Aug. 17, 1965 R. J. HARPER 3,201,579

ILLUMINATED BUILDING AND SIGN

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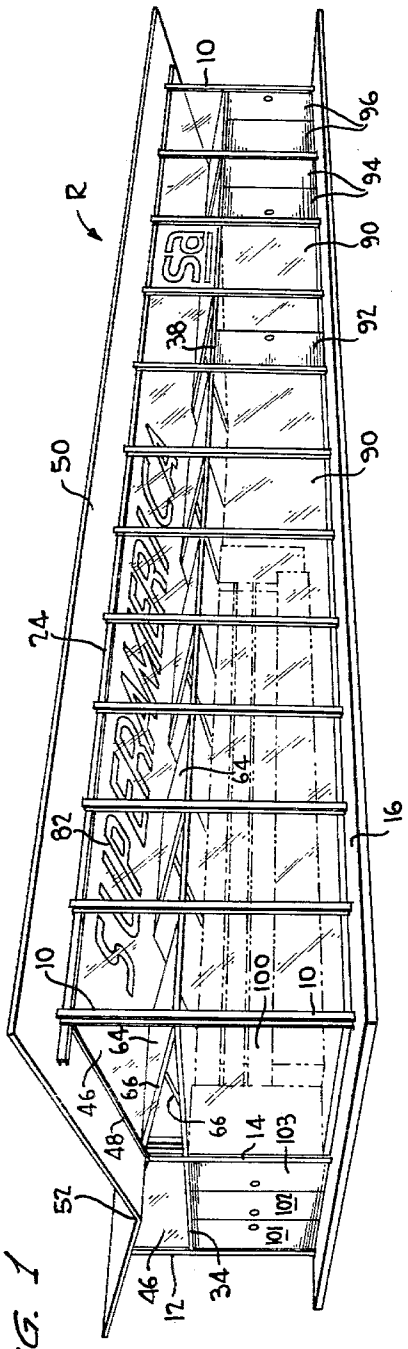


FIG. 1

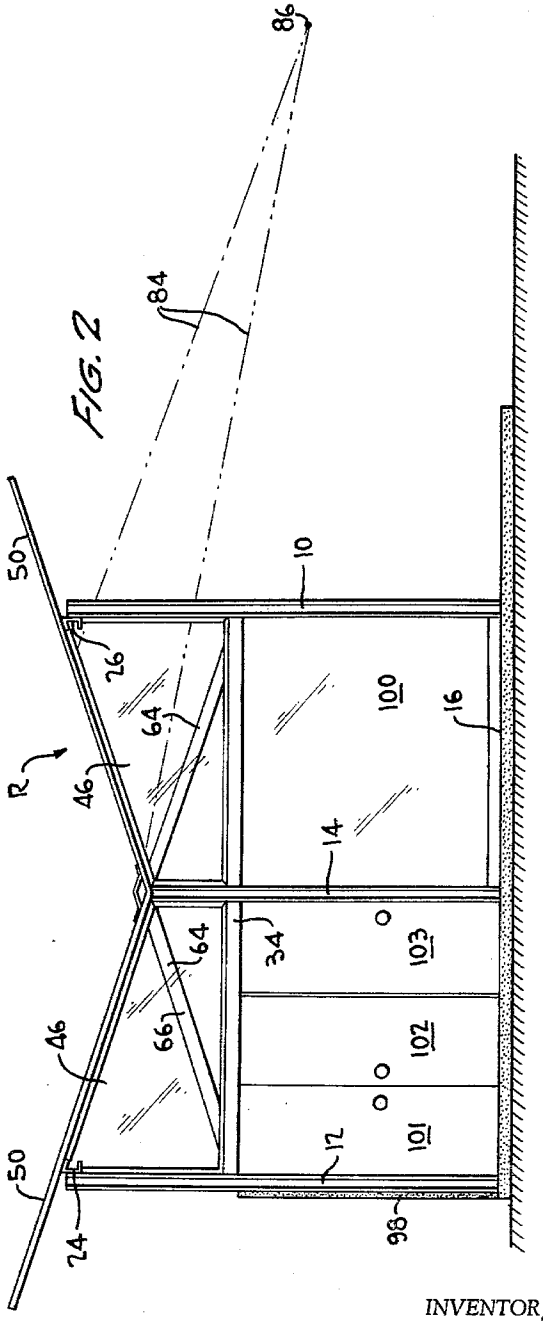


FIG. 2

INVENTOR,
ROBERT J. HARPER

BY Watson, Cole, Grindle & Watson
ATTORNEYS

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ILLUMINATED BUILDING AND SIGN

