

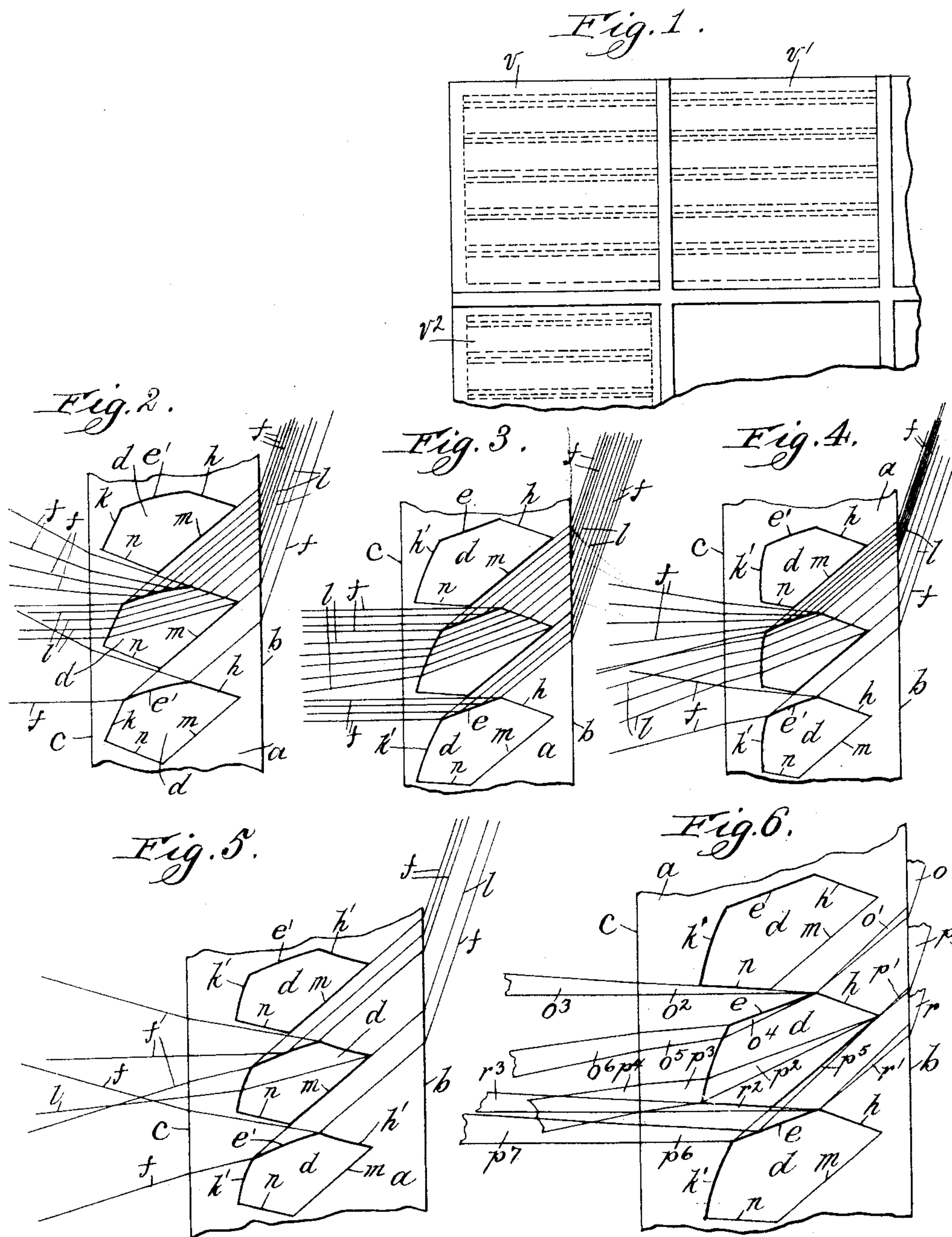
No. 607,792.

Patented July 19, 1898.

O. E. WINGER.
WINDOW PANE OR LIGHT.

(Application filed Oct. 15, 1897.)

(No Model.)



Witnesses:

W. J. Jacker,
M. A. Rockford

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UNITED STATES PATENT OFFICE.

OSWALD E. WINGER, OF CHICAGO, ILLINOIS, ASSIGNOR TO RALPH D. SMALL,
OF SAME PLACE.

WINDOW PANE OR LIGHT.

SPECIFICATION forming part of Letters Patent No. 607,792, dated July 19, 1898.

Application filed October 15, 1897. Serial No. 655,341. (No model.)

