June 28, 1949. L. A. WILLIAMS, JR 2,474,709

HEATING SYSTEM

Filed Dec. 16, 1943 2 Sheets-Sheet 1

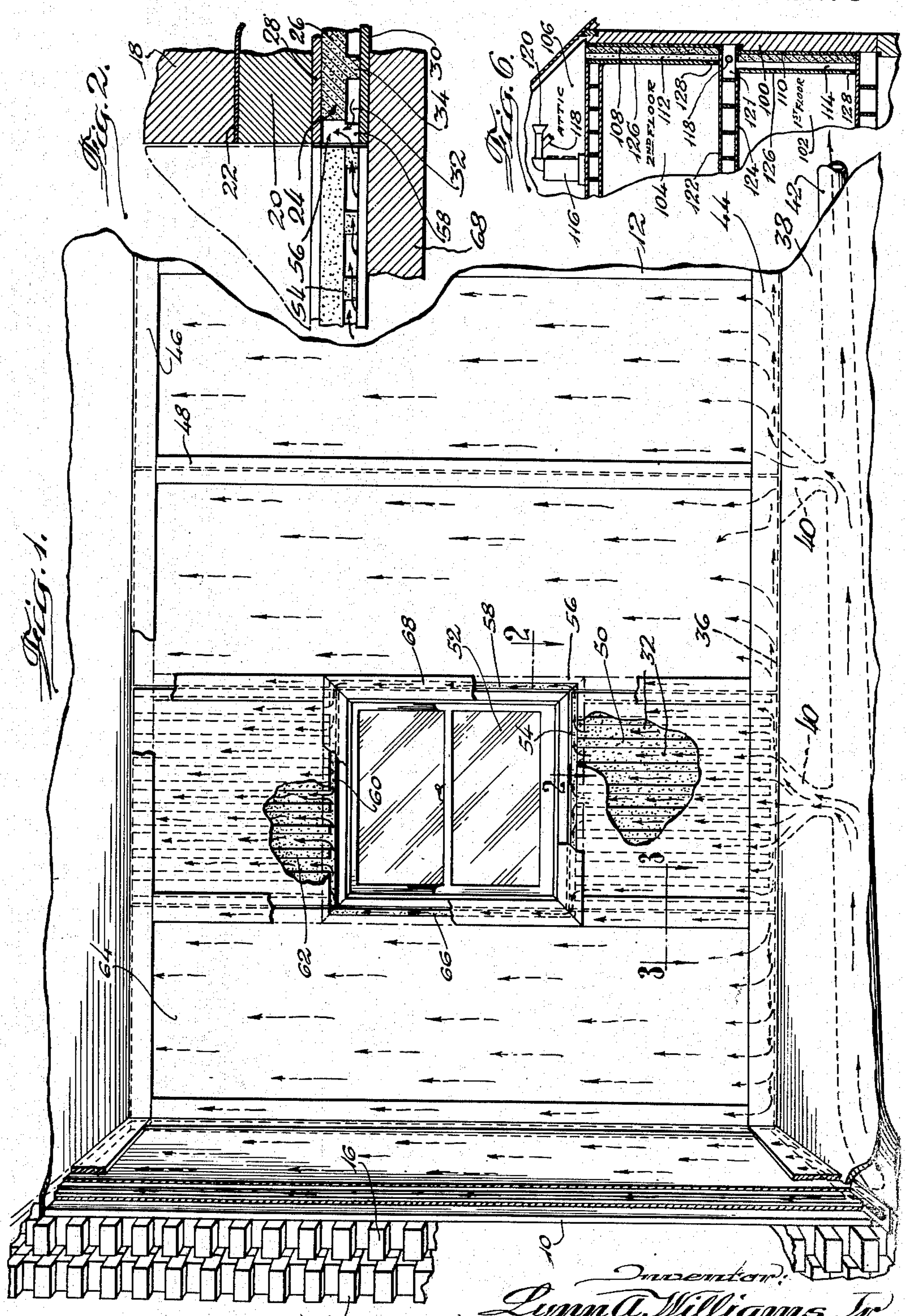

