Aug. 7, 1945. J. B. COKER 2,381,260

BOWLING SCORE PROJECTOR

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Fig. 1.

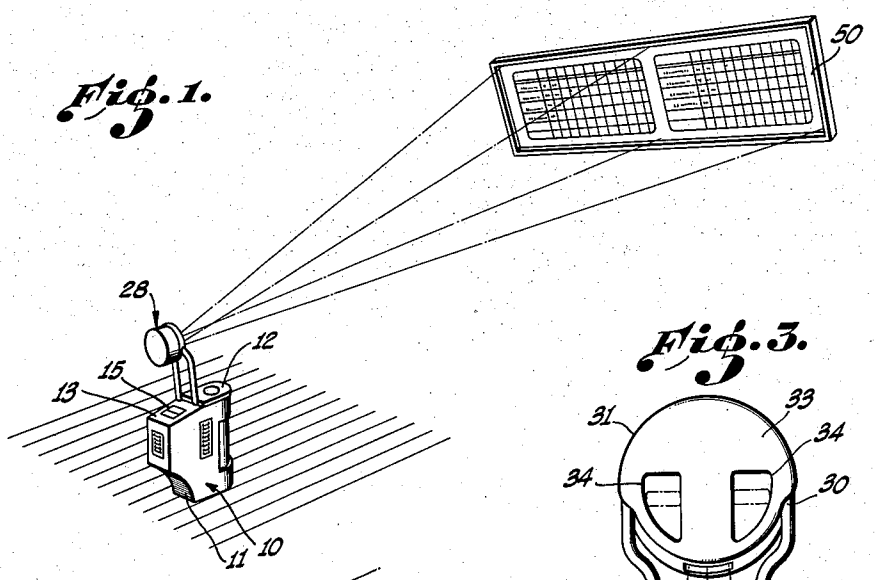
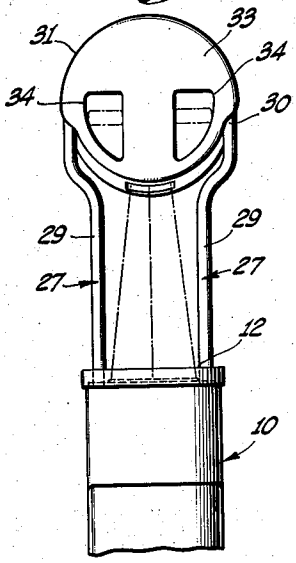


Fig. 3.



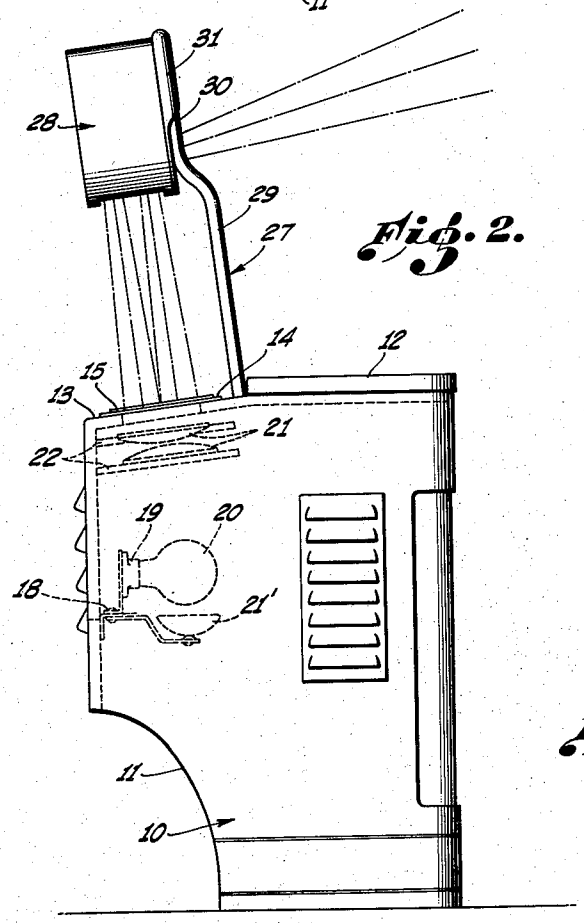


Fig. 2.