To all whom it may concern:

Be it known that I, OSWALD E. WINGER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Window Panes or Lights, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a window pane or light, my object being to provide an improved construction of pane or light for changing or deflecting the direction of the light passing therethrough to thereby render the pane more effective in illumination.

My invention relates to a window-pane having substantially parallel opposed faces on the receiving and discharging sides of the pane and having formed in the interior of the pane one or more cavities extending longitudinally into the pane between the substantially parallel receiving and discharging faces, the walls of the cavity constituting light-deflecting surfaces for changing the direction of the rays of light passing through the pane, whereby the rays may be directed into any desired position. In practice I have usually formed the interior cavity so that the walls thereof constitute a reflecting-surface and entering and leaving refracting-surfaces, and the present invention contemplates the formation of one or more of the deflecting-surfaces of the cavity with a curved transverse dimension, whereby the deflected rays are caused to diverge or converge as desired to direct the same into proper paths, as will be more fully described hereinafter.

I have illustrated my invention, in connection with a number of modifications thereof, in the accompanying drawings, in which—

Figure 1 is a face view thereof. Fig. 2 is a view showing the reflecting-surface curved. Fig. 3 is a view showing the leaving-surface of the cavity curved. Fig. 4 is a view showing the reflecting-surface and the leaving refracting-surface of the cavity curved. Fig. 5 is a view showing the reflecting-surface and the entering and leaving refracting-surfaces of the cavity curved. Fig. 6 is a view show-

ing the manner in which the pencils of light determine the form of the cavity.

Like letters refer to like parts in the several figures.

As illustrated in Fig. 1, the pane *a* has a light-receiving surface *b* and a light-discharging surface *c*, arranged opposite and running substantially parallel with the light-receiving surface. Within the pane, between the said substantially parallel surfaces *a b*, are provided a series of cavities *d d d*. The wall of each cavity is constructed to constitute a reflecting-surface *e'*, which acts to deflect the rays striking the same by reflection. Thus the rays *f f* enter the receiving-surface of the pane, are refracted, strike the reflecting-surfaces *e' e'*, and are deflected, and in passing from the pane through the discharging-surface are again refracted unless, as in the present case, the rays pass through the discharging-surface at right angles thereto.

The cavities each has its wall so constructed as to also constitute a refracting-surface *h*, through which some of the rays pass and are refracted, and also a refracting-surface *k*, through which the rays pass after traversing the cavity, being again refracted. Thus the rays *l l* enter the receiving-surface *b* of the pane and are refracted, pass through the surface *h* of the cavity, are again refracted, traverse the cavity, pass through the surface *k* of the cavity, are again refracted, and finally pass through the discharging-surface of the pane, being again refracted. The deflection of the rays *l l* is thus accomplished wholly by refraction. I have termed the surface *h* the "entering light-refracting surface" of the cavity and the surface *k* the "leaving light-refracting surface" of the cavity and will hereinafter refer to the same by these terms.

The lower surfaces *m n* of the cavity are preferably not light-deflecting surfaces and may have any desired position, though preferably so arranged as not to conflict with the light-rays reflected from the reflecting-surface of the cavity just beneath, as will be more particularly set forth hereinafter.

In Fig. 2 the reflecting-surface *e'* is illustrated as curved, whereby the parallel rays entering the pane are caused to diverge after

leaving the pane. The refracting-surfaces h and k are shown as plane.

In Fig. 3 the leaving-surface k' of the cavity is illustrated as curved, while the entering-surface h and the reflecting-surface e are plane. Parallel rays pass through the receiving-surface b and the entering-surface h without diffusion and are diffused by the non-planular surface k' .

In Fig. 4 the reflecting-surface e' and the leaving refracting-surface k' are curved, while the entering refracting-surface is plane.

In Fig. 5 all of the deflecting-surfaces are curved—that is, the reflecting-surface e' , the entering-surface of the cavity h' , and the leaving-surface of the cavity k' are curved. By this construction each of the deflecting-surfaces serves to diffuse the light-rays.

When it is desired to cause the rays acted upon by one of the deflecting-surfaces to diverge or converge, the transverse dimension of the deflecting-surface is curved—that is, the dimension of the deflecting-surface which lies in the plane which includes the deflected ray before and after deflection is curved—whereby the angle of deflection will vary throughout the width or transverse dimension of the deflecting-surface. As shown in the drawings, one or more of the deflecting-surfaces may be curved, as desired.