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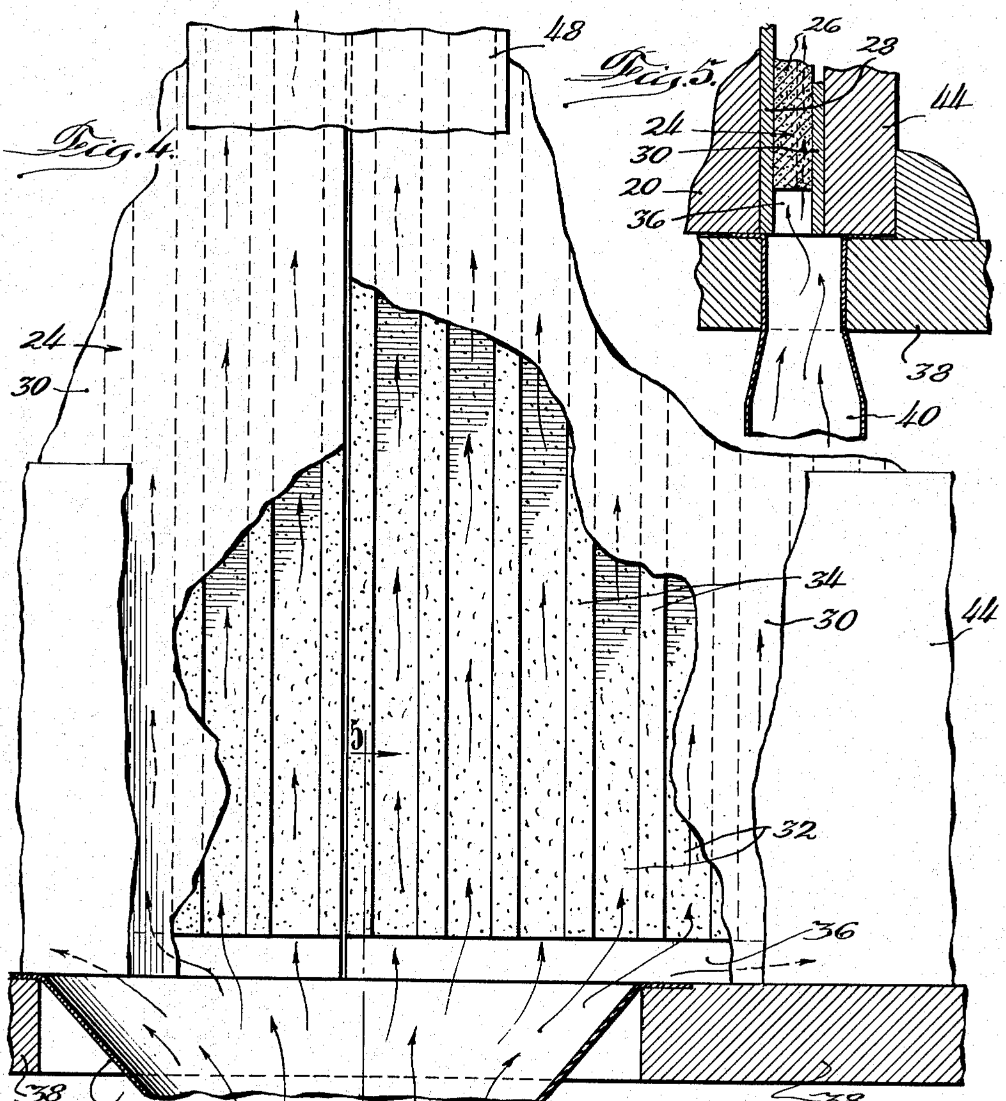
Fig. 5.

Fig. 4.



