W. H. SPENCER & H. C. STORM.

ILLUMINATED SIGN.

APPLICATION FILED JUNE 13, 1914.

1,146,361.

Patented July 13, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

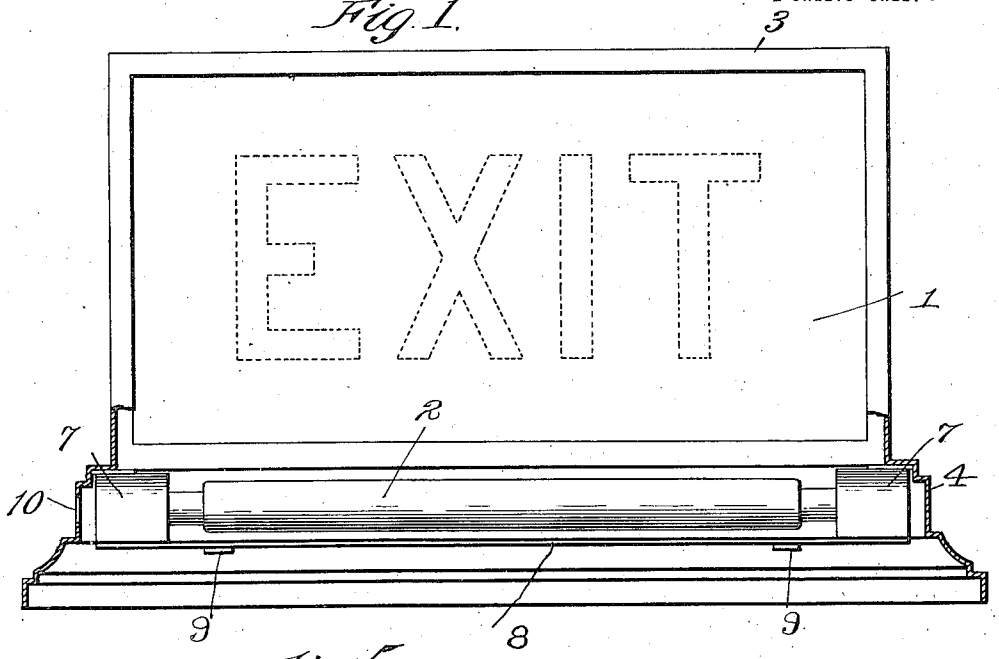
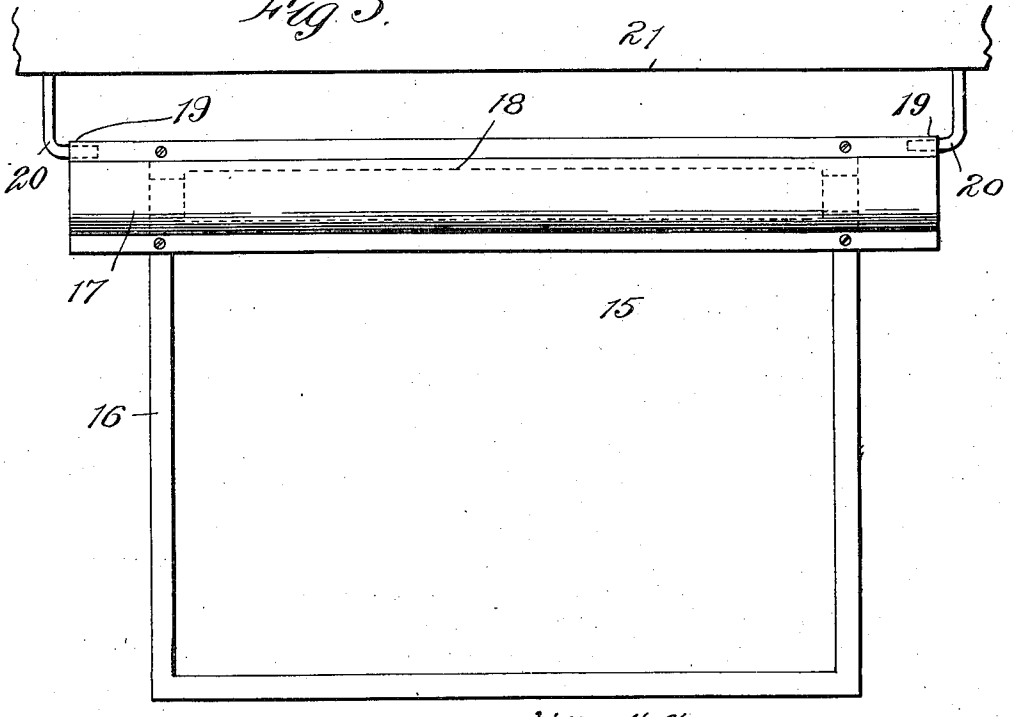


Fig. 5.