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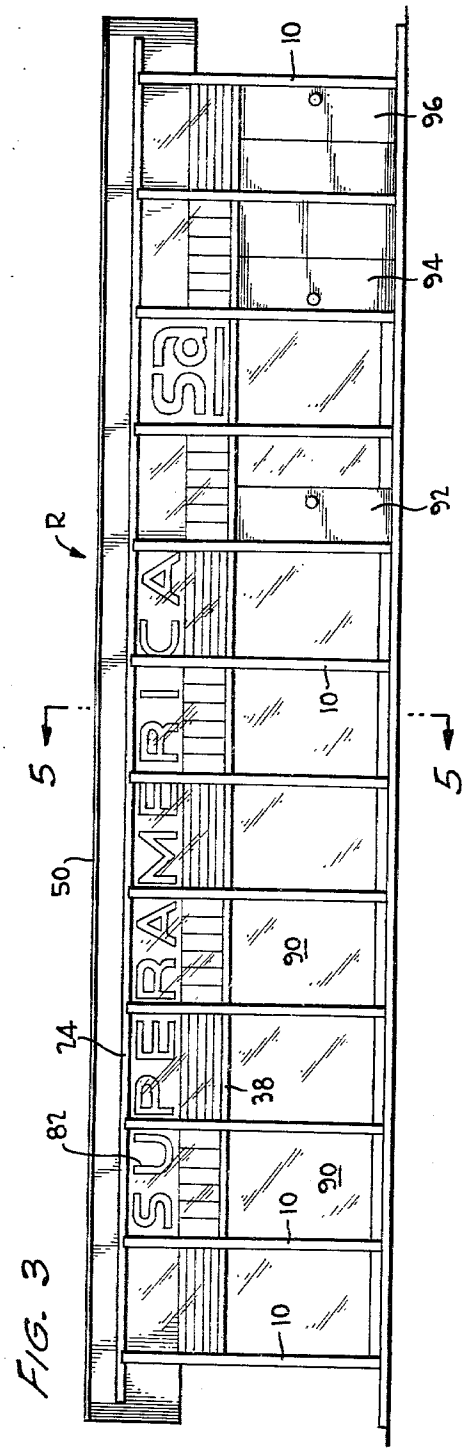


FIG. 3

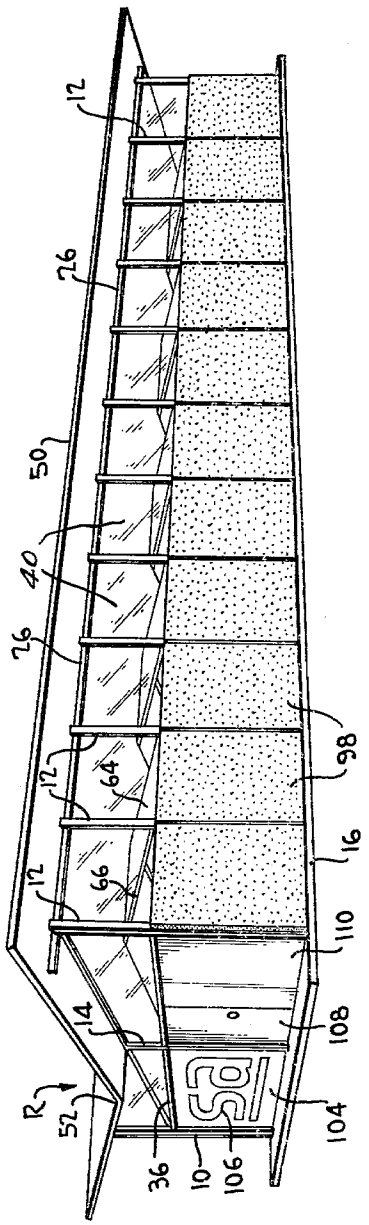


FIG. 4

INVENTOR,
ROBERT J. HARPER

BY Watson, Cole, Grindle & Watson
ATTORNEYS

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ILLUMINATED BUILDING AND SIGN

