March 23, 1937. W. C. COULTON 2,074,370

AIR CONDITIONING AND VENTILATION OF HOUSES

Filed April 16, 1935 6 Sheets-Sheet 1

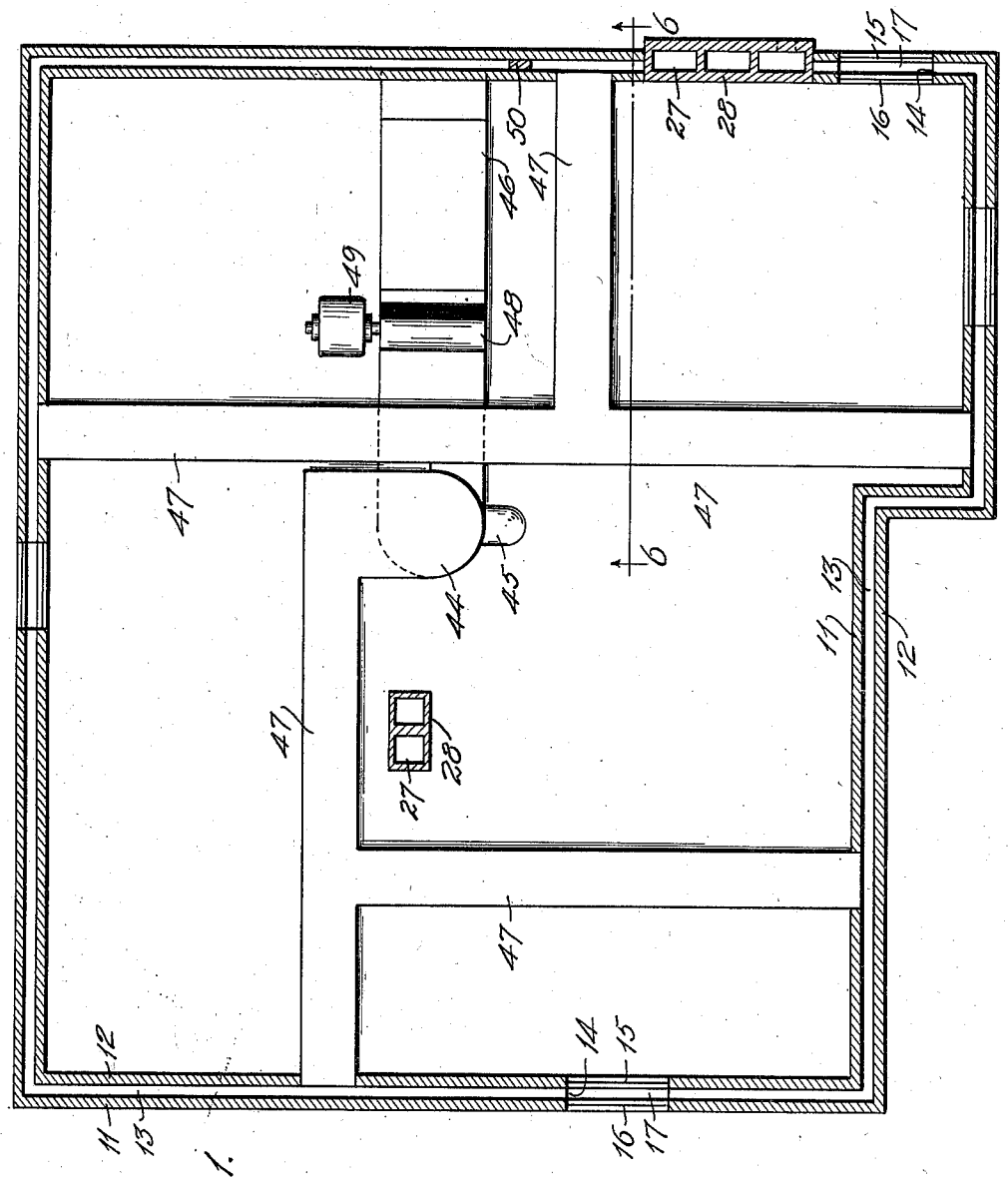


Fig. 1.