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2 SHEETS—SHEET 2.

Fig. 2.

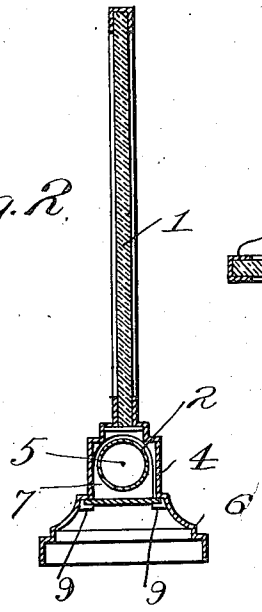


Fig. 4.

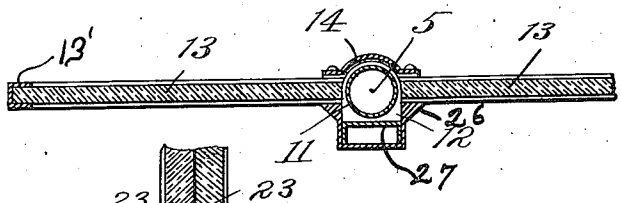


Fig. 6.

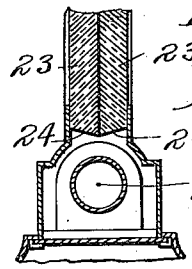
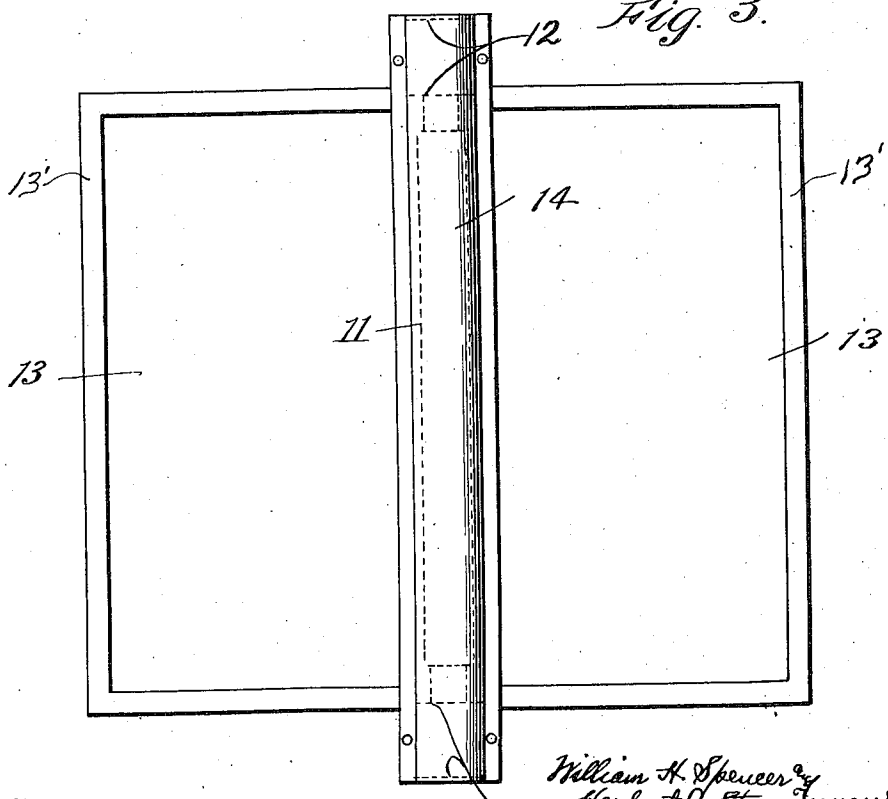


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ILLUMINATED SIGN.

1,146,361. Specification of Letters Patent. Patented July 13, 1915.

Application filed June 13, 1914. Serial No. 844,945.