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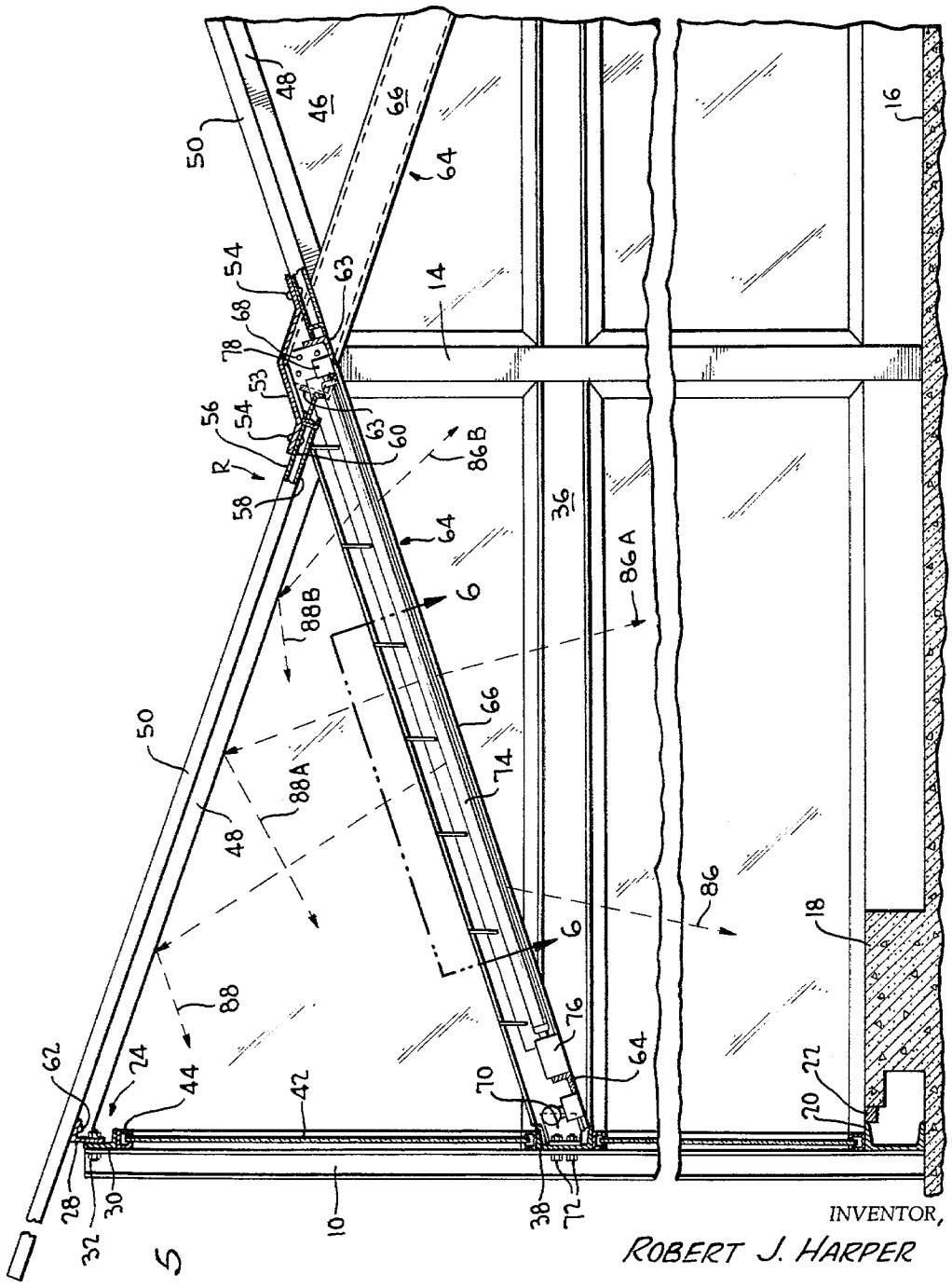


FIG. 5

INVENTOR,
ROBERT J. HARPER

BY Watson, Cole, Grindle & Watson
ATTORNEYS

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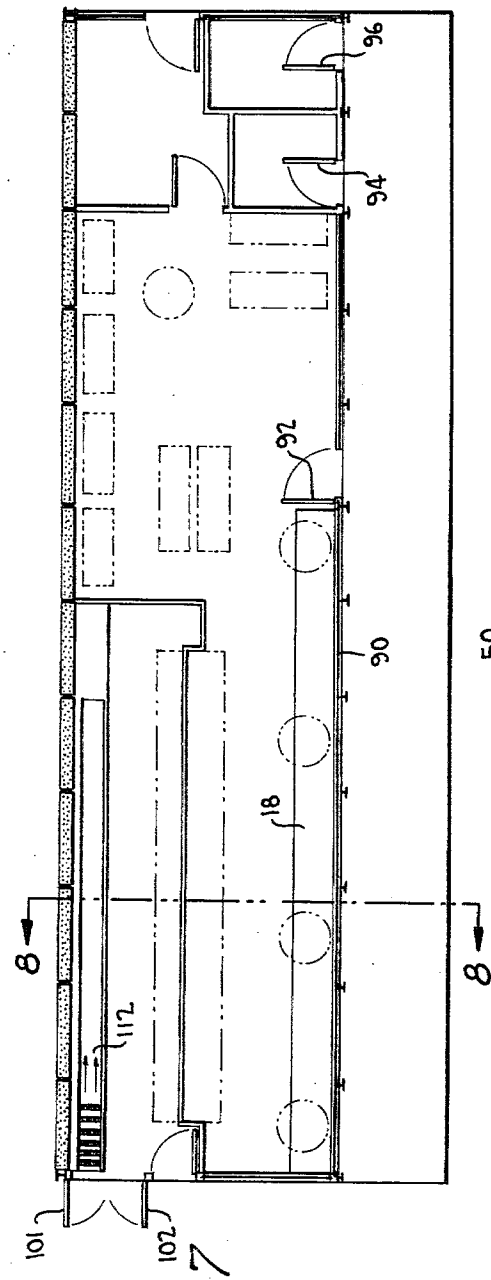


