No. 734,020. PATENTED JULY 21, 1903.

F. L. O. WADSWORTH.

ILLUMINATING STRUCTURE.

APPLICATION FILED JULY 28, 1898.

NO MODEL.

Fig. 4.

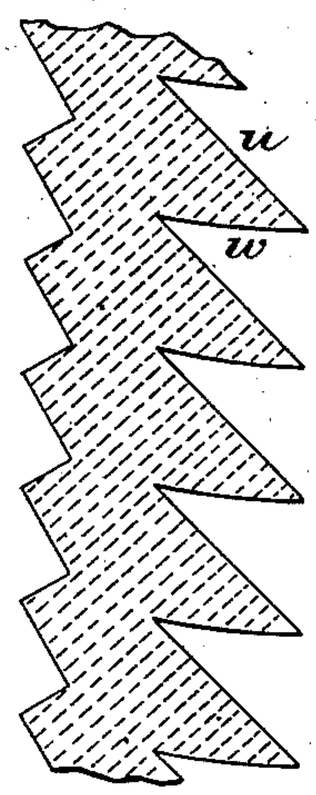


Fig. 1.

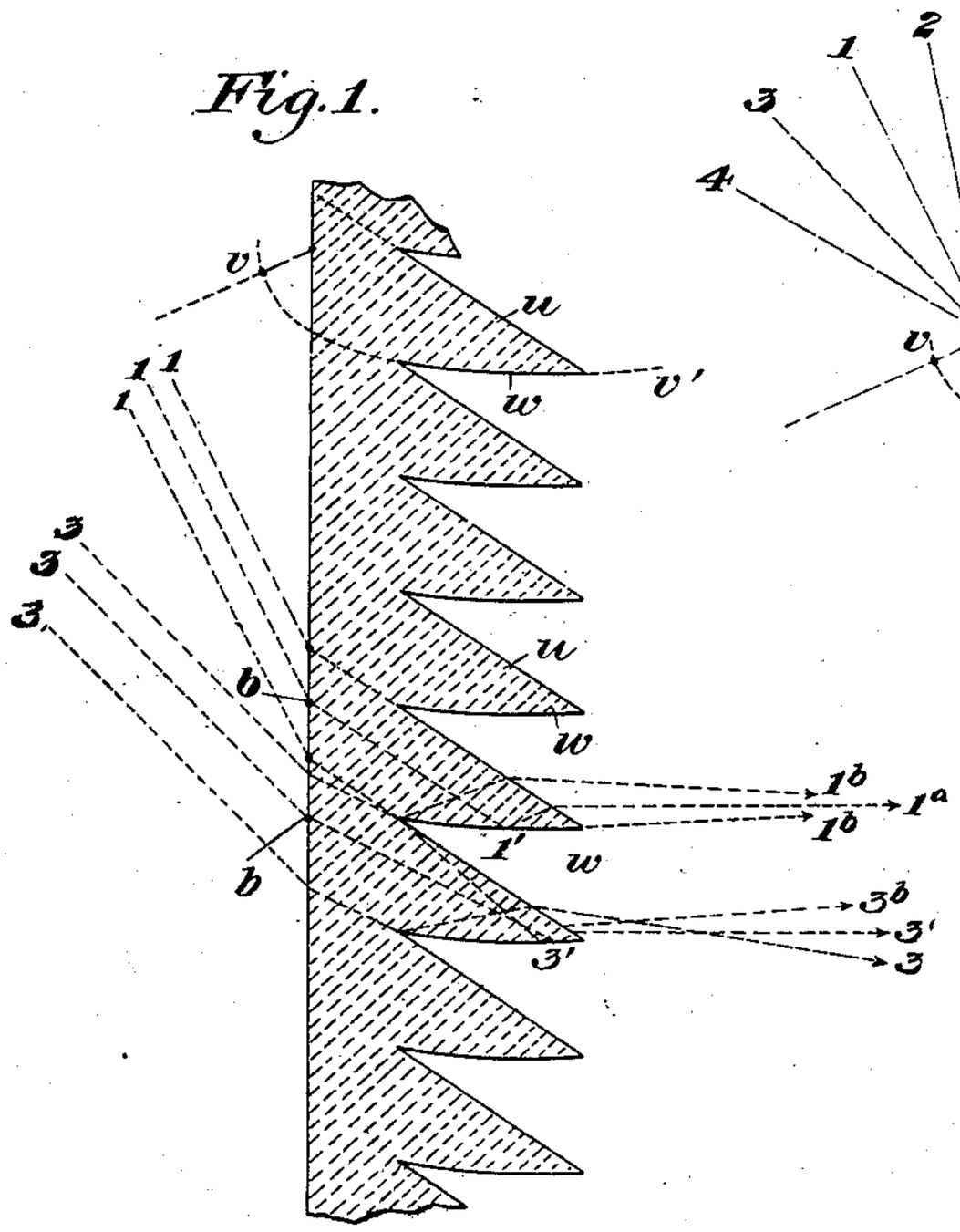


Fig. 2.

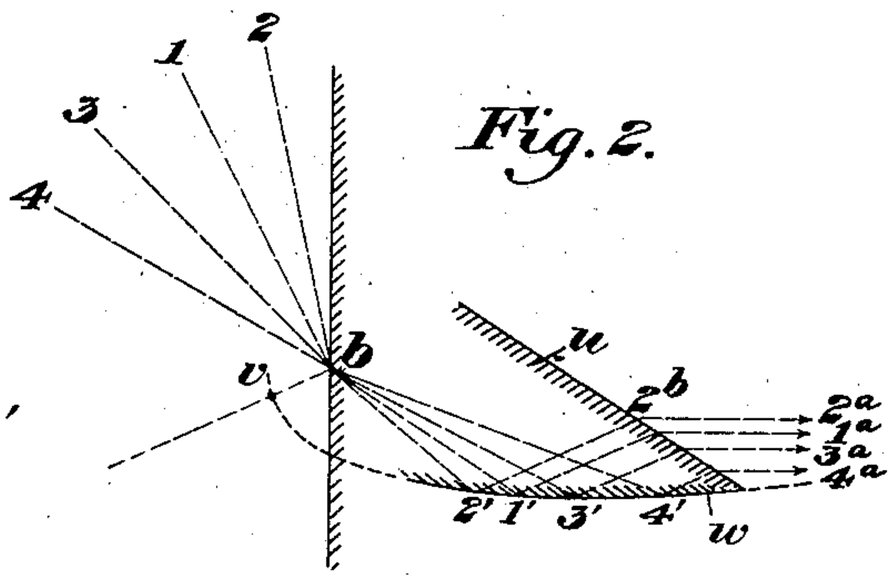
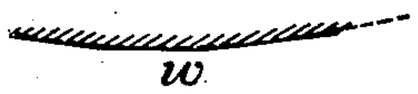


Fig. 3.



WITNESSES

L. A. Innes Jr.
G. B. Blenning

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Frank L. O. Wadsworth
by Bakewell & Bakewell
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No. 734,020. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

FRANK L. O. WADSWORTH, OF WILLIAMS BAY, WISCONSIN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO PRESSED PRISM PLATE GLASS COMPANY, A CORPORATION OF WEST VIRGINIA.

ILLUMINATING STRUCTURE.

SPECIFICATION forming part of Letters Patent No. 734,020, dated July 21, 1903.

Application filed July 28, 1898. Serial No. 687,132. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. O. WADSWORTH, of Williams Bay, in the county of Walworth and State of Wisconsin, have invented a new and useful Improvement in Illuminating Structures, of which the following is a full, clear, and exact description.

My invention relates to illuminating structures; and the object is to secure a form of structure which will be more efficient in collecting and directing into the room a larger proportion of the light from the outside than is ordinarily obtained. The means and method of securing this result are fully illustrated in the accompanying drawings, in which—

Figure 1 represents in cross-section my improved structure. Fig. 2 is a diagram. Figs. 3 and 4 are modifications.