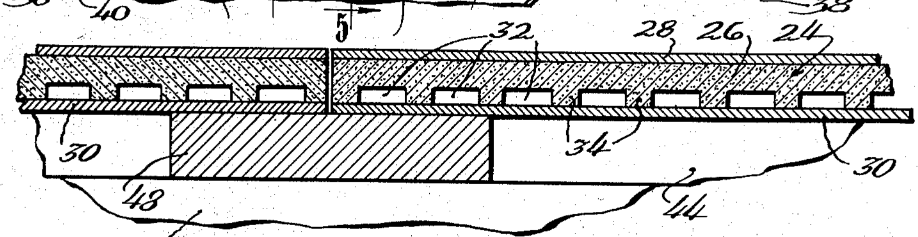


Fig. 3.

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HEATING SYSTEM

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9 Claims. (Cl. 98—31)

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My invention relates to heating systems and more particularly to hot air heating systems for homes and other buildings.

In the hot air heating systems for homes and other buildings it is now current practice to provide the rooms of the buildings with one or more inlets through which heated ventilating air is forced at a relatively high rate of flow. It is also common to provide such rooms with one or more outlets for returning cold air to the furnace for heating and recirculating. Such heating systems are objectionable in that a blast of warm ventilating air is discharged from each room outlet and this blast of air must mingle with the room air throughout the entire room in order adequately to raise the temperature of all of the air in the room.

There has been considerable controversy among architects and others interested in home heating, as to whether the outlets for the heated ventilating air should be located near the floor or ceiling of the room and both types of installations are common. In neither instance, however, is there adequate and proper distribution of the heated ventilating air throughout the room, with the result that certain portions of the room are too warm whereas other portions are too cold. An object of my invention is to overcome these difficulties with the prior art devices and to provide a heating system which affords a more uniform distribution of the heated ventilating air throughout the room.

In homes and other buildings utilizing the prior art ventilating systems, the outside walls of the room are cold and unpleasant to the touch and absorb heat from the air in the room and from people occupying the room. The portions of the room immediately adjacent exterior walls are also subject to down drafts of cold air except immediately adjacent such ventilating air outlets as may be located in these walls. Another object of my invention is to provide a heating system wherein the entire area of the exterior walls is adequately heated.

Another object of my invention is to provide a new and improved heating system which can be utilized to heat any or all of the wall areas of a room or other space.

Another object of my invention is to provide a new and improved wall board.

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Other objects and advantages will become apparent as the description proceeds.

In the drawings:

Fig. 1 is a view, partly in section, showing my heating system applied to a room of a home or other building;

Fig. 2 is an irregular section taken on the line 2—2 of Fig. 1;

Fig. 3 is a partial horizontal section taken on line 3—3 of Fig. 1;

Fig. 4 is a enlarged view of a portion of wall with parts cut away to show constructional details;

Fig. 5 is a partial vertical section taken on the line 5—5 of Fig. 4; and

Fig. 6 is a partial diagrammatic view illustrating another application of my invention.

In Fig. 1, I have illustrated a room of a dwelling or other building as having external walls 10 and 12, illustrated as comprising two layers of brick 14 and 16, two layers of wooden sheathing 18 and 20, a layer of building paper 22 interposed between the two layers of sheathing, and wall board 24 providing the internal surface of the outer walls. It will be understood that, in lieu of the brick layers 14 and 16, any other suitable construction may be utilized, such as a conventional frame wall, a stucco wall, hollow tile or other alternative building materials. The wooden sheathing 18 and 20 is also optional and may be dispensed with, if desired.

The wall board 24 is preferably formed of three layers of material comprising a central layer 26 of gypsum or other suitable material and external layers 28 and 30 of paper or other suitable material. The wall board is preferably formed in rectangular units which may be assembled to form a wall of any given size or shape and the gypsum layer 26 is provided with vertical flutes 32 which extend from the top to the bottom of each section of wall board and are separated by ribs 34. The flutes 32 form ducts for ventilating air.