To all whom it may concern:

Be it known that we, WILLIAM H. SPENCER and HERBERT C. STORM, citizens of the United States, and residing at the borough of Manhattan, city, county, and State of New York, and Ridgefield Park, county of Bergen, and State of New Jersey, respectively, have invented certain new and useful Improvements in Illuminated Signs, of which the following is a full and clear specification.

This invention relates to the illuminating of glass surfaces which may be used for illuminated signs or decorative forms of illumination and in the embodiment shown on the drawings, consists essentially of a sheet of glass with substantially parallel faces, the light source being placed at one or more edges of the sheet of glass instead of being placed, as is usually done, either in front of the sheet or in back of it.

It is well known that when light rays exist in a relatively dense optical medium, such as glass, which is surrounded by a relatively rare optical medium, such as air, these light rays will, when striking on the surface of separation between the two media at an angle with the surfaces of separation less than what is known as the critical angle, be totally reflected back into the denser medium. It is possible then to form the denser medium between two properly related surfaces which, as in the case of a sheet of glass would be substantially parallel, and to cause the light rays to enter the medium at a portion of its surface in such a way that when they are refracted at this surface into the medium they will then be transmitted through the medium in such direction that they will strike the interior surface of the medium at an angle less than the critical angle. They will then be totally reflected and travel off through this medium until they strike the opposite surface where they will again be totally reflected. By this series of reflections it is possible to cause the light rays to travel through the medium and practically none of them will escape into the rarer surrounding medium. If, however, any portion of the surface of the dense medium is treated by sandblasting or acid etching so as to destroy the regularity of its surface, the angles of the surface on the projections and irregularities caused by this treatment will be such that the light rays will strike against this surface at more than the critical angle, in which case they will be refracted out into the rarer medium.

If a sheet of glass with substantially parallel surfaces has cut, etched or sand-blasted upon it figures or designs and light rays from a suitable light source are caused to enter this sheet of glass through its edges in such a way that they will be totally reflected from the surface of the glass in the manner above described, then there will be little or no appearance of the existence of the light within the sheet of glass until these rays strike upon the etched portions of the surface when they will be refracted out of the sheet and the etched portions will appear brilliantly luminous.

One of the objects of this invention is to provide an improved construction for putting the above mentioned interrelated principles of reflection and refraction of light to practical use.

One of the important requirements of this construction is that the portion of the surface of this dense optical medium such as the edge of a sheet of glass, upon which the light rays from the light source are received, be of such shape with relation to the distribution of light emitted by the light source that when the rays of light so emitted strike this portion of the surface, they will be refracted into the dense medium, entering it in such a direction that as much of the light as possible will strike the interior surfaces of the medium at less than the critical angle and so be totally reflected. In order to apply this construction to sheets of glass it is preferable that the light source be in the form of a line such as an incandescent lamp with a straight line filament and that this filament be located parallel to the edge of the sheet and with proper relation to the surface of this edge for the purposes above described. But it should be understood that it is not necessary to use a line source of light and that this invention is not confined to the devices in which line sources only are used. Thus it is possible to cause the light rays to enter a sheet of glass at the central point of the sheet from a point source of light such as an incandescent lamp having a concentrated filament placed near to one side of the sheet, the center of the sheet on the same side as the light source being so formed that the rays of light emitted by the

source will strike upon this surface and being refracted into the sheet in the manner above described. Numerous other arrangements are possible but it is not essential to describe them for the purpose of this application.

Other and further objects will appear in the specification and claims, reference being had to the accompanying drawings, in which,—

Figure 1 is a side elevation of one embodiment of our invention, in which the source of light is a straight line parallel to one edge of a relatively dense medium such as glass, parts being broken away and parts shown in section; Fig. 2 is a transverse vertical section midway of the length of Fig. 1; Fig. 3 is a plan view of another embodiment; Fig. 4 is a transverse section midway of the length of Fig. 3 parts being broken away; Fig. 5 is a side elevation of another embodiment; Fig. 6 is a middle transverse vertical section of another embodiment of my invention in which a sign may be provided with illuminated characters on oppositely presented faces thereof parts being broken away.