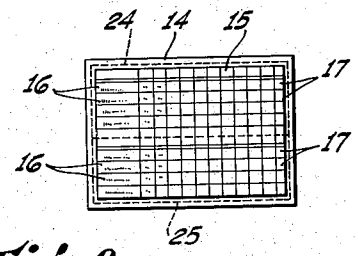


Fig. 9.

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BOWLING SCORE PROJECTOR

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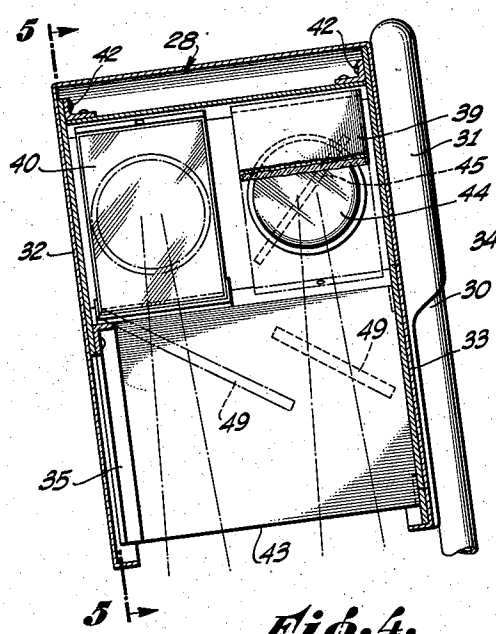


Fig. 4.

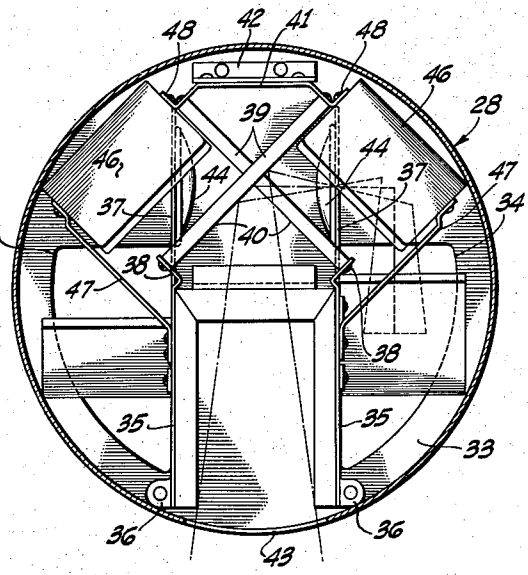


Fig. 5.

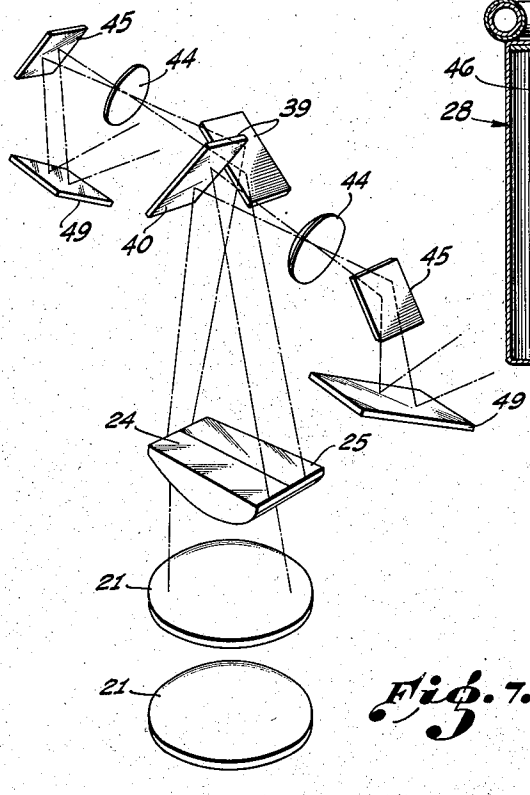


Fig. 7.

