

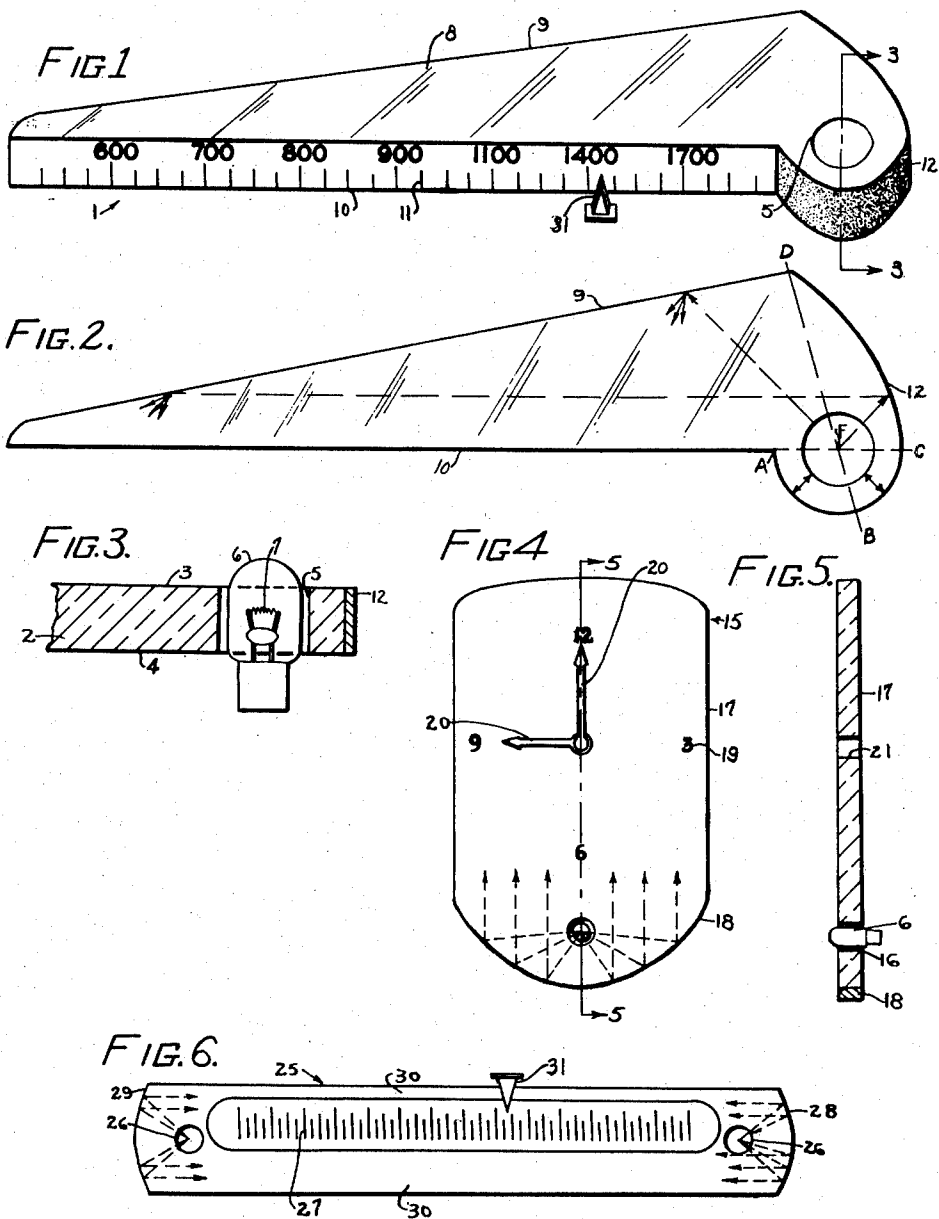
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G. F. PRIDEAUX ET AL

2,561,885

ILLUMINATED DIAL

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ILLUMINATED DIAL

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9 Claims. (Cl. 40-130)

1 Our invention relates to illuminated devices, such as signs, dials or the like, comprising a light transmitting member having a plane surface which totally reflects light traveling in the member and incident on the surface at angles exceeding the critical angle. A common device of this kind is a sign comprising a sheet or plate of glass having plane polished surfaces with indicia etched or sand blasted into one of the surfaces. A lamp is mounted adjacent the edge of the glass sheet and light travels from the lamp through the glass to the indicia where it is refracted and reflected outward. The indicia appear luminous and of good visibility.

The principal object of our invention is to increase the efficiency and the effectiveness of such devices. Further objects and advantages of our invention will appear from the following detailed description of species thereof and from the appended claims.