FIG. 7

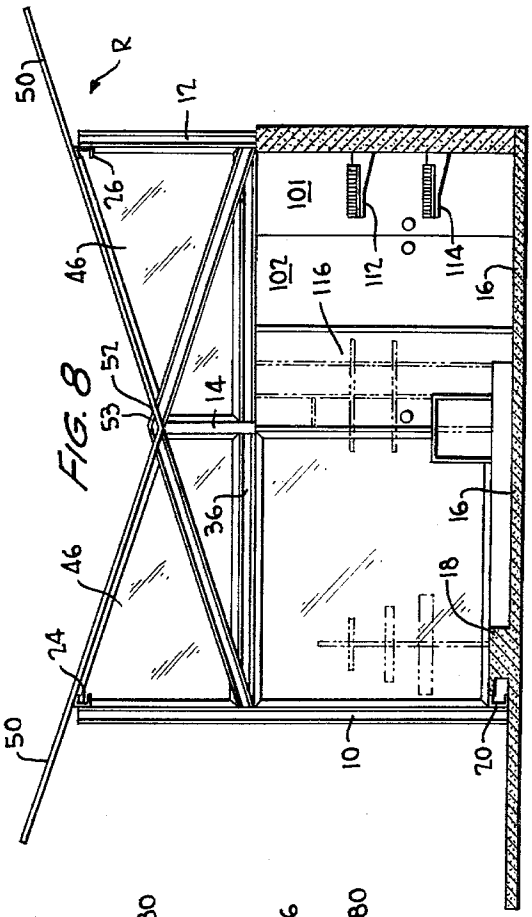


FIG. 8

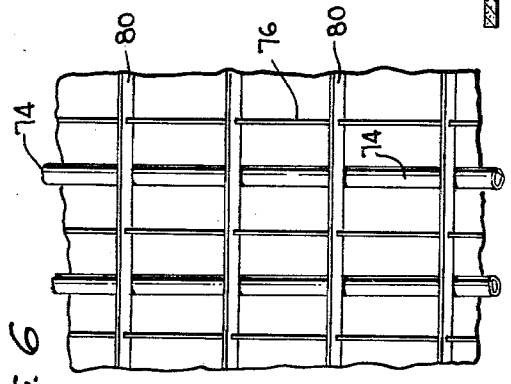


FIG. 6

INVENTOR,
ROBERT J. HARPER

BY Watson, Cole, Grindle & Watson
ATTORNEYS

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3,201,579

ILLUMINATED BUILDING AND SIGN

Robert J. Harper, Scarsdale, N.Y., assignor to Northwestern Refining Co., St. Paul, Minn., a corporation of Minnesota

Filed July 11, 1963, Ser. No. 294,325
10 Claims. (Cl. 240—2)

This invention relates to improvements in an illuminated building.

In accordance with an important feature of the invention the roof structure of the building cooperates with one or more banks of lights so arranged that the roof and the light banks cooperate with each other and with the main frame of the structure to impart structural strength to the roof.

A further feature consists in so associating the roof structure with a light source or series of light sources that the lower surfaces of the roof sections function as an important part of the means for illuminating both the interior and exterior of the structure.

Thus in accordance with the invention the undersides or surfaces of the roof panels function as reflectors for reflecting light both downwardly into the building structure and laterally outwardly of the structure, as well as onto the ground surface adjacent and exteriorly of the building.

In accordance with a further important feature of the invention the undersurface of the roof is adapted to constitute an illuminated sign receiving direct illumination from the light source or sources within the structure and readily visible and legible from the exterior of the structure from quite substantial distances, as well as from locations quite close to the building.

A further feature of the invention is the adaptability thereof for erection in rapid and easy manner from readily available components including certain units which may be preassembled prior to transportation to the job site.

The foregoing as well as other features and advantages are all inherent in the preferred embodiment of the invention shown by way of example in the accompanying drawings, in which:

FIGURE 1 is a perspective view showing the front and one end of a building structure and sign made in accordance with the invention in a form adapted for use as a store and/or service station.

FIGURE 2 is an end elevation of the structure illustrated in FIGURE 1 as seen from the left-hand end thereof, and indicating in broken lines the visibility of the lower sign bearing surface of the roof on the interior of the building as seen from the eye level of an observer exteriorly of the structure.

FIGURE 3 is a front elevation of the structure shown in FIGURE 1.

FIGURE 4 is a rear perspective view thereof.

FIGURE 5 is an enlarged vertical section on the line 5—5 of FIGURE 3, with a portion thereof broken away; and showing in broken-line arrows the manner in which a single light source furnishes direct lighting for the store interior there beneath and for the undersurface of the roof structure there above, as well as the manner in which the light is reflected from the roof structure to the exterior of the building.

FIGURE 6 is a plan view on the line 6—6 of FIGURE 5 showing a portion of one of the banks of lights as employed in the invention.

