Jan. 7, 1930. C. F. JOHNSON 1,742,861

BUILDING

Filed March 24, 1924

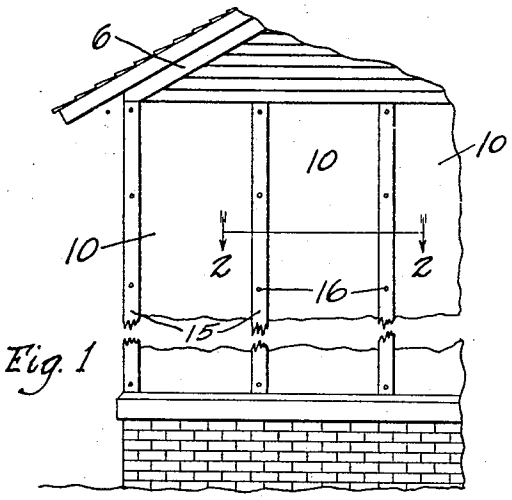
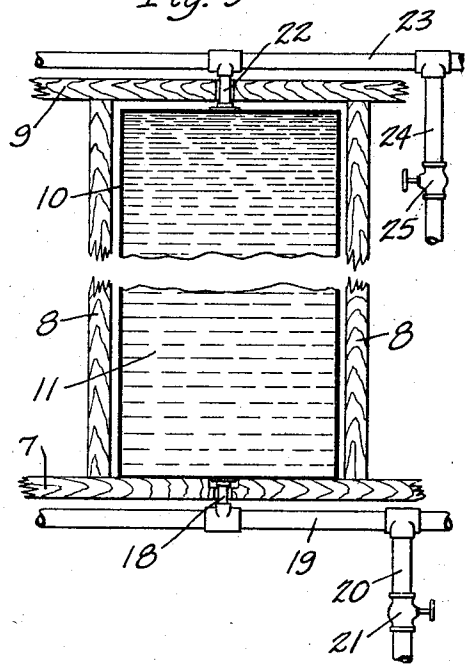


Fig. 1

Fig. 3



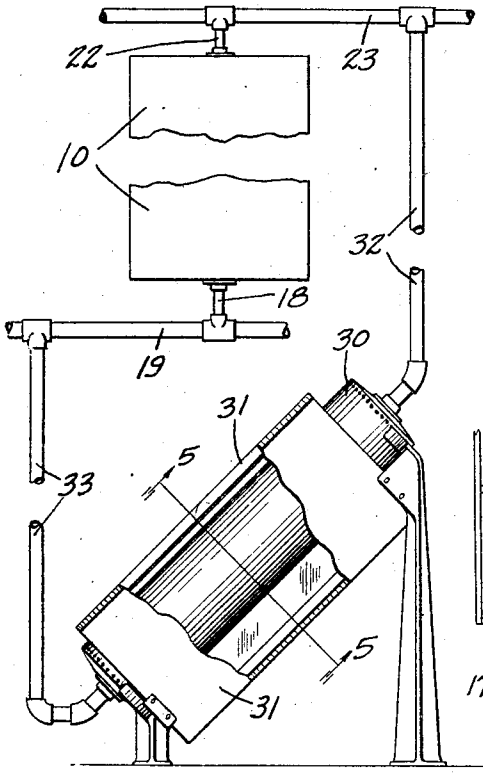


Fig. 4

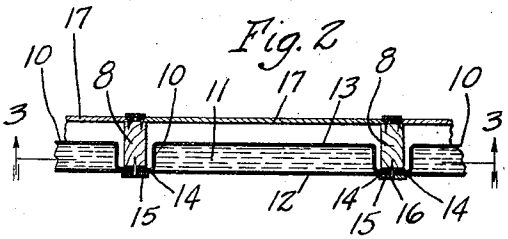


Fig. 2

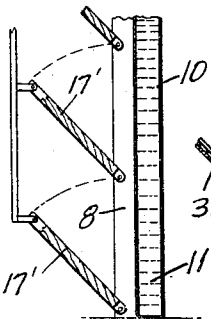


Fig. 6

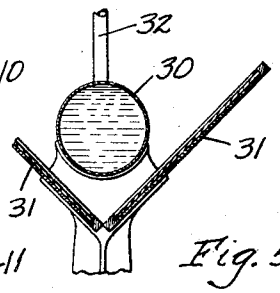


Fig. 5

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UNITED STATES PATENT OFFICE

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BUILDING

Application filed March 24, 1924. Serial No. 701,300.