In the drawing accompanying and forming part of this specification species of our invention are shown in which Fig. 1 is a perspective view of an illuminated dial embodying our invention; Fig. 2 is a top plan view of the dial shown in Fig. 1 the path of light therein being indicated by arrows; Fig. 3 is a fragmentary, enlarged, partly sectional view along the line 3-3 of Fig. 1 and showing the lamp in full; Fig. 4 is a front elevational view of another illuminated dial embodying our invention; Fig. 5 is a sectional view along the line 5-5 of Fig. 4, and Fig. 6 is a front elevational view of still another illuminated dial embodying our invention.

Referring to Figs. 1, 2 and 3 of the drawing the illuminated dial 1 comprises a pellucid plate-like member in the form of a flat slab 2 of transparent material, such as glass or an organic plastic, having plane polished top and bottom surfaces 3 and 4 (Fig. 3) which totally reflect light traveling in the slab 2 and incident on the surfaces at angles greater than the critical angle. A lamp-accommodating, cylindrical aperture or opening 5 extends through the slab 2 and an incandescent lamp 6 may be disposed in the opening 5 with its filament 7 surrounded by the surface of the slab defining the opening 5 (Fig. 3). Thus, light from the lamp 6 enters the slab 2 directly throughout the full 360 degree angle subtended by the cylindrical opening 5. Some

2 of the light travels directly to a wedge-shaped portion 8 (Fig. 2) of the slab 2 and is incident on the straight back face or edge 9 of the wedge portion 8 which face has a matte surface and is diffusely reflecting. The front face or edge 10 of the wedge portion 8 is clear and polished and has opaque indicia in the form of calibrations and numerals which may be painted on the face 10. These constitute a scale 11 which is silhouetted against the illuminated back face 9 when the dial 1 is viewed from the front. The wedge portion 8 may be called the indicia-bearing section of the dial 1.

The diffusely reflecting back face 9 is also 15 illuminated by reflected light which substantially increases its brightness. Some of the light emitted by the lamp 6 travels toward the convex edge of the slab 2 joining the front and back faces or edges 9 and 10. This joining edge is well 20 polished and then covered by material of high reflection factor, such as silver or aluminum applied in the usual manner, which constitutes a concave specular reflector 12 for incident light from the lamp 6. The thickness of the reflecting 25 coating has been greatly exaggerated in Fig. 3 of the drawing for clarity of illustration.

The contour of the convex joining edge and the spacing of the said edge with respect to the lamp-accommodating opening 5 is such that, as 30 shown in Fig. 2, the reflector 12 has a circular section A-C and a parabolic section C-D having a common focal point F which coincides with the center of the opening 5. The focal length of the parabolic section C-D is equal to the radius of the circular section A-C and the lamp 6 is 35 mounted in the opening 5 with its filament 7 at the common focal point F of the reflector sections A-C and C-D. Light from the filament 7 incident on the portion A-B of the circular reflector section is reflected back toward the filament 7 and is incident on the parabolic section C-D which directs this light and the direct light from the filament 7 also incident on its surface 40 toward the diffusely reflecting, back face 9 of the wedge shaped portion 8, as shown by the arrows. Light from the filament 7 incident on the portion B-C of the circular reflector section is reflected back toward the filament 7 and also 45 illuminates the back face 9 of the wedge portion 8.

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The back face 9 of the wedge portion 8 is thus uniformly and intensely illuminated by both direct and reflected light from the lamp filament 7. It is of high brightness and is visible through the front face 10 of the dial for clearly silhouetting the scale and the numerals 11. The illuminated back face 9 also creates an appearance of depth which is attractive and distinctive.

The usual opaque indicating needle 31 of the dial is silhouetted against the bright back face 9 of the wedge 8. The needle and the markings on the front face 10 of the dial may be light transmitting instead of opaque to appear luminous in contrasting brightness or color against the luminous background provided by the back face 9. For example, a colored, light transmitting paint may be used for the markings. An organic plastic slab such as a slab of methyl methacrylate, may have markings consisting of solid material molded into the slab. The markings may be etched or sand-blasted into the slab 2. The back face 9 of the wedge may be made specularly reflecting and the front face 10 light diffusing so that the front face 10 serves as the source of brightness for silhouetting or providing a contrasting surface for the dial markings. Preferably, the front face 10 is in a common plane with the contiguous edge of the circular reflector section A—C and the filament 7 so that light from the filament does not come directly out of the said face.

In mounting the dial 1 in a radio cabinet or the like its front face 10 may be exposed to view and the remainder of the dial may be concealed by panels, shields or the like on the cabinet. The socket for the lamp 6 may be mounted in a readily accessible location outside the cabinet and concealed by a readily removable panel for facilitating lamp replacements.