FIGURE 7 illustrates a typical floor plan such as may be advantageously employed in a structure in accordance with the invention, this being but one of many possible such plans and illustrating the flexibility of arrangement

that is available due to the lack of need for any supporting columns or partitions within the building interior.

FIGURE 8 is a vertical section on the line 8—8 of FIGURE 7.

Referring now in detail to the accompanying drawings, the roof structure, designated in its entirety by the reference character R, and in which the inventive concept primarily resides, is supported by a series of upright columns 10, 12 and 14, above a suitable floor surface 16 which, in the present instance, comprises a monolithic concrete slab functioning also in lieu of a usual foundation for the building structure. If desired, the slab may be formed with one or more raised platforms or the like 18, as shown for instance in FIGURES 5, 7 and 8, to function as a raised displayed area.

It will be seen that the columns 10, 12 and 14 are arranged to form a rectangle in plan, coincident with and comprising part of the wall structure which encloses the building. To this end the columns 10 and 12 respectively are arranged in parallel rectilinear rows extending longitudinally along the front and rear respectively of the structure, while the ends of the structure are defined by the end columns 10 and 12 respectively between which is medially interposed the upright column 14 which functions is the manner of a king post for the resulting building structure. Preferably the columns 10, 12 and 14 are connected at their lower ends to plates or sills 20, as exemplified in FIGURES 5 and 8, such sills being spaced from the raised stand or platform 18 preferably by a spacer or fillet 22 as in FIGURE 5.

Horizontal stringers or lintels 24 and 26 respectively extend along and interconnect the upper ends of the columns 10 and 12 of each said row. The construction of each said lintel may be similar to that exemplified for the lintel 24 in FIGURE 5 in which it will be seen that the said lintel is of composite construction including the interconnected angle iron members 28 and 30, these being secured together by bolts such as 32. In accordance with usual practice the two rows of columns 10 and 12 are interconnected at their respective ends by the tie beams 34 and 36 and also at the same height, namely the door head height of the front and rear walls, there are provided the rigid horizontal structural members 38 and 40 respectively interconnecting and supported by the columns 10 and 12 of each row, these being in the same horizontal plane as the tie beams 34 and 36.

The rectangular spaces, as defined by each adjoining pair of uprights 10—10 and 12—12 above the plane of horizontal members 34, 36, 38 and 40, are arranged to transmit light therethrough, being preferably occupied by transparent windows or sashes 42, each preferably including a conventional metal frame 44 such as is illustrated in FIGURE 5. At the ends of the building the spaces between the tie beams 34 and 36 and the roof, similarly are occupied by transparent panels or windows 46. To assist in supporting the frames for these panels 46 there may be provided diagonal lintels such as 48 (FIGURE 5) interconnecting the upper end of each king post 14 to the upper ends of the columns 10 and 12 respectively on either side thereof.

The roof structure R of the invention includes a pair of relatively angularly disposed plane roof sections 50—50 which intersect along a horizontal line in the vertical plane of king posts 14—14 and converge upwardly from said line symmetrically to the vertical plane thereof to define a drainage valley 52 between the sections. In order to render the juncture or intersection of said sections 50—50 completely watertight in the drainage valley 52 it is desirable that said valley be defined by a spanning or gutter forming member 53 extending across the said line of intersection and riveted or otherwise connected as

at **54** (see FIGURE 5) to the roof sections on either side thereof.

Each roof section **50** is preferably comprised of a series of thin rectangular structural panels of uniform size adapted to serve simultaneously as roof, ceiling and sign surface, these panels being interfitted and connected in watertight manner to define each of the roof sections **50**. It is contemplated for instance that the panels might each comprise a pair of relatively spaced and interconnected upper and lower sheets of aluminum or other metal **56** and **58** respectively, as shown in FIGURE 5, having a space **60** therebetween which is adapted for the reception of a sheet of insulating material or the like, not shown.

Adjacent their outwardly directed end edges, the roof panels respectively rest upon and extend across the respective stringers or lintels **24, 26** and are secured thereto, as for instance by the bolts or rivets such as indicated at **62** in FIGURE 5. At their relatively adjoining inner ends or end edges, the sections **50** of the roof are respectively connected to each other through their common bridging and gutter forming valley member **53**, and in addition are preferably connected to the frame members **63** at the inner edges of the respective frames of light banks **64**, as hereinafter more fully described.

Each such bank of lights comprises a rigid and open rectangular frame generally designated **64** which is disposed beneath one of the roof sections **50** in the same plane as the other said roof sections to constitute a visual extension of the other such roof section across the imaginary line of intersection of the two roof sections **50**.

Each said frame consists primarily of the relatively spaced parallel pair of transversely extending rigid struts **66** in the form of channel irons having their lateral flanges directed toward each other, with their inner ends connected by the longitudinal members such as **63** above mentioned, and their relatively remote outer ends interconnected by the angle members such as **64** in FIGURE 5.