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AIR CONDITIONING AND VENTILATION OF HOUSES

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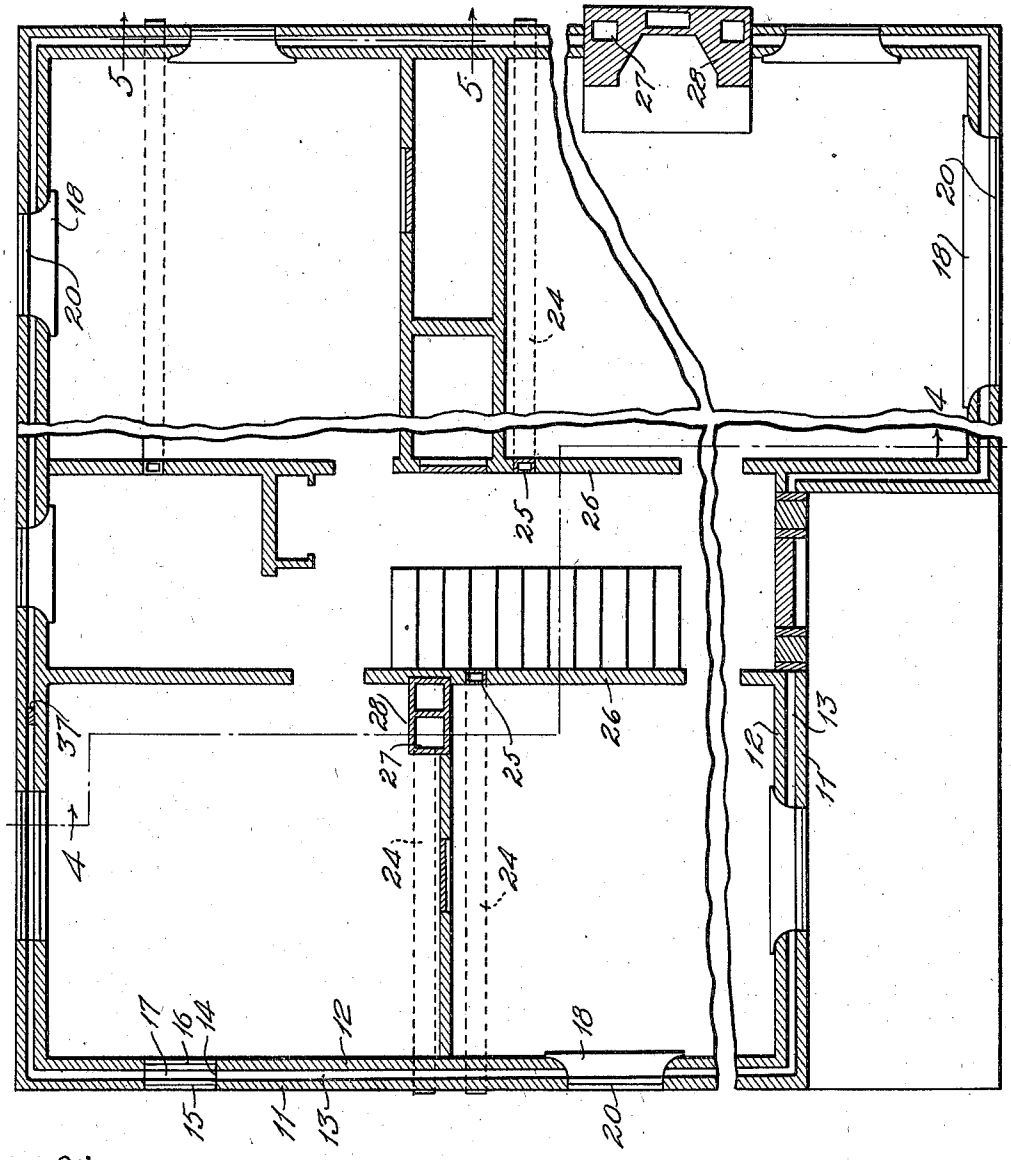


Fig. 2.