When the various sections of wall board are assembled to produce the wall of a room or other space, a tool is used to cut away the lower ends of the ribs 34 of the wall board units to provide a horizontal passage 36 located just above the floor 38, as most clearly shown in Fig. 4. Heated ventilating air is supplied to the horizontal passage 36 by one or more warm air outlets 40 connected to a hot air pipe 42 leading from a furnace located in the basement or utility room of the building. Warm air from this pipe flows through the outlets 40 into the horizontal passages 36 located in the bases of the exterior walls of the room and then flows upwardly through the flutes or vertical ducts 32 formed in the wall board 24. The paper layer 30 which separates these warm air ducts 32 from the interior of the room is sufficiently porous to permit seepage of warm air therethrough into the interior of the room so that substantially the entire exterior wall area of the room affords a porous surface through which warm ventilating air seeps into the room and mingles with the air therein.

An attractive interior finish for the walls of the room may be provided by supplying a paneled effect for these walls by means of a base board 44, a moulding 46 and connecting strips 48, which cover the joints between adjacent sections of wall board. The inner layer 30 of the wall board may be colored or provided with any desired design to enhance the attractiveness of the room. If this layer is covered with a heavy coat of paint, permeability of this layer to the passage of air therethrough may be affected to such an extent that small holes on the order of pin holes should be made in the wall board layer 30 just beneath the moulding 46 to facilitate the flow of ventilating air from the flutes or ducts 32 into the interior of the room. Such pin holes would be imperceptible or substantially so and would not detract from the appearance of the room.

It will be understood, of course, that the wall board sections must be cut to fit around windows, doors, chimneys, and other interruptions to the wall area and, in Figs. 1 and 2, I have illustrated a preferred manner of insuring a supply of ventilating air to the section of wall board located above a window. The upper end of the wall board section 50 below the window 52 has the upper ends of its ribs 34 cut away to provide a horizontal passage 54. Referring to Fig. 2, it will be seen that that portion of the wall board section 56 which is at one side of the window 52 has a portion of its central layer 26 cut away to provide a vertical passage 58 communicating with one end of the horizontal passage 54. The upper end of the passage 58 also communicates with a second horizontal passage 60 formed by cutting away the lower ends of the ribs 34 of the section of wall board 62 located above the window.

That part of the section of wall board 64 located on the other side of the window has its central layer cut away to provide a vertical passage 66 corresponding to the vertical passage 58 in wall board section 56. The vertical passage 66 also connects horizontal passages 54 and 60 so that the ventilating air may flow from the flutes of the lower wall board section 50 beneath the window, up each side of this window, and into the corresponding ducts in the wall board section 62 above this window, as clearly indicated by the arrows in Figs. 1 and 2. The window frame may be finished with a moulding 68 which matches with the paneling of the wall, or the moulding 68 may be of any other size or design.

While it is particularly advantageous to apply my novel heating system to the exterior walls of a room, in some instances, it may be advisable to construct the interior walls of my fluted wall board and to supply ventilating air to these interior walls as well as to the exterior walls. I have shown no return ducts for conducting cold air from the rooms to the heating plant, but any usual or known arrangement of return ducts or other means for returning cool air from the rooms to the heating plant may be provided. It is usual in present hot air heating systems to mix a certain amount of fresh air with the recirculated air and also to add moisture to this air, and it is to be understood that any heating system embodying my invention may incorporate these features.

In the summertime, cool air is sometimes circulated through the ducts of the heating system in order to cool the rooms of a house or other building and means is sometimes provided for chilling this air. My novel heating system may also be utilized for circulating atmospheric air or artificially cooled air, as desired and has the advantage of eliminating the blasts of cold air formed by the prior art systems. My system has the further advantage of directly cooling the exterior walls and preventing them from radiating heat into the room.