In the embodiment of our invention shown in Figs. 1 and 2, a light transmitting body or plate 1 is mounted in suitable relation to a light source 2 so that the light flux from said source will enter the plate through one edge thereof. While we have shown a plate with a light source along one edge thereof, it will be apparent that when large sized plates are employed or if for any other reason, an increased illumination is desired, light sources can be readily provided along any or all of the edges, thus providing an increased illumination by the same principle of light transmission.

As shown in Fig. 2, the oppositely disposed surfaces of the plate 1 are substantially parallel, one of said surfaces being adapted to have applied thereto the characters which are to be displayed when the surface is illuminated, such for example as the word "Exit" formed by roughing portions of said surface, and the other surface being preferably provided with a backing for reflecting the light flux which falls thereon over to the first mentioned surface.

Simple and efficient means for retaining the plate 1 and lamp 2 in their proper relative positions, may be provided by a frame 3 which borders the plate 1 and is secured to an elongated housing 4 within which the lamp 2 is mounted. In its preferred form, the light source comprises the incandescent tube shown in Figs. 1 and 2 within which is mounted an elongated filament 5, the light flux therefrom entering the plate 1 through one edge. If desired, the housing 4 can be provided with an enlarged base. The opposite ends of lamp 2 are mounted in sockets 7 which are preferably carried by a base plate 8. The base plate 8 is retained in position to hold the lamp 2 in proper position within the housing 4 by means of lugs 9, which may be straightened out to permit the removal of lamp 2 on its base 8 in case a renewal of any part thereof becomes necessary. In one end of the housing 4 is an opening 10 through which the wires for energizing the lamp may be passed, or said wires may be passed through any suitable spaces provided anywhere in the wall of the housing.

In the embodiment shown in Figs. 3 and 4, the lamp 11 is mounted within a housing comprising frames 13′, 13′, a base frame 26 which rigidly connects the frames 13′, 13′, a removable base 27 which serves to support the lamp 11, by means of sockets 12, and a removable cover plate 14. The adjacently disposed edge of the frames 13′, 13′ are provided with longitudinal slots, said slots being arranged diametrically opposite to each other to receive the edges of the transparent plates 13. The base 27 is then positioned to hold the lamp 11 in suitable position to have the light flux therefrom enter through their edges. In this embodiment, the removable cap 14 permits access to the interior of housing 12 without removing the lamp base 27.

In the embodiment shown in Fig. 5, the transparent plate 15 is mounted in a frame 16 which depends from a housing 17 within which the lamp 18 is mounted in a manner similar to that already pointed out in the other embodiments. Said housing 17 in this embodiment is provided with tubular sockets 19 to adapt the sign to be pivoted on rods 20 which is suspended from any suitable support 21.

Referring now to Fig. 6, a line filament 22 of an incandescent lamp is disposed substantially in the contacting plane of two plates 23 of glass or other suitable light-transmitting medium, said plates being arranged back to back and preferably having their adjacently disposed surfaces silvered or otherwise rendered good reflecting surfaces. Said plates are adapted to receive suitable characters on their outwardly presented surfaces so that when the filament 22 is energized, the light flux therefrom will be refracted in passing the inclined edge faces 24 of the plates and in such manner as to strike the adjacently arranged reflecting surfaces of both plates to totally reflect such light flux onto the outwardly presented surfaces which carry the display characters. If desired, the lamp embodying filament 22 can be constructed similar to that shown in Figs. 1 and 2, *i. e.* removably mounted in a base or standard 25 which is adapted to rest upon any suitable surface or support.

In whatever form our device is embodied, including those shown and described, when

light sources are not disposed along all edges, those edges are silvered or otherwise suitably treated to render them good reflectors so that the light flux which reaches those edges after passing entirely through the plate from one edge to the other, is turned back into the plate again, thus confining its outlet to the surface or surfaces to be illuminated.

Obviously, various changes in the details of construction can be embodied in a device of this character without departing from the broad spirit of our invention.

We claim:

1. In an illuminated sign, a frame for holding a transparent plate, said frame being provided with a slot corresponding to one edge of said plate, a housing extending longitudinally of said slot, said housing being provided with a removable wall extending from one end of said housing to the other, and a lamp in said housing and provided with terminals adjacent opposite ends of said housing.

2. In an illuminated sign, an elongated housing, a line filament lamp within said housing, sockets for said lamp fitting and closing the ends of said housing, said housing being provided with a longitudinal slot, and a sign bearing plate having an edge in said slot presented toward said filament.

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