Nov. 2, 1937. K. OITA 2,097,738

SKYLIGHT

Filed May 31, 1935

Fig.1

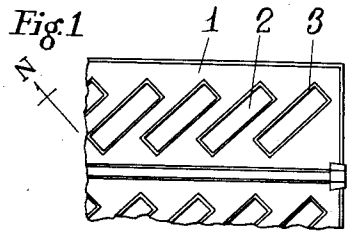


Fig.5

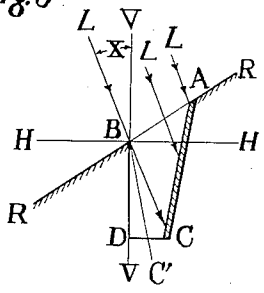


Fig.2

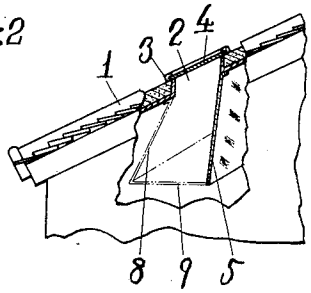


Fig.6

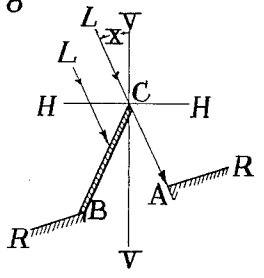


Fig.3

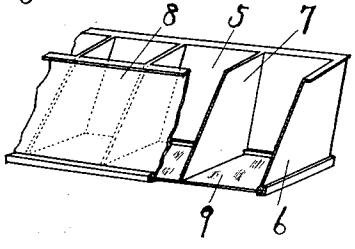


Fig.7

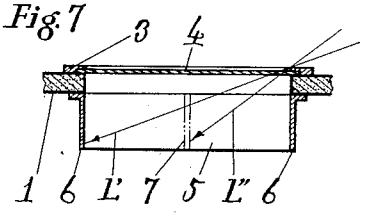
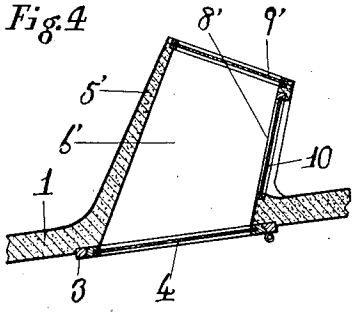


Fig.4



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UNITED STATES PATENT OFFICE

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SKYLIGHT

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5 Claims. (Cl. 108—16)

This invention relates to a skylight which has its special feature in that an oblong inlet for light, length lying in the east and west direction, is opened in the roof, and a board for the purpose of intercepting the light projects outwardly from the south side or inwardly from the north side of the inlet for light, the end of the board being extended at least to the point which intersects the path of sunlight entering through the side opposite to that which has the board attached when the sun comes to its highest point over the place of the building in the year. Its object is to present a new method which has such advantages that the direction of the beam line of the building can be selected at will and that a strong building can be constructed with comparative ease and at a low cost.

The separate drawing shows the theory and practice of the skylight of this invention. Figure 1 is a plan of a part of the building which is fitted with the skylight of this invention. Figure 2 is a vertical section. Figure 3 is a sectional view of the skylight with a reflector. Figure 4 is a vertical section of an example of action in a different form. Figure 5 is for explanation of the relation of what is shown in Figure 2 with the direct rays. Figure 6 explains the relation of what is shown in Figure 4 with the direct rays. Figure 7 explains the use of partition-boards.

This invention relates to an improvement of skylight which intercepts the sun's direct rays and leads in the abundant scattered rays. Referring to the attached figures, the mode of action will first be explained.

Figure 1 is a plan of the building fitted with the skylight of this invention. The building can be constructed in any desired direction according to the shape of the ground and environments, and this matter is to be counted as one of the useful merits obtainable from this invention.

The building shown in Figure 1 is constructed in the direction of the direction-symbol given to the figure. In the roof (1), an oblong inlet for light (2), narrow in width measured in the south and north direction and comparatively long in length laying in the east and west direction, is opened and a window frame (3) is fixed to it. Figure 2 is a vertical section showing a glass plate (4) fixed to cover the top of the window frame, and a board (5) made of a material which intercepts the light, i. e. a quite opaque or semi-transparent material, is attached to the north side of the window frame and is extended vertically or slightly inclined southward, and its vertical length is to be determined according to the explanatory Figure 5. In Figure 5, (R) is the surface of the roof; (AB) shows the width of the inlet for light (2); and (H) and (V) are the horizontal line and vertical line respectively which pass through the point (B) which is the south side of the inlet for light. The angle (X), formed between the ray (L) directly emitted from the sun and the vertical line (V), becomes smallest at noon time when the sun is on the Tropic of Cancer and has a value X=Y−23° 30′, (Y) being the latitude of the place of the building. It is necessary that the intercepting board has at least a vertical length (AC) which is sufficient to completely intercept all of the rays that come in at the above mentioned angle of (X) through the south side (B) of the inlet for light. The length (AC) becomes long when the intercepting board (AC) is vertical and it becomes shorter as its lower end is inclined southward. Therefore, in order to avoid a loss of space which will be caused by the long protrusion of the board into the available space of the building, the intercepting board should better be inclined, while, if more consideration has to be paid to the utilization of the scattered rays which come from the reflection of rays falling on the intercepting board, the degree of the inclination should be lessened. According to the desire, the intercepting board may be hinged at the top end so that the inclination can be varied. When the sun is in a position other than the meridian as in the morning and evening, the direct rays are emitted always at an angle larger than (X), making the point (C) approach (A), but at the same time, as the sun gets inclined to the east or west, it is possible that the direct rays come in without being intercepted by the eastern or western end of the intercepting board. Therefore, it is sometimes required to use a board longer in the east and west length than the length of the inlet for light (2), or to fix end-plates (6) in the south and north direction to both of the eastern and western ends of the board which is of the same length as the inlet for light. As shown by (ABDC) in Fig. 5, the end-plates (6) may be an irregular square formed by the line (BD) drawn vertically from (B) and the line (DC) drawn horizontally from (C). However, if the length of the inlet for light is made longer, the end-plates (6) (6) alone at the both ends will be effective only for intercepting the slanting rays (L′) which are emitted from the sun when it is in a very low position, and they can not exercise the action of interception when the sun rises higher in position. In such case, one or more partition boards (7) have to be fixed between the end-plates (6) (6)