In Fig. 6 I have illustrated the light as entering and passing through the pane in pencils and have shown how the pencils determine the form of the cavity. In the present instance the lowermost ray of the pencil enters the pane at an angle of seventy degrees. The panes are preferably designed for the particular conditions of use, and the principal element in this consideration is the nature of the pencil of light as determined by surrounding objects or buildings which intercept light which would otherwise pass through the pane. Thus in cities, and particularly in the business districts, the lowermost ray of the pencil will be determined by the height of the building across the way. The angle which the lowermost ray passing over the opposite building makes with the pane is the angle which in practice I preferably employ as defining the lowermost ray of the pencil of light which I employ in designing the cavities in the pane. For the purpose of illustration I have chosen this angle as seventy degrees. The pencil of light o is shown as entering the pane, being refracted into the pencil o' , striking the reflecting-surface e and being reflected into the pencil o^2 , and then passing from the pane, being refracted into the pencil o^3 . The portion of the pencil striking the refracting-surface h is refracted into the pencil o^4 and in passing the refracting-surface k is refracted into the pencil o^5 and, finally, into the pencil o^6 . The uppermost ray of the pencil o^4 determines the preferable position for the reflecting-surface, which should be so situated that the uppermost ray of this

pencil o^4 will not strike the reflecting-surface, but will pass through the refracting-surface k . The pencil of light p is refracted into the pencil p' , passes through the refracting-surface h , is refracted into the pencil p^2 , thence into the pencil p^3 , and finally into the pencil p^4 . The portion of the pencil passing just below the end of the refracting-surface h , forming the pencil p^5 , strikes the reflecting-surface e of the next cavity below, is reflected into the pencil p^6 , and then refracted into the pencil p^7 . The lower surface m should coincide with the uppermost ray of the pencil p^5 in order that interference may not result. The extreme upper ray of the pencil p^5 determines the position of the lower surface m of the cavity. The pencil r refracts into the pencil r' , which strikes the extreme rightward end of the reflecting-surface e , and is reflected into the pencil r^2 , which is finally refracted into the pencil r^3 . The uppermost ray of the pencil r^2 determines the position of the surface n of the cavity. The entering-surface h and the leaving-surface k of the cavity may occupy such angular positions relatively as to direct the rays at the desired angle. The lower end of the leaving-surface k should be located at the intersection of the uppermost ray of the pencil r and the lowermost ray of the pencil p^2 .

In practice I preferably form the window light or pane of a number of small panes or lights $v v' v^2$, secured together at the edges by any preferred form of framework, Fig. 1. These smaller panes are each preferably formed in a single and integral piece and are molded of glass, having the interior cavity or cavities extending longitudinally through the pane. These lengthwise cavities may be open at one end, as shown in the pane v , or open at both ends, as shown in pane v' , or sealed at both ends, as shown in pane v^2 . The receiving and discharging surfaces of the pane are illustrated herein as plane surfaces; but they may have other form, as desired, without departing from my invention.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, a pane formed of a single and integral piece of transparent material, as glass, having formed therein and inclosed between the light-receiving and light-discharging surfaces one or more interior cavities, the walls of which are constructed to form curved light-reflecting and curved entering and leaving light-refracting surfaces, substantially as described.

2. A pane formed of a single and integral piece of glass having opposed and substantially parallel light-receiving and light-discharging surfaces and having formed therein an interior cavity extending longitudinally into the pane between said substantially parallel receiving and discharging surfaces, said cavity having a wall constituting a light-de-

flecting surface and having its transverse dimension curved, substantially as described.

3. A pane formed of a single and integral piece of glass having light-receiving and light-discharging surfaces and formed between said surfaces with a cavity, having walls constituting curved entering and leaving light-refracting surfaces, substantially as described.

4. A pane formed of a single and integral piece of glass having light-receiving and light-discharging surfaces and formed between

said surfaces with a cavity having walls constituting entering and leaving light-refracting surfaces, one of said surfaces being curved, substantially as described. 15

In witness whereof I have hereunto subscribed my name in the presence of two witnesses.

OSWALD E. WINGER.

Witnesses:

W. CLYDE JONES,
R. S. LUDINGTON.

It is hereby certified that in Letters Patent No. 607,792, granted July 19, 1898, upon the application of Oswald E. Winger, of Chicago, Illinois, for an improvement in "Window Panes or Lights," an error appears in the printed specification requiring correction, as follows: After line 38, page 1, the following paragraph should be inserted:

In an application filed September 22, 1897, Serial No. 652,573, and also in an application filed December 18, 1897, Serial No. 662,417, I have illustrated and described window panes of the same general structure as the pane shown herein, and I hereby reserve for said applications such features of invention as are not specifically claimed herein.

And that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 11th day of October, A. D., 1898.

[SEAL.]

THOS. RYAN,

First Assistant Secretary of the Interior.

Countersigned:

C. H. DUELL,

Commissioner of Patents.