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AIR CONDITIONING AND VENTILATION OF HOUSES

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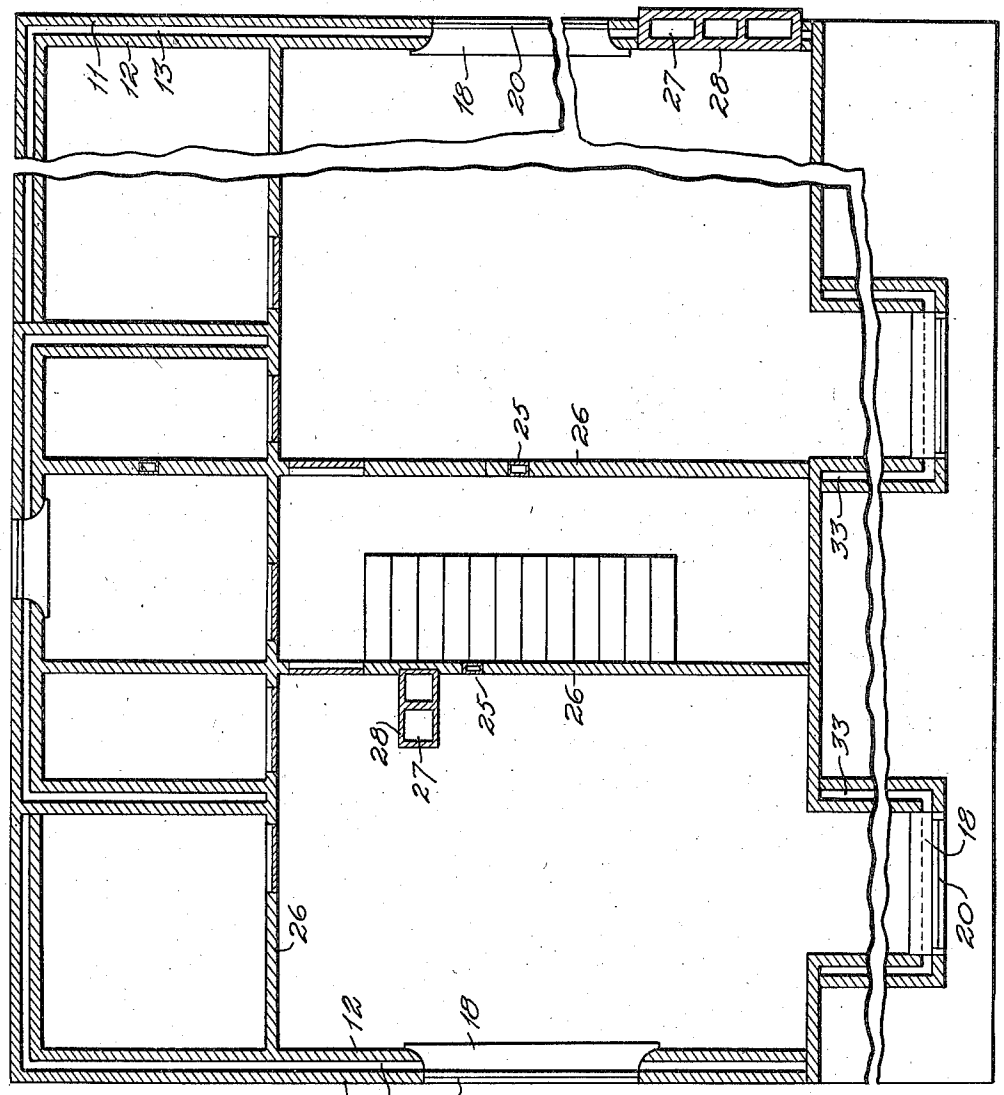


Fig. 3.

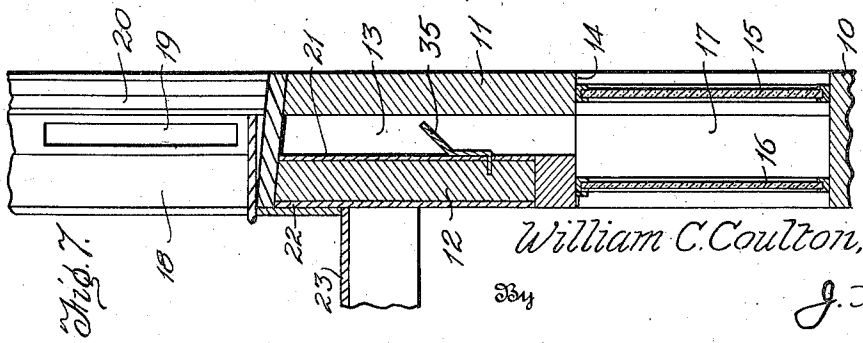


Fig. 7.