of the both ends. It is not always necessary that the upper part of the partition board reaches the top surface of the inlet for light, but it can be fixed to the lower part only of the intercepting board.

Secondly, it is sometimes good to fix to the south side of the inlet for light a secondary reflector (8) opposite to the above mentioned intercepting board. This reflector can be fixed to the end-plates (6) (6) with the advantage of making the construction of the skylight strong. Furthermore, it serves, when suitably inclined, for reflecting and leading into the building more rays reflected by the intercepting board, while, if without such reflector, there are, among the reflected rays, some which proceed along the upper space near the roof and become wasted. This reflector considerably increases the efficiency of utilizing the rays. It is suitable that the degree of inclination of the secondary reflector (8) be greater to some extent than that of the intercepting board (5). The base of an irregular pyramid which is formed by the intercepting board (5), end-plates (6) (6) and the secondary reflector (8) may be covered with a transparent or milk-colored glass, so that the mutual induction of heat or cold in and out of the building can be prevented to a great extent. It is desirable to coat the inside surface of the intercepting board, end plates and secondary reflector with white or light colored paint which is suitable for the emission of mild reflected rays.

The foregoing is an explanation of the example of fixing the intercepting board inside the building. However, it is not objectionable to fix the intercepting board by protruding it outside the roof. For example, Figure 4 and Figure 6 are shown. In this case, the intercepting board (5') is fixed to the south side of the inlet for light (2) and as shown in Figure 6, its top (C) should be determined in such way that the ray (L) passing through (C) falls beyond the north side (A) of the inlet for light when the angle (X) between the vertical line (V) passing through the point (C) and the direct ray (L) of the sun is in the relation of $X=Y-23°\ 30'$ as mentioned before. The back surface of the intercepting board (5') in this form can be made to serve for the secondary reflector. As in the case of Figure 2, another board (8') which is parallel (or it may not be parallel) to the intercepting board (5') is attached to the north side of the inlet for light, and at the eastern and western ends of the boards (5') and (8'), the end-plates (6') (6') are fixed, and on the top of an irregular pyramid thus formed, a glass plate (9') is to be fixed in. Instead of the above mentioned board (8') being made as reflector, it may also be made with a window frame fitted with glass in order to lead into the building the scattered rays which come from the north.

As can be noted from the foregoing examples of action, the chief points of this invention consist in that the inlet for light, length laying in the east and west direction, is opened in the roof of building and an intercepting board extends outside the building from the south side of the inlet for light or extends inside the building from the north side, the vertical length of the board being such that the end intersects the line drawn from the sun to the side opposite to that which has the intercepting board attached, when the sun comes to its highest position over the place of the building in the year. As compared with other skylights hitherto in use, this method can lead more light into the building and simplifies the construction of a building, which can be constructed according to the shape of the ground and independently from the point of direction. Consequently, the construction can be made with the best attention given to the promotion of the working efficiency in the arrangement of a building, and this will give a facility in obtaining the most suitable plans for the construction of office building, godown, factory, etc., and will entirely dispense with weak and inconvenient methods for skylights hitherto in use.

I claim:

1. A skylight for a roof in which an oblong inlet for the light is provided which is relatively narrow in the south and north direction and relatively long in the east and west direction, comprising a board associated with said inlet for intercepting the light, end plates associated with said board, a second board disposed opposite to said first board so as to form with said end plates and said first board, a hollow pyramid construction, said hollow pyramid construction extending inwardly from the four sides of said inlet.

2. A skylight for a roof in which an oblong inlet for the light is provided which is relatively narrow in the south and north direction and relatively long in the east and west direction, comprising a board associated with said inlet for intercepting the light, end plates associated with said board, a second board disposed opposite to said first board so as to form with said end plates and said first board, a hollow pyramid construction, said hollow pyramid construction extending outwardly from the four sides of said inlet.

3. A skylight for a roof in which an oblong inlet for the light is provided which is relatively narrow in the south and north direction and relatively long in the east and west direction, comprising a board associated with said inlet for intercepting the light, end plates associated with said board, a second board disposed opposite to said first board so as to form with said end plates and said first board, a hollow pyramid construction, said hollow pyramid construction being coated at the inside with a paint of light color whereby mild reflected rays of sunlight may be emitted.

4. A skylight for a roof in which an oblong inlet for the light is provided which is relatively narrow in the south and north direction and relatively long in the east and west direction, comprising a board associated with said inlet for intercepting the light, end plates associated with said board, a second board disposed opposite to said first board so as to form with said end plates and said first board, a hollow pyramid construction, said hollow pyramid construction having the top thereof covered with a glass plate.

5. A skylight for a roof in which an oblong inlet for the light is provided which is relatively narrow in the south and north direction and relatively long in the east and west direction, comprising a board associated with said inlet for intercepting the light, end plates associated with said board, a second board disposed opposite to said first board so as to form with said end plates and said first board, a hollow pyramid construction, said hollow pyramid construction having the base thereof covered with a glass plate.

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