The clock dial 15 shown in Figs. 4 and 5 of the drawing is similar to the dial shown in Figs. 1 to 3 in that a lamp-accommodating aperture or opening 16 is provided in a transparent glass or organic plastic plate 17 so that light from the lamp 6 enters the plate within the full 360 degree angle subtended by the opening 16 and a reflector 18 is provided for some of the light from the lamp 6 to increase the amount and uniformity of illumination on the dial figures. The clock dial face is constituted by the customary numerals 19 sand blasted or etched in the usual manner into the upper portion of one surface of the plate 17 which portion is the indicia-bearing section of the dial. The front and back surfaces of the plate 17 are polished so as to totally reflect light from the lamp 6 travelling in the plate and incident on said surfaces at angles exceeding the critical angle. The plate is slightly elongated and the edges thereof are polished and covered with a reflecting metal. The contour of the convex edge on the side of the opening 16 away from the numerals and its position relative to the lamp-accommodating opening 16 is such that the reflecting material thereon constitutes a parabolic reflector 18 having its focal point coincident with the center of the said opening 16. The lamp 6 is mounted with its filament at the focal point. Thus, light from the lamp 6 travelling in the plate 17 and incident on the reflector 18 is directed toward the portion of the plate having the recessed numerals 19, as shown by the broken lines. The incised numerals 19 intercept and refract light outward and appear brightly luminous when illuminated by both the direct and the reflected light in the plate.

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The clock hands 20 are silhouetted against the plate 17 which has an opening 21 (Fig. 5) for accommodating the usual supporting and turning means for the hands. The lamp 6 and the lower portion of the plate 17 may be concealed by the clock casing in which the dial is mounted.

The dial 25 shown in Fig. 6 of the drawing is similar to that shown in Figs. 4 and 5 and the plate-like member is in the form of an elongated, transparent strip having lamp-accommodating openings 26 adjacent its ends and a scale 27 etched or sand blasted into the surface of the strip between the openings to constitute the dial face. The convex end edges 28 and 29 of the strip have the same configuration, the same spacing with respect to the adjacent openings 26 and are covered with the same reflecting material which serves the same purpose as the reflector on the lower edge of the clock dial of Figs. 4 and 5. The area surrounding the scale 27 may be provided with an opaque covering 30, such as an opaque paint. The illuminated dial 25 is useful for radio cabinets and the like and may be curved slightly to follow the contour of slightly rounded cabinet surfaces. The usual indicating needle 31 may be mounted in front of the scale 27 and may be opaque so as to be silhouetted against the luminous background provided by the scale 27.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. An illuminated device of the class described comprising a plate-like member of light-transmitting material having two smooth flat substantially parallel surfaces, an aperture therein normal to said flat surfaces and spaced from the edges of said member, and a light-source in said aperture, an edge of said member being parabolic in part and circular in part with said parts joining each other at the vertex of the parabolic part, the radius of the circular part being equal to the distance between the focus and the vertex of the parabolic part and the center of the circular part coinciding with the focus of the parabolic part at the center of said aperture, both of said edge parts having thereon a reflector for receiving and redirecting light from said source within said member, the flat surfaces of the portion of said member between said aperture and the said edge parts reflecting light received from said source at angles greater than the critical angle to increase the amount of light incident on and reflected back into said member by the reflector on said edge parts.

2. An illuminated device of the class described comprising a plate-like member of light-transmitting material having two smooth flat substantially parallel surfaces, a wedge-shaped portion with diverging front and back edges with a light diffusing reflector on the back edge and light absorbing material in the form of indicia on the front edge which constitutes the face of the device, another portion of said member having an aperture therein normal to said flat surfaces, a light source in said aperture, said portion having also an edge spaced from the aperture and which is parabolic in part and circular in part with the said parts joining each other at the vertex of the parabolic part and with the radius of the circular part being equal to the distance between the focus and the vertex of the parabolic part and the center of the circular part coinciding with the focus of the parabolic part at the center of said aperture, said last named edge having thereon a reflecting surface for receiving and redirecting light from said source within said member to in-

crease the illumination of the diffusing reflector, the flat surfaces of the portion of said member between said aperture and the said last-named edge reflecting light received from said source at angles greater than the critical angle to increase the amount of light incident on and reflected back into said member by the reflecting surface on said last-named edge to increase the efficiency of said device.