While it is more common to locate the furnace or other heater in the basement of a building or in a utility room usually on the ground floor, it is sometimes desirables to locate the heater in the attic of a building. When the heater is located in the attic, it may be preferable to supply hot air to the upper ends of the wall ducts under sufficient pressure to cause a slow downward movement of the heating and ventilating air in these ducts. Such an arrangement could be a reversal of that shown in Fig. 1, with the horizontal passage 36 located at the upper ends of the ducts and connected to the heater by piping similar to the piping 42 and outlets 40. Where the porosity of the paper layer 30 is insufficient to provide adequate seepage of air into the room, small openings connecting the lower ends of the ducts with the interior of the room just above the floor board could be provided. In some instances, it would be preferable to rely solely upon such small openings and, under these circumstances, the layer 30 which separated the ducts from the interior of the room could be formed of any suitable impervious material.

In Fig. 6, I have shown a modification of the last described arrangement wherein there is illustrated a two-story building having an external wall 100, a first floor room 102, a second floor room 104 and an attic 106. The wall 100 may be of any suitable construction and preferably includes a water-proof outer sheathing of brick, wood or other suitable material, heat insulation or means for providing an insulating space, and inner portions 108 and 110 formed of my novel wall board or otherwise designed to provide vertical heating ducts 112 and 114 having a total area occupying a large proportion of the total area of the wall.

The heating ducts 112 of that portion of the inner wall 108 communicate at their upper ends with the attic 106 which forms a plenum chamber for supplying the upper ends of these ducts with hot air. The attic is supplied with hot air by a heater 116 which discharges hot air into the attic chamber 106 through a hot air outlet 120. This heater 116 also supplies hot air through a pipe 118 to the space 121 formed between the floor 122 of the second floor room 104 and the ceiling 124 of the first floor room 102. The upper ends of the ducts 114 are in open communication with the space 121 and are supplied with heated air therefrom. Where the porosity of the material 126 separating the ducts 112 and 114 from the interior of the rooms 102 and 104 is insufficient to provide adequate seepage of air into these rooms, the lower ends of the ducts may connect with the interiors of the rooms through small openings 128. Where the material 126 is impervious to the passage of air therethrough, all air flowing in the ducts 112 and 114 may enter the rooms through the openings 128 communicating with the lower ends of these ducts.

In that form of my invention shown in Fig. 6, it is convenient to locate the heater 116 in the attic but this is not essential and the heater may be located in any other suitable space. It is to be understood that any usual or suitable arrangements may be made for recirculating the heating and ventilating air, as herein above referred to in the description of the embodiment of Figs. 1 to 5, inclusive.

While I have illustrated and described only a few embodiments of my invention, it is to be understood that my invention may assume numerous other forms, and includes all modifications, variations, and equivalents coming within the appended claims.

I claim:

1. In a heating system, the combination of a side wall of a room comprising a plurality of wall board units each having a body portion in the form of a continuous unbroken sheet having a series of vertically extending ribs in slightly spaced relation to each other on the inner face of the sheet, a second sheet composed of porous material secured to the faces of said ribs so as to provide a plurality of independent ducts extending substantially throughout the height of the room between the ribs and adapted to carry ventilating air therethrough and to permit such ventilating air to seep out slowly through the porous sheet into the room, and means for delivering heated ventilating air to said ducts for escape into the room.

2. In a heating system, the combination of a side wall of a room comprising a plurality of wall board units each having a body portion in the form of a continuous unbroken sheet having a series of vertically extending ribs in slightly spaced relation to each other on the inner face of the sheet, a second sheet composed of porous material secured to the faces of said ribs so as to provide a plurality of independent ducts extending substantially throughout the height of the room between the ribs and adapted to carry ventilating air therethrough and to permit such ventilating air to seep out slowly through the porous sheet into the room, means providing a horizontally extending duct at the lower edge of said wall communicating with said vertically extending ducts, and means for delivering heated ventilating air to said horizontally extending duct for movement into said vertically extending ducts for escape into the room through the porous face of the ducts.

