inch produces a movement of the target plate along the transverse bar for the distance of an inch, and a chain element of the gearing is operatively connected to the target plate in such a manner that the target plate moves in a direction corresponding to the direction of movement of the chart whereby a counterclockwise movement of the chart produces a movement of the target plate to the left and a clockwise movement of the chart produces a movement of the target plate to the right.

20. For use in the practice of bowling with tenpins by means of a standard bowling ball and a standard bowling alley having a foul line, a bowling lane including a deck for the tenpins, gutters for wild balls at each side of the lane and upright division boards adjacent the gutters and which project to an elevation above the lane, apparatus which comprises, in combination: a pair of transversely alined upright standards mounted upon the division boards at the opposite sides of the alley, a transverse bar extending between the standards, supported by them and connected to their upper ends, a target plate supported by and normally pendant from the bar and pivotally movable about a transverse axis, the target plate being engageable by the bowling ball with resultant pivotal movement from its normal position and returning by gravity to its normal position when the bowling ball passes beyond it, the target plate being mounted for slidable positionally adjustable movement in either direction lengthwise of the bar and in any position thereof overhanging the bowling lane, means for effecting the slidable movement of the target plate to any desired position, the standards and the bar being positionable at a selected location remote from the foul line and the tenpin deck, a manually actuated target plate positioning device located in adjacency to the foul line and having a fingerpiece for its operation by the bowler, means of operative connection

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between the target plate positioning device and the means for effecting the movement of the target plate, one of the upright standards for the support of the transverse bar being of tubular form, and a target plate positioning device including an upright standard also of tubular form, both standards of tubular form being supported by the same division board and each being formed at its lower end with a plinthlike projection, mounting plates for the standards of tubular form secured to the division board and formed along the sides with overhanging flanges with which the plinthlike projections may be articulated by a sliding movement, the standards of tubular form being disengaged from the mounting plates by a sliding movement in the opposite direction, the second upright standard for the support of the transverse bar being supported in a detachable manner by the division board at the opposite side of the lane.

21. For use in the practice of bowling with tenpins by means of a standard bowling ball and a standard bowling alley having a foul line, a bowling lane including a deck for the tenpins, gutters for wild balls at each side of the lane and upright division boards adjacent the gutters and which project to an elevation above the lane, apparatus which comprises, in combination: a pair of transversely aligned upright standards mounted upon the division boards at the opposite sides of the alley, a transverse bar extending between the standards, supported by them and connected to their upper ends, a target plate supported by and normally pendant from the bar and pivotally movable about a transverse axis, the target plate being engageable by the bowling ball with resultant piv-

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otal movement from its normal position and returning by gravity to its normal position when the bowling ball passes beyond it, the target plate being mounted for slidable positionally adjustable movement in either direction lengthwise of the bar and in any position thereof overhanging the bowling lane, means for effecting the slidable movement of the target plate to any desired position, the standards and the bar being positionable at a selected location remote from the foul line and the tenpin deck, a manually actuated target plate positioning device located in adjacency to the foul line and having a fingerpiece for its operation by the bowler, means of operative connection between the target plate positioning device and the means for effecting the movement of the target plate, the transverse bar being connected to one of the upright standards for pivotal movement about its vertical axis to a position in which it overhangs in parallel relation the division board upon which such standard is supported, and a second upright standard participating in the pivotal movement of the bar and supported in detachable relation by either of the division boards, accordingly as it may be positioned transversely of the lane or as it may be positioned in overhanging relation to the division board which supports the first named upright standard.

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