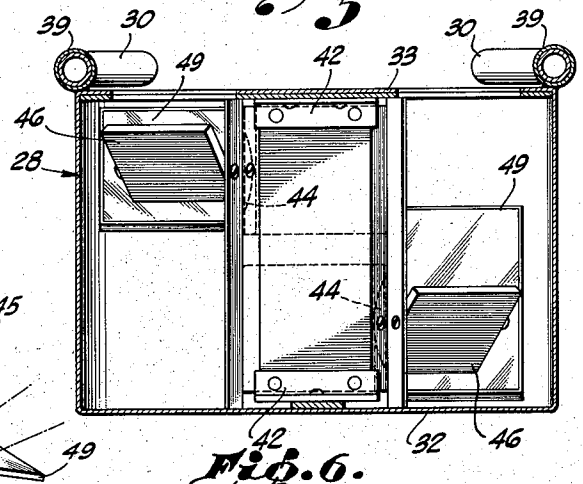


Fig. 6.

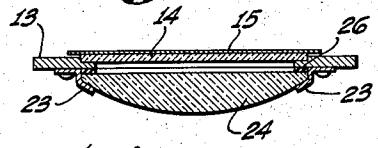


Fig. 8.

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UNITED STATES PATENT OFFICE

2,381,260

BOWLING SCORE PROJECTOR

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Application April 10, 1942, Serial No. 438,368

7 Claims. (Cl. 88—24)

This invention relates to projectors, and more particularly contemplates apparatus adapted for disposition at the back of the playing area of a bowling alley for projecting an image of the score recorded on a sheet onto a screen located where it will be visible to the scorekeeper, contestants and spectators alike.

Bowling scores are commonly recorded on quadrille-ruled sheets providing vertically arranged spaces for the names of the contestants, the score for each contestant being marked as the game progresses in squares or "frames" extending laterally across the sheet opposite each name. By such arrangement the current scores of the various contestants at any particular period during the game will be vertically aligned for comparison in adjacent squares opposite the respective names. In team play it is a common practice to utilize a score sheet on which the names and scores of the contestants of each team are recorded in horizontal lines as just indicated, with the score lines for the contestants of the respective teams assembled in team groups which are arranged one above the other.

Apparatus for projecting an image of the score sheet of the character above alluded to onto a screen suitably located is well known. The screen is ordinarily placed in front of the playing area, preferably at the head of the alley, so that the contestants may see it, but with such disposition, the screen must be sufficiently large in order to be legible to spectators located at the rear of the playing area. Projecting apparatus of the prior art, however, is only adapted to register an image of the scores of the respective teams in the same relative positions as on the score sheet, i. e., with the team scores arranged in vertical alignment. In bowling alley establishments having low ceilings such apparatus is impractical because a screen having a vertical dimension sufficient to accommodate the image will necessarily be of such size as to restrict the view of the pins at the opposite end of the alley by the contestants and others located at the head of the alley.

It is a general object of the present invention to provide a bowling score projector which is adapted to obviate the above-indicated disadvantages in prior art structures by the embodiment of a dual optical system operable to form separate images of the team group scores and to cast the same onto the screen side by side.

Another object is the provision of a split lens for dividing a beam of light emanating from a single light source below the score sheet, and to direct separate beams of light through the portions of the sheet on which the respective team scores are recorded to separate objective lenses mounted thereabove on which images of the respective team scores are recorded.

Another object is to provide pivotal mountings for reflecting media juxtaposed adjacent respective objective lenses to cast separate reflections of the images registered on said objectives obliquely upwardly at variable angles onto a screen located above the playing area or alley, whereby the apparatus may be adjusted to meet specific requirements.