3. In a heating system, the combination of a side wall of a room comprising a plurality of wall board units each having a body portion in the form of a continuous unbroken sheet having a series of vertically extending ribs in slightly spaced relation to each other on the inner face of the sheet, a second sheet composed of porous material secured to the faces of said ribs so as to provide a plurality of independent vertically extending ducts between the ribs adapted to carry ventilating air therethrough and adapted to permit such ventilating air to seep out slowly through the porous sheet into the room, the end portions of the ribs being cut away at both the top and bottom edges of certain of said wall board units for providing transverse ducts connected with said vertically disposed ducts whereby ventilating air fed in through one of said transverse ducts may pass through the vertically disposed ducts and escape through the other transverse duct, and means for delivering heated ventilating air to one of said transverse ducts for the escape of a portion of the air through the other transverse duct and of another portion of the air through said porous second sheet into the room.

4. In a buiding construction, the combination of a side wall for a room comprising a plurality of wall board units each having a series of ventilating ducts extending vertically therethrough in slightly spaced relation to each other with face portions of the ducts at the inside face of the wall composed of porous material adapted to permit ventilating air to seep out into the room from substantially the entire area of the wall, means for delivering ventilating air to said ducts along one horizontal edge of the wall, and means for closing the ends of the ducts along the other horizontal edge of the wall.

5. In a building construction, the combination of a side wall for a room comprising a plurality of wall board units each having a series of ventilating ducts extending vertically therethrough in slightly spaced relation to each other with face portions of the ducts at the inside face of the wall composed of porous material adapted to permit ventilating air to seep out into the room from substantially the entire area of said wall, means for delivering heated ventilating air to the lower end portions of said ducts, and means for closing the upper end portions of said ducts.

6. In a heating system for a building, the combination of the side wall of a room having a window therein, said wall comprising a plurality of wall board units above and below the window and at opposite sides thereof and each having a series of ventilating ducts extending vertically therethrough in slightly spaced relation to each other and with the face portions of the ducts at the inside face of the wall composed of porous sheet material adapted to permit ventilating air to seep out into the room, means including intercommunicating longitudinally extending ducts above and below said window for establishing communication between the vertically extending ducts in the board portion below the window and the vertically extending ducts in the board portion above the window, means for closing the ends of the vertically extending ducts at the upper edge of the room wall, and means for delivering heated ventilating air to the lower end portions of all of said vertical ducts.

7. A heating system for a room having a ceiling, floor and wall, said wall comprising a plurality of wall board units each having a body portion in the form of a continuous unbroken sheet having a series of vertically extending ribs in slightly spaced relation to each other on the inner face of the sheet, a second sheet composed of porous material secured to the faces of said ribs so as to provide a plurality of independent ducts extending substantially throughout the height of the room between the ribs and adapted to carry ventilating air therethrough and to permit such ventilating air to seep out slowly through the porous sheet into the room,

and means for supplying heated air to the upper ends of said ducts.

8. A heating system for a building having two floors, an attic, and side walls for said two floors, said walls comprising a plurality of wall board units each having a body portion in the form of a continuous unbroken sheet having a series of vertically extending ribs in slightly spaced relation to each other on the inner face of the sheet, a second sheet composed of porous material secured to the faces of said ribs so as to provide a plurality of independent ducts extending substantially throughout the height of the side walls between the ribs and adapted to carry ventilating air therethrough and to permit such ventilating air to seep out slowly through the porous sheets, the vertical ducts in the walls of the upper floor being in open communication at their upper ends with said attic, means providing a space in open communication with the upper ends of the ducts in the walls of the lower floor, and means for supplying conditioned air to the attic and to the open space in communication with the upper ends of the ducts in the walls of the lower floor for passage into the ducts in the walls of said two floors.

9. A heating system for a building including a room having side walls and an attic space above said room, said side walls comprising a plurality of wall board units each having a body portion in the form of a continuous unbroken sheet having a series of vertically extending ribs in slightly spaced relation to each other on the inner face of the sheet, a second sheet composed of porous material secured to the faces of said ribs so as to provide a plurality of independent ducts extending substantially throughout the height of the room between the ribs and adapted to carry ventilating air therethrough and to permit such air to seep out slowly through the porous sheet into the room, said attic providing a plenum space communicating with said ducts and forming a source of heated air for said ducts, and means for supplying heated air to said attic space.

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