In the roof structure these frames **64** are disposed alternately, first beneath one section **50** of the roof then beneath the other section thereof, so as to lie alternately on opposite sides of the roof valley. The arrangement is such that the inner ends of the relatively adjoining frames on opposite sides of the roof overlap each other with the smooth or flat sides of their channel members **66** in abutting relation, and these are rigidly secured together as by the bolts **68** in FIGURE 5. The relatively outermost ends of the frames **64** extend into the coves of the longitudinal stringers or structural members **36** and **38** respectively of the building frame and are secured therein by the angle brackets such as **70** having bolts **72** or equivalent fastening means securing them to the members **36** and **38**.

Supported in and transversely spanning the open space within the interior of each such frame **64** is a plurality of relatively spaced and parallel fluorescent light tubes **74** supported between the usual terminal defining members **76** and **78** respectively, with the relatively spaced lights or light tubes **74** separated from each other by the transversely extending vertical partitions **76** of a conventional grid or egg-crate type structure which also includes the longitudinal partitions **80**, all as illustrated in somewhat more detail in FIGURE 6 of the drawings. The battery of light tubes **74** in each frame is a preferred exemplification of a light source carried by such frame.

With the foregoing structure, it will be readily apparent that the several light frames **64** are interconnected with their respective superposed roof sections **50** and that both are connected to the columns **10** or **12** to therewith define rigid triangles as seen in vertical cross section. In other words, the arrangement is such that the light frames **64** cooperate with the roof sections and the supporting columns in defining a rigid structural tri-

angle for supporting the roof sections and the roof in its entirety along the line or valley of intersection of such roof sections, the struts **66** of the frames being so arranged to provide the necessary compressive strength while the roof sections **50** are arranged in this construction so that they need withstand only the tensile forces imposed thereon. Thus the roof sections **50** are utilized not only in the usual manner but as an integral part of the load bearing structure and in a most efficient manner to contribute to the strength thereof. It is thus possible to provide a relatively large clear span without need for intervening supporting columns within the building enclosure.

In addition to the foregoing functions, the roof sections **50** are preferably provided with light reflecting under or lower surfaces adapted to bear lettering or signs such as **82** in FIGURES 1 and 3. By virtue of the light transmiting areas defined by the transparent panels or windows **42** between the relatively diverging roof sections **50** and light frames **64**, these signs will be readily visible from the exterior of the building through the transparent panels **42**, all as is indicated in FIGURE 2 of the drawings wherein there is indicated in broken lines **84** the span of vision from the eye level **86** of a viewer of the sign from a point outside of the building. Because of the angular relationshp between the viewer's line of vision and the undersurface of the roof panel **50**, the matter appearing on the sign will appear somewhat fore-shortened and it will therefore be advisable in most instances to exaggerate the vertical dimensions of the lettering or other matter depicted on the signs **82** so that it will appear of normal proportions when viewed as indicated in FIGURE 2.

Because of the interrelationship of the light frames **64**, lights **74** and the roof sections **50** with their reflecting and sign bearing surfaces, it will be readily apparent that the light from the light sources **74** will be directed downwardly into the interior of the building, as indicated generally by the brokenline arrows **86, 86A** and **86B** in FIGURE 5 to illuminate the building interior. In addition the light from these same sources will impinge against the reflecting undersurface of the roof section **50** and such sign or signs as are borne thereon, and then will be reflected laterally outwardly through the transparent panels or windows **42**, all as indicated by the broken-line arrows **88, 88A** and **88B** in FIGURE 5.

Moreover it will be readily apparent that after dark, much of the reflected light from the undersurfaces of the roof sections **50** will be directed outwardly and downwardly, thereby illuminating the area immediately around the building structure to facilitate the approach and entry of customers. Similarly the light escaping through the transparent panels **46** at the ends of the building structure will provide illumination in the area thereof, all to the end that adequate illumination may be provided for the entire area surrounding the building structure, while at the same time the signs **82** are illuminated and made visible from outside of the store for great distances.

As will be clear from reference to FIGURES 5 and 8, the several banks of lights **64** beneath each section **50** of the roof alternate with blank or unoccupied spaces of equal width, and moreover the light tubes **74** and grid members **76** and **80** comprising each frame structure are sufficiently widely spaced to allow ample space for the downward passage of light into the building interior.

For these reasons even though the entire building should be substantially completely enclosed beneath the transparent panels **42** with walls or other structure incapable of transmitting light, the interior of the building may nevertheless be adequately illuminated by daylight from the outside of the building and without use of light sources **74**. This is made possible by virtue of the fact that light entering the building through the transparent panels such as **42** and **46** will be reflected downwardly from the undersurfaces of the roof sections **50** and into the interior

of the building, both through the open light frames **64** and through the spaces between such frames.