Other objects and salient features of my invention, as for example economy of manufacture, simplicity of construction, and adaptability for use of the apparatus in alleys of different design and arrangement, will be apparent to those of skill in the art upon an examination of the following description read in the light of the accompanying drawings, in which:

Fig. 1 is a perspective view of the projector and screen, illustrating particularly the arrangement of the score sheet on the top of the projector cabinet and the transposition of the respective team scores relative to one another effected by the projection of the images of the scores onto the screen;

Fig. 2 is a side elevation of the projector cabinet depicting in dotted lines the light source, the condenser lenses, and the split lens for dividing the beam of light collected and directed upwardly by the condenser;

Fig. 3 is a front elevation of the cabinet;

Fig. 4 is an enlarged sectional view through the casing which encloses the objective lenses and the reflecting media, showing one of the supports for the casing in broken elevation;

Fig. 5 is a sectional view taken on lines 5—5 of Fig. 4;

Fig. 6 is a horizontal view through the casing showing one of the brackets by which the two pairs of mirrors are secured in adjusted position, and the mirrors by which tha separate image-carrying beams are directed forwardly and upwardly from the casing;

Fig. 7 is a schematic drawing of the system of lenses and mirrors employed in the embodiment herein disclosed, illustrating the manner in which the light rays are divided, refracted, and reflected by the optical system;

Fig. 8 is a sectional view, partially broken away through the translucent top of the cabinet showing the score sheet thereon, and illustrating one of the lenses by which the light beam is divided;

Fig. 9 is an enlarged plan view of the top portion of the cabinet on which the score sheet is supported.

Referring to the drawings in detail, the numerals of which indicate similar parts throughout the several views, 10 designates generally a thin cabinet for the support of a score sheet, hereinafter described. The lower rearward portion of the cabinet is recessed as at 11 to accommodate the feet of the scorekeeper when he is seated in back of the cabinet in a position most convenient for recording the score as the game progresses. The top of the cabinet is formed in two sections 12 and 13, respectively, the latter covering the rearward portion of the cabinet and being declined rearwardly. A translucent panel 14 is fitted into an opening in the top section to afford a convenient writing surface on which the score sheet 15 is placed as indicated in Figs. 1, 2, 8 and 9. The score sheet 15, which, the projector is adapted to accommodate, is of a conventional type composed of transparent or translucent material, such for example as Cellophane. Sheet 15 (see Fig. 9) is quadrille-ruled to form vertically-arranged spaces 16 at the left side thereof for the names of the contestants of each team, and a plurality of squares or "frames" 17 extending to the right edge of the sheet opposite each name-space 16 for the recordation of the scores registered by the respective contestants. The "lines" of "frames" 17 for the scores of contestants of the respective teams are arranged on the sheet in groups one above the other as is generally illustrated in Fig. 1. This enables the use of a much narrower cabinet than would be possible if the team score spaces were placed side by side, i. e., if the groups of "lines" for the respective team scores were arranged on the sheet end to end. As cabinet 10 is located in the playing area for most convenient use, it necessarily tends to restrict the movements of the players and, accordingly, any factor which contributes to a reduction in width of the cabinet is important. The cabinet is preferably positioned so that the scorekeeper, seated behind it, may face toward the opposite end of the alley to more easily observe the pins and the results of each ball delivered for recording the scores on the sheet.

A bracket 18, mounted within the cabinet below top panel 14, provides a support for an electric bulb socket 19 into which bulb 20 is threaded to furnish a source of light. A concave reflector 21' is secured by suitable means below bulb 20 to direct a concentrated beam of light upwardly. A pair of lenses, 21—21 comprising a condenser system, are secured in frames 22 mounted in the cabinet under panel 14 and substantially parallel therewith. The lenses 21—21 are each plano-convex and are arranged in their respective frames 22 with their convex surfaces opposed and adjacent to one another. A pair of lens frames 23 (Fig. 8) are secured to opposite sides of the top section 13 of the cabinet under opposite edges of the panel for mounting the tapered edges of a pair of lenses 24 and 25 which are adapted to split the beam of light. Each lens 24 and 25 comprises a diametric segment of a circular plano-convex lens, the segmental plane surfaces, coinciding with chords of the circle of the lens from which the segment is cut, and which form two opposite sides of the lens, being parallel to, equi-spaced from, and at opposite sides of the optical axis thereof. The lenses 24 and 25 are arranged in the brackets with their plane sides lying in the same plane, parallel to and nearest adjacent the top panel 14 so as to converge rays of light directed upwardly therethrough. The axially parallel sides of the lenses are held in abutting relationship and parallel to the back side of the cabinet by brackets 23 which retain the lenses in positions whereby the team score rulings of score sheet 15 will be coaxially aligned with respective lenses 24 and 25 when the sheet is properly arranged on the panel. 26 indicates a strip of soft material disposed between the top section of the cabinet and the tapered edges of the lenses to obviate vibration of the lenses within the cabinet, the effect of which would be greatly magnified in the projected image.