The invention relates generally to buildings, such, for example, as dwelling houses, in the interior of which it is desirable to maintain a relatively constant temperature and is especially concerned with the provision of means of particular utility where the climatic conditions are favorable whereby the temperature within the building may be maintained approximately uniform without necessitating the use of fuel.

In some localities, such, for example, as the warmer sections of the south-western United States, where the air is dry and rain is infrequent, the diurnal range of temperature is comparatively great, the temperature during the day in situations exposed to the direct rays of the sun being very high and the night temperature falling to a point such that the comfort of the occupants of a dwelling requires the use of heavy clothing or the provision of special domestic heating means.

In accordance with my invention, it is proposed to store up the heat energy obtainable from solar radiation when the sun is shining and to utilize the same for warming the interior of the building at other times. It is further proposed to provide heat-storage means of such character that the building in connection with which it is utilized may be protected from excessive heating during the hours of direct sunshine and may be prevented from rapid cooling when the external atmospheric temperature has fallen.

To this end the invention comprises the provision of wall portions or elements containing a suitable heat-storage medium which elements or portions are, or may be, exposed to the heating effect of the sun's rays. The heat-storage capacity may be increased and the heating effect enhanced by providing additional heating agencies, which may also be designed to utilize solar energy, associated with the wall elements of the building in such manner that the temperature of the heat-storing medium within the wall elements may be raised to a higher point than would be possible by the mere exposure of the elements themselves. Means may also be provided to restrict excessive loss of heat energy to the exterior atmosphere during the time when the temperature on the outside is less than that of the heat-storage medium which means may be movable or adjustable in order to permit exposure of the wall elements to the sun when desired.

In the accompanying drawings illustrating one mode of carrying out the invention,

Fig. 1 is an elevation of a portion of a building having wall portions adapted to provide storage spaces for liquid, parts being broken away;

Fig. 2 is a horizontal section on line 2—2 of Fig. 1;

Fig. 3 is a vertical section on line 3—3 of Fig. 2, parts being broken away;

Fig. 4 is a view with parts broken away showing in side elevation an auxiliary heating means and also showing diagrammatically the connections between said means and the wall structure;

Fig. 5 is a section on line 5—5 of Fig. 4; and

Fig. 6 is a fragmentary view showing movable means for covering or protecting the surface of the liquid-storing elements.

Referring to the drawings, 6 indicates a building, such as a dwelling house, which may be of any usual or desired configuration. The building may have the usual frame elements as sills 7, studding 8, and plates 9. The wall portions of the building, however, consist, at least in part, of elements 10, preferably of sheet metal, which are formed as containers for a material having high heat-storage capacity, such as water, indicated at 11.

The containers as shown comprise walls 12 and 13 which may be connected at their edges to form flanges 14 adapted to rest against either the inner or outer faces of the studding. They may be supported at their lower ends upon the sills 7 and be of such dimensions as to substantially fill the spaces between the studding. As a convenient means for retaining the containers in place I have shown the flanges 14 secured by battens 15 which cover and conceal the edges of the flanges and are fixed to the studding by suitable fasteners 16. The walls 12 and 13, while illustrated

as flat or plane, may be shaped as desired and may be suitably finished or decorated to present a neat and pleasing appearance. If desired, however, additional wall elements may be mounted upon either the inside or the outside, or both, of the wall, which elements would then constitute the visible or exposed portions of the wall. In Fig. 2, such additional elements 17 are shown as forming the inner wall surface, the containers 10 forming the outer wall surface. In Fig. 6, the reverse arrangement is shown, the additional wall elements 17' being mounted outside of the containers 10. With this arrangement, it may be desirable to support the additional elements pivotally, for example at the lower edges, as shown, so that they may swing, somewhat in the manner of shutters, thereby permitting, when in open position, the direct impingement of the sun's rays upon the containers. These pivoted members may be of heat-insulating or radiation-preventing material, as wood, cork or the like, adapted, when closed, to prevent radiation of heat from the containers, thus conserving the heat energy acquired during the period of exposure.