The structure above described is capable of wide adaptability to use in different types and arrangements of buildings. For instance, in a preferred arrangement of the walls or wall defining structure in such a building, the entire front thereof may well have the spaces between the columns **10** completely occupied by transparent or translucent panels **90** of glass or other suitable material except as to certain spaces which may be occupied by doors **92**, **94** and **96** respectively, all as indicated in FIGURE 1. The corresponding spaces between the columns **12** at the rear of the store may be occupied by masonry or concrete wall panels **98**, while the left-hand end of the building, as seen in FIGURES 1 and 2, may have its wall space occupied by the glass show window **100** and the several doors **101**, **102** and **103**. At its other end there may be provided the further glass show window **104** which may, if desired, bear the sign **106** as indicated in FIGURE 4, and also there is provided a door **108** and a stationary wall section **110**.

Similarly the interior of the store is capable of utilization in any of various ways due to the large clear space provided therein by the large span of the roof structure. This permits the use of partitions and the like in any desired manner without need for providing interior support for the roof structure. Thus as indicated in FIGURES 7 and 8 there may be provided within the building a pair of relatively superposed shelves such as **112** and **114**, each preferably being in the form of a usual skate wheel or other type of conveyor for the reception and movement therealong of materials or goods delivered through the doors **101** and **102**. These conveyors extend parallel to a series of shelves **116** accessible from both the front and the rear for the reception and display of goods for sale. These shelves **116** and various other display stands, dispensing machines and the like, all are illustrated in broken lines in FIGURES 7 and 8, simply by way of illustration of one of the numerous interior arrangements available. Similarly in FIGURE 8 there is shown by way of exemplification one type of partitioning of the building interior to divide it into several rooms or compartments, though such arrangement obviously constitutes no part of the instant invention.

It will be readily apparent that the building structure, in addition to its adaptability as to interior arrangement and floor plan as above mentioned, also may be readily modified to increase its depth or its length by adding further building units such as the illustrated one either in end to end relation or in side by side relation with the roof sections of the structures interconnected.

From the foregoing therefore it will be noted that I have proposed a particularly advantageous structure in which the building interior may be readily and adequately illuminated by natural daylight when use of its artificial illuminating means is not desired. In addition, the artificial illumination means when used is adapted to illuminate a sign and/or reflecting surface defined by the roof, the sign being rendered visible for great distances from the exterior of the building and the reflecting action serving to illuminate the exterior of the building quite efficiently, while at the same time the interior of the building is illuminated both by the direct light from the light source as well as from light reflected from the roof. At the same time there is the added advantage that the roof panels contribute substantially to the structural strength of the roof structure itself.

In this application I have shown and described only the preferred embodiment of the invention simply by way of illustration of the preferred mode of practicing the invention. However, I recognize that the invention is capable of other and different embodiments and that its several details may be modified in obvious ways, all without departing from the invention as defined in the appended claims.

Having thus described my invention, I claim:

1. An illuminated building structure comprising a vertical supporting wall, a plane roof section supported by and sloping downwardly on one side of said wall, said roof section having a light reflecting undersurface, a battery of relatively parallel spaced fluorescent light tubes disposed beneath said roof section in a plane diagonal to the planes of said roof section and said wall, each of said planes intersecting the other two planes along horizontal lines, the plane containing said light tubes sloping downwardly from the lower edge portion of said roof section to illuminate the underside of said roof section as well as the interior of the building beneath said light tubes, said wall including light transmitting areas between its intersections with the planes of said roof section and said light tubes to permit the passage therethrough in one direction of light originating at said light sources and reflected from the undersurface of said roof section, and also to permit the passage therethrough in an opposite direction of daylight to be reflected from the undersurface of said roof section downwardly between the relatively spaced light tubes.

2. An illuminated building structure comprising a vertical supporting wall, a plane roof section supported by and sloping downwardly on one side of said wall, said roof section having a light reflecting undersurface, an open rigid light frame disposed beneath said roof section in a plane diagonal to the planes of said roof section and said wall, each of said planes intersecting the other two planes along horizontal lines and said roof section, wall and light frame defining in vertical cross section a rigid structural triangle, a battery of relatively spaced light sources carried within the opening of said frame and in the plane of said frame to illuminate the underside of said roof section and the area beneath said frame, said light sources being relatively spaced to permit the free passage of light through the frame, said wall including light transmitting areas between the said roof section and said frame to permit the passage therethrough in one direction of light originating at said light sources and reflected from the undersurface of said roof section, and also to permit the entry therethrough in an opposite direction of daylight to be reflected from the undersurface of said roof section downwardly through said frame.

3. An illuminated building structure as defined in claim 2, in which the underside of said roof section bears a sign for illumination by said light sources, said light transmitting areas being transparent to render the sign legible therethrough.