3. An illuminated device of the class described comprising a plate-like member of light-transmitting material having two smooth flat substantially parallel surfaces, an aperture therein normal to said surfaces and spaced from the edges of said member, and a light source in said aperture, an edge of said member being convex and having thereon a light concentrating reflecting surface having its focus at said aperture and redirecting light from said source within said member, the flat surfaces of the portion of said member between said aperture and said convex edge reflecting light received from said source at angles greater than the critical angle to increase the amount of light incident on and reflected back into said member by the reflecting surface on said convex edge to increase the efficiency of said device, a surface of the said member having recesses in the form of indicia in the path of the redirected light for intercepting light within said member and outwardly refracting the intercepted light.

4. An illuminated device of the class described comprising a plate-like member of light-transmitting material having two smooth flat substantially parallel surfaces, an aperture therein normal to said surfaces and spaced from the edges of said member, and a light source in said aperture, an edge of said member being parabolic and having thereon a reflecting surface having its focus at said aperture and redirecting light from said source within said member, the flat surfaces of the portion of said member between said aperture and said parabolic edge reflecting light received from said source at angles greater than the critical angle to increase the amount of light incident on and reflected back into said member by the reflecting surface on said parabolic edge to increase the efficiency of said device, a surface of the said member having recesses in the form of indicia in the path of the redirected light for intercepting light within said member and outwardly refracting the intercepted light.

5. An illuminated device of the class described comprising a strip of light-transmitting material having two smooth flat substantially parallel surfaces, an aperture therein normal to said surfaces, spaced from the edges of the strip and adjacent one of its ends, and a light source in said aperture, the edge of the said end being convex and having thereon a light concentrating reflecting surface having its focus at said aperture and redirecting light from said source within said member, the flat surfaces of the portion of said strip between said aperture and said convex edge reflecting light received from said source at angles greater than the critical angle to increase the amount of light incident on and reflected back into said strip by the reflecting surface on said convex edge to increase the efficiency of said device, a surface of the strip having recesses in the form of indicia in the path of the redirected light for intercepting light within said member and outwardly refracting the intercepted light.

6. An illuminated device of the class described comprising a strip of light-transmitting material

having two smooth flat substantially parallel surfaces, an aperture therein normal to said surfaces, spaced from the edges of the strip and adjacent one of its ends, and a light source in said aperture, the edge of the said end being parabolic and having thereon a reflecting surface having its focus at said aperture and redirecting light from said source within said member, the flat surfaces of the portion of said strip between said aperture and said parabolic edge reflecting light received from said source at angles greater than the critical angle to increase the amount of light incident on and reflected back into said strip by the reflecting surface on said parabolic edge to increase the efficiency of said device, a surface of the strip having recesses in the form of indicia in the path of the redirected light for intercepting light within said member and outwardly refracting the intercepted light.

7. An illuminated device of the class described comprising a plate-like member of light-transmitting material having two smooth flat substantially parallel surfaces, an aperture therein normal to said surfaces and spaced from the edges of said member, a light source in said aperture, an edge of said member being convex and having thereon a light-concentrating reflector having its focus within said aperture and redirecting light from said source within said member, the flat surfaces of the portion of said member between said aperture and said convex edge reflecting light received from said source at angles greater than the critical angle to increase the amount of light incident on and reflected back into said member by the reflector on said convex edge to increase the efficiency of said device, another edge of said member being light-transmitting and bearing indicia to constitute the face of said device.

8. An illuminated device of the class described comprising a plate-like member of light-transmitting material having two smooth flat substantially parallel surfaces, an aperture therein normal to said surfaces and spaced from the edges of said member, a light source in said aperture, an edge of said member being convex and having thereon a light-concentrating reflecting surface having its focus at said aperture and redirecting light from said source within said member, the flat surfaces of the portion of said member between said aperture and said convex edge reflecting light received from said source at angles greater than the critical angle to increase the amount of light incident on and reflected back into said member by the reflector on said convex edge to increase the efficiency of said device, another edge of said member being light-transmitting and bearing indicia to constitute the face of said device, a third edge of said member being behind said face and in the path of the reflected light from said first-named edge and from said source and being provided with a reflector to direct light toward said face.

9. An illuminating device of the class described comprising a plate-like member of light-transmitting material having two smooth flat substantially parallel surfaces, an aperture therein normal to said surfaces and spaced from the edges of said member, and a light source in said aperture, an edge of said member being convex and having thereon a light-concentrating reflecting surface having its focus at said aperture, the flat surfaces of the portion of said member between said aperture and said convex edge reflecting light received from said source at angles of incidence greater than the critical angle to increase

the amount of light incident on and reflected back into the member by the reflecting surface on said edge to increase the efficiency of said device.

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Certificate of Correction

Patent No. 2,561,885

July 24, 1951

GWILYM F. PRIDEAUX ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 6, line 38, for "fact" read *face*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of January, A. D. 1952.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.