A tubular mounting 27 for an objective lens casing 28 has its ends securely fastened in the top of the cabinet adjacent opposite sides thereof and on the lines of joinder of the top section 12 and 13. Straight reaches 29 of the mounting extend upwardly from the cabinet parallel to one another and perpendicular to the panel. From the top of reaches 29 the mounting 27 diverges outwardly and rearwardly and then enters a loop 30 which comprises the upper portion of the mounting. The casing 28 which is circular in cross section is secured to the mounting 27 by a forward edge 31 of the casing which turns over loop 30 in order to support the casing with its transverse axis perpendicular to panel 14 and passing through the score sheet intermediate the respective team score spaces. The rearward end of the cylindrical casing 28 is enclosed by an imperforate circular cover 32. The opposite or forward end of the casing is similarly closed by a circular plate 33 having a pair of spaced openings 34 therein which are located in opposite lower quadrants of the plate for the projection of beams of light carrying the images of the respective team scores, as will appear.

Within the casing a pair of spaced vertical supports 35 are disposed, having lugs 36 integral with their opposite lower portions which are secured by suitable means to the edges of the end plates 32 and 33, respectively. An opening 37 is formed in the upper portion of each support, which openings 37 are offset axially with respect to one another to provide a pair of lateral light passages. The edges 38 of supports 35 below openings 37 therein, respectively, diverge outwardly, to each of which edges the lower end of a mirror frame 39 is secured. The upper edges of the mirrors, 40, carried by the respective frames, extend obliquely upward in intersecting planes being rigidly secured in the casing against dislodgement by the attachment of the upper edges of their frames 39 to opposite side edges of a transverse supporting member 41 having its ends secured to opposed end plates 32 and 33 adjacent the upper arc of casing 28 by angle pieces 42. The lower portion of casing 28 is cut away as at 43 to admit into the casing the rays of light converged by the condenser system 21—21 and the lens segments 24 and 25, respectively, it being understood that the mirrors 40 are positioned to direct these rays in relatively opposite directions through the respective openings 37 of supports 35. A plano-convex objective lens 44 is fitted in each opening 37, being fastened to the supports 35 by suitable means (not shown) with the convex surfaces opposed to one another.

The light rays directed through the respective object lenses 44 are reflected downwardly at opposite sides of the casing by mirrors 45 mounted in frames 46 pivotally supported between arms 47 diverging from the supports 35 and integral extensions 48 of opposite sides of the sup-

porting member 41. The faces of mirrors are opposed to one another and each forms an angle with the mirrors 40 with which it is in transverse alignment to reflect the image registered on its adjacent objective lens 44 downwardly to a third mirror 49 of the series of which each mirror is an intermediate reflecting expedient.

Mirrors 49 are pivotally connected to the supports 35 at opposite sides of the casing 28 below the respective mirrors 45 and in alignment with respective openings 34 in the forward end of the casing.

While the longitudinal axes of mirrors 49 are substantially parallel, it will be understood that these mirrors are preferably tilted slightly so that their transverse axes form a slight angle therebetween whereby the rays reflected by them respectively will not overlap as they diverge toward the screen, the location of which is about to be described.

The screen 50 (Fig. 1) is preferably disposed over the bowling alley in front of the playing area and at a sufficient elevation that it may be seen by the contestants in the playing area, the scorekeeper located in back of cabinet 10 at the rear of the playing area, as well as by the spectators for whom a gallery (not shown) is usually provided in back of the playing area. Screen 50 is rectangular to accommodate images of the team scores side by side, as illustrated in Fig. 1, the height of the screen being thus approximately one-half of the height required in a screen to accommodate the images of the respective team scores if arranged one above the other. This permits the location of the screen a sufficient distance above the alley or playing area, even in buildings having lower ceilings, to enable the contestants, scorekeeper and spectators to view the opposite end of the alley by looking under the screen.