4. An illuminated building structure comprising a vertical supporting wall, a plane roof section supported by and sloping downwardly on one side of said wall, said roof section having a light reflecting undersurface an open rigid light frame disposed beneath said roof section in a plane diagonal to the planes of said roof section and said wall, each of said planes intersecting the other two along horizontal lines, and therewith defining in vertical cross section a rigid structural triangle, a light source carried within the opening of said frame to illuminate the underside of said roof section and the area beneath said frame, said wall including light transmitting areas between said roof section and said frame to permit the passage therethrough of light originating at said light sources and reflected from the underside of said roof, and also to permit the passage therethrough of daylight for reflection from the undersurface of said roof downwardly through said frame.

5. An illuminated building structure comprising a horizontal floor, a row of rigid vertical columns projecting upwardly from said floor, a plane roof section supported by said columns above said floor, said roof section having light reflecting characteristics, said roof section sloping downwardly to one side of said row of columns at an acute vertical angle thereto, an open rigid light frame disposed at ceiling height beneath said roof section in a plane diagonal to the planes of said roof section and said

columns, said planes intersecting each other along horizontal lines, and said frame interconnecting said roof section and said columns and therewith defining a rigid structural triangle, a battery of light sources carried within the opening of said frame and in the plane thereof to illuminate both said floor and said roof section, said light sources being relatively spaced to permit the free passage of light from other sources through the frame, light transmitting means occupying the spaces between relatively adjoining columns to permit the outward transmission of light originating at said sources and reflected from the undersurface of said roof, and illumination of the interior of said structure by daylight entering laterally through said light transmitting means and reflected downwardly from the roof section through the openings of said light frames.

6. An illuminated building structure comprising a horizontal floor, a row of rigid vertical columns projecting upwardly from said floor, a plane roof section supported by said columns above the floor, said roof section sloping downwardly to one side of said row of columns at an acute vertical angle thereto, an open rigid light frame disposed at ceiling height beneath said roof section in a plane diagonal to the planes of said roof section and said columns, said planes intersecting each other along horizontal lines, said frame interconnecting said roof section and said columns and therewith defining a rigid structural triangle, a light source carried within the opening of said frame to illuminate both said floor and the undersurface of said roof section, and light transmitting means occupying the spaces between relatively adjoining columns to permit the transmission of light both from and to the said undersurface of the roof section.

7. An illuminated building structure comprising a row of rigid vertical columns and supporting means therefore, a plane roof section supported by said columns and sloping downwardly to one side of said row of columns at an acute vertical angle thereto, said roof section having a light reflecting undersurface, a rigid light frame disposed at ceiling height beneath said roof section in a plane diagonal to the planes of said roof section and said columns, said planes all intersecting each other along horizontal lines, said frame interconnecting said roof section and said columns and therewith defining a rigid structural triangle, a light source carried by said frame, said light reflecting undersurface of the roof section being exposed to light from said light source, and light transmitting means occupying the spaces between relatively adjoining columns.

8. An illuminated building structure comprising a pair of relatively angularly disposed plane roof sections intersecting each other along a horizontal line to form a roof having a valley along said horizontal line, and diverging upwardly symmetrically to the vertical plane of said line, said roof sections having light reflecting lower surfaces, supporting means for said roof sections comprising a pair of relatively spaced parallel rows of columns disposed symmetrically on opposite sides of said vertical plane, a horizontal stringer extending along and interconnecting the upper ends of the columns of each said row, the roof sections respectively being supported by and secured to said stringers, each roof section overlying one of said stringers, a longitudinal structural member supported by each said row of columns beneath one of said stringers and its overlying roof section and in the plane of the relatively remote said roof section, a plurality of banks of lights supported beneath said roof sections, each said light bank comprising a rigid open rectangular frame disposed beneath one of said roof sections in the same plane as and constituting a visual extension of the other said roof section, and a plurality of relatively spaced parallel fluorescent light tubes in said frames, each said frame being secured to the roof substantially along said line of intersection and secured to one of said longitudinal structural members to cooperate with one of said roof sections and its supporting columns in defining a rigid structural triangle, whereby the lights from said tubes may be reflected laterally outwardly between said columns by the said lower surfaces of the roof sections.

9. The combination defined in claim 8, wherein each said rigid frame includes struts extending diagonally between and interconnecting said valley of the roof with one of said structural members.

10. An illuminated building and sign structure comprising a roof including a pair of relatively angularly disposed plane roof sections intersecting along a horizontal line and diverging upwardly from said line symmetrically to the vertical plane thereof to define a drainage valley between said sections, the underside of each said section being provided with a light reflecting surface bearing a sign, supporting means for said roof comprising a pair of relatively spaced parallel rows of columns disposed symmetrically on opposite sides of said vertical plane, an open rigid light frame disposed beneath each said roof section in a plane diagonal thereto, the plane of each said roof section and the plane of the light frame there beneath diverging outwardly in a horizontal direction away from said horizontal line and toward one of said rows of columns, and a light source supported in the opening of each said frame beneath one of said roof sections for reflection of its light from one of said light reflecting surfaces outwardly between said columns.

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NORTON ANSHER, *Primary Examiner.*