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AIR CONDITIONING AND VENTILATION OF HOUSES

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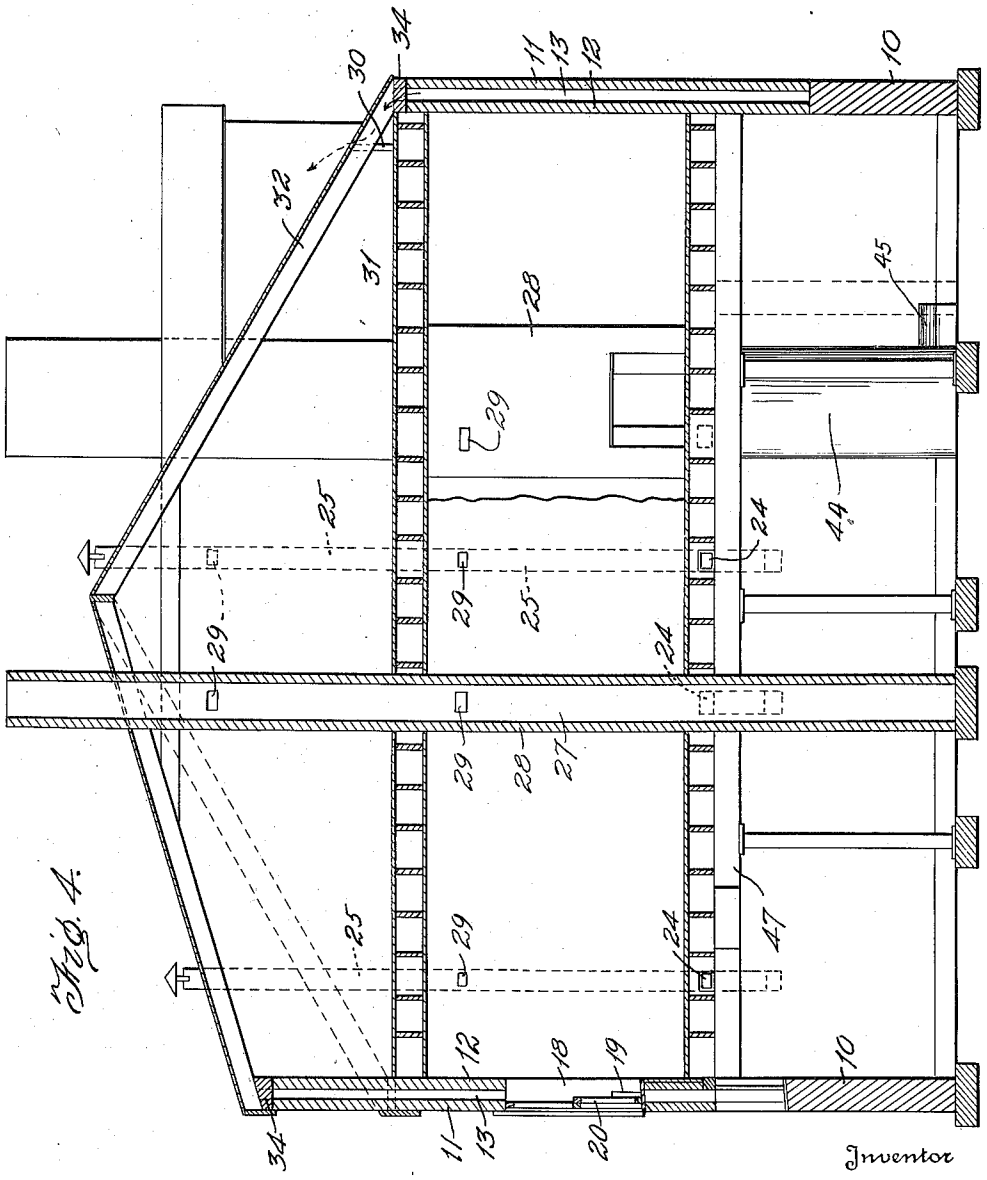


Fig. 4.