In many cases it is desirable that all the light collected by a prism structure from outside be sent into the room in practically one direction. In order to secure this result, as shown in Fig. 2, I take advantage of the fact that those rays, such as 2, coming from directions more nearly vertical than the principal direction 1 strike the deflecting-faces *w* of the prism elements at points 2′ inside of that at which the principal rays strike, while rays coming from the more nearly horizontal directions 3 and 4 strike these elements at points 3′ 4′ outside of the point 1′. It is therefore possible to shape the deflecting-faces *w* of the prism elements *a* in such a way that the different rays $b^{1'}$ $b^{2'}$ $b^{3'}$ b^{4} are each and all reflected at the face *w* in the same direction, as in Fig. 2. I have discovered that the form of surface necessary to secure this result is a parabola, of which the focal point lies at the point *b* on the receiving-face of the prism elements and the vertex *v* of which lies on a line passing through the focal point *b* and parallel to the lines 2′ 2^{b}, along which the rays falling on the face *w* are reflected. When the surface *w* of the prism element is so shaped, all of the rays passing through the point *b* on the front surface of the illuminating structure are reflected from *w* in the same direction, and consequently all emerge from the face *u* of the prism element in the same direction into the room, as at 1^{a} 2^{a} 3^{a} 4^{a}, Fig. 2, no matter what may be the direction of the light incident on the structure.

In order to secure the result desired, it is not necessary that the surfaces *w* should be continuously curved. They may be made up of a series of flat faces which are tangent planes to the parabolic surface, as in Fig. 3.

In forming an illuminating structure a series of prism elements are usually united either by being made integral in one piece or by being placed together in close proximity to each other, each of these elements having curved lower faces *w*, laid out as already described, and a second series of flat faces *u u*, which in general are preferably made parallel to the direction $b^{1'}$ which the principal rays take after refraction at the front surface of the prismatic structure. These prismatic elements generally extend transversely across the entire width of the illuminating structure, and the lower curved surfaces *w*, each of which corresponds in cross-section to a portion of the parabolic curve, as just described, thus become as a whole portions of parabolic cylinders of which the vertices are lines parallel with and in front of the front surface of the structure.

It is of course evident that all of the rays of light which fall on the front surface of the structure do not pass through the points *b b* which are opposite the center of each prism element. Consequently the whole bundle of rays from any one direction, such as the bundle 1 1 1 or 3 3 3, Fig. 1, does not fall on that part of the deflecting-faces *w* which is inclined at the right angle to reflect them in the proper direction. If, however, the points *b* are so located that the central ray of each bundle strikes at the proper points of the faces *w w*, the other rays on each side of this central one will strike at such points that they will be converged along the direction 1^{a}, as at 1^{b} 1^{b}, so that the main direction of the whole bundle is that desired.

By making the deflecting-faces *w* of the prism elements portions of parabolic cylin-

ders laid out as above described I am enabled to collect from the outside rays coming from many different directions and direct them all into the room in substantially the same direction, securing thus a much greater illuminating effect at any desired point than is possible with prismatic structures whose elements have plain surfaces.

My invention as illustrated in Fig. 4 is like Fig. 1, except that the receiving-surface of the glass instead of being plain is ribbed or corrugated.

I am aware that prism elements have been formed with curved surfaces heretofore; but the nature of these surfaces has not been accurately determined and made such as to secure the result desired.

My invention, which consists in the use of a prism having curved surfaces of defined and definite curvature, may be applied not only to cases in which such curved surface is an internally-reflecting surface, as illustrated in the drawings of this specification, but also to cases where such curved surface is a refracting-surface. In an application filed by me this date, Serial No. 687,134, I illustrated the application of my invention to a refracting-surface as last mentioned.

I claim—

1. An illuminating prism-plate with a series of prism elements each having a one flat face and one internally-reflecting face, the latter curved to correspond in cross-section to a parabolic curve of which the focal point lies in the front face of the prism element; substantially as described.

2. An illuminating prism-plate having on one side a receiving-face and on the other side a series of curved internal-reflecting faces curved to correspond to parabolic cylinders whose focal lines lie in the receiving-face and whose vertices lie in front of said face; substantially as described.

3. An illuminating prism-plate having on one side a receiving-surface and on the other side a series of plane refracting-faces u, and a series of reflecting-faces w, the latter being curved to correspond in transverse cross-section to a parabolic curve whose focal point lies at b on the receiving side of the plate and whose vertex lies at v on a line passing through the point b and parallel to the rays reflected from the parabolic face w; substantially as described.

4. An illuminating prism-plate having a series of prism-faces curved to correspond to portions of parabolic cylinders with the focal lines of these cylinders on the receiving-surface of the plate, and so disposed and adapted as to direct in one direction all rays falling on the receiving side of the plate at the focal lines; substantially as described.

In testimony whereof I have hereunto set my hand.

FRANK L. O. WADSWORTH.

Witnesses:

C. BYRNES,

G. I. HOLDSHIP.