It will be observed that by varying the pivotal adjustment of the mirrors 45 and 49 the angles formed between the image-carrying beams cast by the latter mirrors, respectively, and the longitudinal axis of the casing may be altered to enable the projection of the images onto a screen variably located above the alley, and that by such adjustments the beam carrying the image of the lower set of the team scores as recorded on the score sheet will be directed upwardly at a sharper angle than the beam of light directed through th upper portion of the score sheet by the upper half of the composite split lens 24—25 as reflected by the mirror 49 to which it is directed.

It will thus be seen that I have provided a projector adapted for use in a bowling alley for forming and casting separate images of different portions of the score sheet onto a screen with the respective images arranged on the screen in a different relationship than the relative disposition of the recorded scores of which the respective images are formed, on the sheet, and more specifically in a manner enabling the use of a screen having a comparatively small vertical dimension without reduction in the size of the images recorded therein.

While I have illustrated and described but one embodiment of my invention which is particularly adapted to overcome the problems outlined incident to the use of bowling score projectors in establishments having low ceilings, it will be understood that the apparatus illustrated may be varied to form separate images from any portions of the subject-matter desired, and to direct light beams carrying those separate images in any direction to meet specific requirements, and that the scope of such modifications is not limited by the necessity for changes in size, design, shape, number and proportion of the parts or the incorporation of additional reflecting media, such changes being within the skill of those in the art, and within the scope of my invention as defined by the appended claims.

What I claim and desire to secure by Letters Patent is:

1. In a projector for a score record in a bowling alley, a cabinet having a light transmitting panel, a light transmitting score record on said panel, said record having opaque divisional lines thereon, and being arranged for recording, one above the other, the respective scores of competing teams of players, a light source supported at one side of said panel, a condenser system disposed between said panel and the light source to direct a beam of light toward said panel, a pair of lenses arranged adjacent one another between said condenser system and said panel with their optical axes substantially parallel to one another and substantially perpendicular to the panel to divide a beam of light directed by said condenser system and to direct the divisional beams thus formed, respectively, through the two portions of the score record, a pair of objective lenses supported at the opposite side of said panel, a pair of reflectors positioned respectively in line with said beams and inclined to direct said beams to said lenses respectively, together with images of the respective portions of the score record through which said beams pass, a second pair of inclined reflectors respectively opposite said lenses, a screen disposed in a substantially vertical plane at a distance from the cabinet, and a third pair of inclined reflectors disposed in laterally adjacent relation both facing said screen and also disposed respectively toward the reflectors of the second pair to receive therefrom the respective beams and images projected by the lenses, said third pair of reflectors being adjusted to reflect said images respectively onto separate horizontally aligned areas of the screen in side by side relation.

2. In a projector for a score record in a bowling alley, a cabinet having a light transmitting top panel, a light transmitting score record on said panel, said record having opaque divisional lines thereon, and being arranged for recording, one above the other, the respective scores of competing teams of players, a light source disposed at one side of said panel, a condenser system interposed between said light source and said panel, a pair of lens segments each having sides coinciding with parallel chords of a circle having its center between said chords and on the optical axis of the lens, means to support said lenses between the panel and said condenser system with one of said sides of each lens in abutting relationship with one of the sides of the other of said lenses and approximately perpendicular to the alley, said lens segments being disposed respectively below the two portions of the score record designed to receive the respective scores of competing teams so as to cast separate beams of light upwardly through said portions of the score record, a substantially vertical screen supported at a distance from the cabinet, and a pair of separate objective lens-and-reflector systems supported at the opposite side of the panel in positions to register respectively the images of the two score records cast by said separate beams of

light, and including a final pair of reflectors inclined toward the screen and adjusted to cast said respective images separately thereon in horizontally aligned side by side relation.