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AIR CONDITIONING AND VENTILATION OF HOUSES

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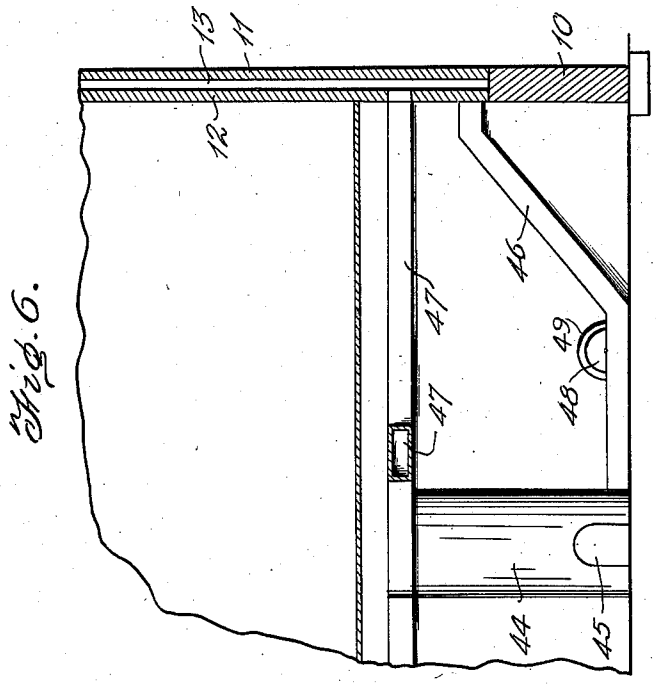


Fig. 6.

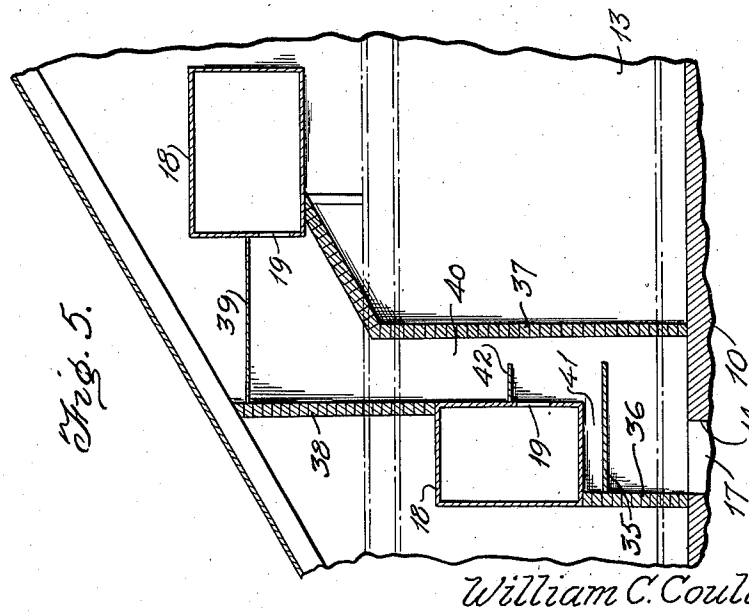


Fig. 5.