Each container 10 is connected at its lower end by a pipe 18 to a pipe 19 whereby the liquid utilized, as water, may be supplied to the containers to fill them to any desired extent. Any available source of supply may be utilized, such as a connection to a city water system, such connection being shown at 20, the flow of water to the containers being controllable by a valve 21.

Each container is also connected at the upper end by a pipe 22 to a header 23 which is provided with an outlet by means of pipe 24 having a valve 25. Since the containers are entirely closed or liquid-tight, except for the connections to the upper and lower headers, the entire system may be completely filled by admission of water through the valve 21. Pipe 24 may be utilized, if desired, as a source of water supply for domestic use. Since the containers are exposed to the heat of the sun the water therein will normally be warmer than that drawn directly from the city supply system.

Additional means may be provided for employing solar radiation to heat the contents of the containers. Such means is illustrated in Figs. 4 and 5 as including a receptacle 30 suitably supported in a position to receive the sun's rays as efficiently as possible, for example by inclining it in such manner as to expose the maximum heating area. Auxiliary devices, such as reflectors 31, are arranged in such position as to intercept and direct upon the walls of the receptacle 30 the rays from a considerable area adjacent to the receptacle. Pipes 32, 33, join the upper and lower portions respectively of the receptacle 30 to the water system of the building, as by connection to the headers 23 and 19, thus providing for flow of heated liquid from the upper portion of the heater to the wall containers and of cold liquid from the containers to the heater. Any desired form of solar or other heater may be employed in this connection, the form shown being merely illustrative. It will be obvious that roof sections of the building may also be provided with wall elements of similar character either interconnected to constitute an independent circulating system or connected to the circulating system of the vertical wall portions.

In the operation of the structure it will be understood that the liquid-containing elements of the system will be exposed to the heating effect of the external atmosphere and the rays of the sun. The heat energy will be expended largely in raising the temperature of the heat-storage medium which is preferably of such character that it has a high heat capacity. For this reason, as well as by reason of its cheapness and availability, the use of water is preferred. The interconnection of the parts of the system also permits circulation of the liquid contained therein whereby the temperature of various sections of the wall portions is equalized even though they are not all exposed directly to solar radiation.

The wall elements containing the heat-storage medium act to prevent the transmission of the heat to the interior of the building, thereby serving to a certain extent as insulating means to maintain lower temperature of the interior during the day than would otherwise be produced. When the exterior temperature falls, however, as during the night, the heat stored in the system during the day becomes effective to warm the interior of the building while serving at the same time as an insulating means to prevent rapid loss of heat from the interior. As a result, fairly uniform temperature conditions may be maintained within the building notwithstanding the occurrence of relatively great variations in external conditions.

It will be understood that modifications in details of construction may be made without departing from the purpose and scope of the invention and therefore I do not wish to be limited to the specific structure herein described except as required by the language of the appended claims in view of the prior art.

I claim:—

1. A building structure comprising studding, sheet metal containers secured to said studding and constituting the main portion of the building wall, the outer wall of said containers being exposed to solar radiation and the inner wall arranged to radiate heat to the interior of the building, conduits connecting said containers in series and providing for circulation of liquid both laterally and vertically throughout said series and means for supplying liquid to said containers and withdrawing it therefrom.

2. A building structure comprising a series of containers for a heat-storage medium arranged to form the major portion of the building wall, said containers positioned to be exposed to solar radiation on the exterior of the building and to radiate the stored heat to the interior of the building, and means on the exterior of the containers adapted to prevent radiation from said containers to the exterior of the building, said means being adjustable to a position to expose said containers to the sun or to shut off such exposure.

3. A building structure comprising studding, closed containers for a heat-storage medium positioned in the spaces between said studding and constituting the main portion of the building wall, the outer wall of said containers being exposed to solar radiation and the inner wall arranged to radiate heat to the interior of the building, and conduits connecting said containers in series and providing for circulation of the medium therein both laterally and vertically throughout the series.

In testimony whereof I affix my signature.

C. F. JOHNSON.