3. In a projector for a score record in a bowling alley, a cabinet having a light transmitting top panel, a light transmitting score record on said panel, said record having opaque divisional lines thereon, and being arranged for recording, one above the other, the respective scores of competing teams of players, a light source arranged at one side of said panel, a condenser system disposed between said light source and panel to direct a concentrated beam of light to said panel, and through light transmitting parts of said score record, a pair of lens segments having separate optical axes arranged between the condenser system and the panel in adjacent relationship with their axes substantially parallel to one another and substantially perpendicular to said panel to divide said beam of light into two divisional beams, said lens segments being disposed respectively below the two portions of the score record designed to receive the respective scores of competing teams so as to cast the separate beams of light upwardly through said portions of the score record, a substantially vertical screen disposed at a distance from the cabinet, a pair of objective lenses supported at the opposite side of said panel above the cabinet, and a series of three reflectors operatively disposed in relation to each of said lenses, said lenses and their associated series of reflectors being positioned to receive and transmit respectively the images of the two score records cast by said divisional beams of light, at least one reflector of each series being tiltably mounted and adjustable to direct the reflected beam and image onto the screen, said tiltable reflectors being relatively adjustable to position the respective images of the two score records in separate areas of the screen horizontally aligned in side by side relation thereon.

4. In combination, a substantially vertical screen, an approximately horizontal light transmitting desk panel subdivided into an upper area and a lower area mounted at a distance from said screen with said upper area nearer the screen than the lower area, and means for projecting separate images of said areas in horizontally aligned, side by side relation on the screen comprising illuminating means below the panel providing two separate lights beams both directed upwardly through said areas respectively, a pair of oppositely inclined reflectors mounted above the two areas of the panel respectively, each intercepting the vertical beam from one of said areas and registering an image of said area, said reflectors casting said beams and images laterally in opposite directions, a pair of objective lenses disposed respectively opposite said reflectors in position to receive the respective beams and images therefrom and to project the same horizontally, a second pair of reflectors each intersecting the axis of one of said lenses and inclined to direct the beam and image therefrom vertically, and a third pair of reflectors disposed respectively in vertical alignment with the reflectors of the second pair and both inclined toward the screen at substantially the same angle thereto but with the perpendiculars from their reflecting faces at a slight angle to each other sufficient to direct the reflected beams divergently toward the screen insuring complete lateral separation of the images of said upper and lower areas projected in side by side relation on the screen.

5. In the combination defined in claim 4, pivotal supporting means for the reflectors of the second and third pairs upon which each of said reflectors is tiltably adjustable to vary its inclination for accurately locating the projected images as desired upon the screen.

6. In combination, a substantially vertical screen, a light transmitting panel subdivided into an upper area and a lower area mounted at a distance from said screen, and an optical system for projecting separate images of said areas in horizontally aligned, side by side relation on the screen comprising a light source at one side of the panel, a condenser system directing the light toward said panel, a pair of split lenses positioned between the condenser system and the panel and respectively adjacent said two areas of the panel to direct separate beams of light through said areas respectively, separate objective lenses mounted at the other side of said panel and arranged to receive the respective beams and to transmit images of the upper and lower areas respectively, together with pivotally mounted and adjustable reflectors juxtaposed adjacent each respective objective lens adjusted to cast separate reflections of the images registered on the objectives from the two panel areas upon the screen in side by side relation.

7. In combination, a substantially vertical screen, an approximately horizontal light transmitting desk panel subdivided into an upper area and a lower area mounted at a distance from said screen with said upper area nearer the screen than the lower area, and means for projecting separate images of said areas in horizontally aligned, side by side relation on the screen comprising illuminating means below the panel providing two separate light beams both directed upwardly through said areas respectively, a casing mounted above said panel and having an opening positioned to admit said beams, a pair of oppositely inclined reflectors in the casing disposed over different portions of said opening in position to receive said beams respectively, a pair of objective lenses in the casing, each opposite one of said reflectors in position to receive and transmit the beam from one of said areas together with an image of said area, a second pair of inclined reflectors in the casing pivotally adjustable to vary their inclination and disposed respectively opposite said objective lenses, and a third pair of reflectors in the casing inclined toward said screen and disposed respectively opposite the reflectors of the second pair, said third pair of reflectors being adjusted to receive the light beams and images transmitted to the second pair and reflected therefrom respectively and to project separate images of said upper and lower areas of the panel onto said screen in side by side relation.

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