Inventor

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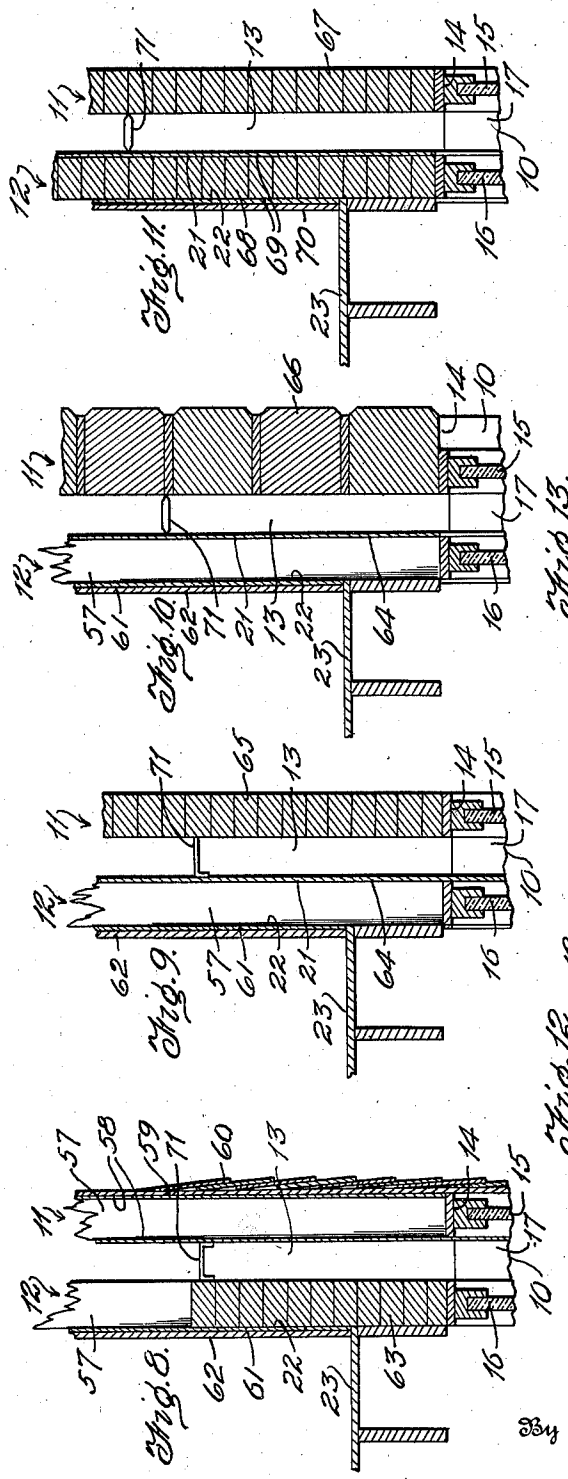
By J. Hanlan

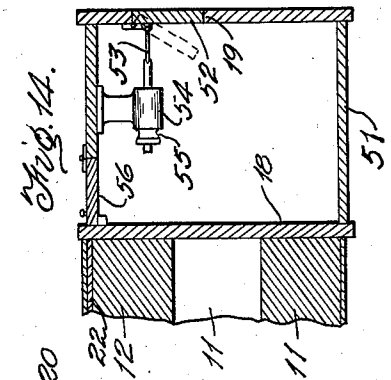
Attorney

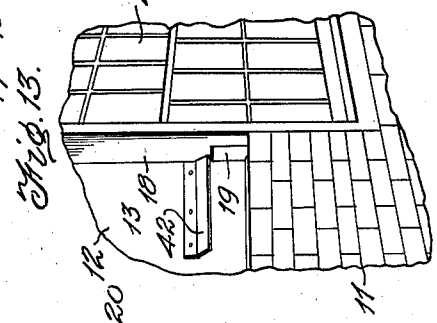
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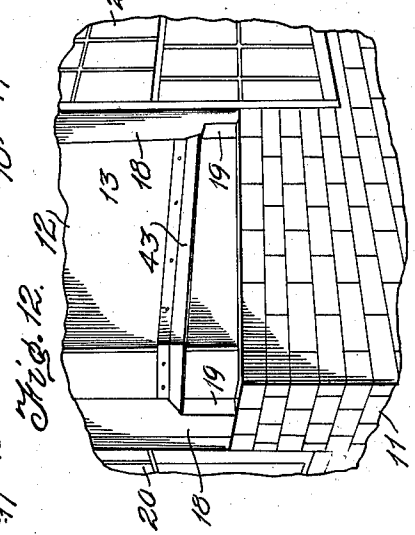
AIR CONDITIONING AND VENTILATION OF HOUSES

Filed April 16, 1935 6 Sheets-Sheet 6









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Patented Mar. 23, 1937

2,074,370

UNITED STATES PATENT OFFICE

2,074,370

AIR CONDITIONING AND VENTILATION OF HOUSES

William C. Coulton, Medford, Mass., assignor, by mesne assignments, of one-eighth to Albert A. Stearns, Brooklyn, N. Y., and Benjamin Lichterman, New York, N. Y.

Application April 16, 1935, Serial No. 16,727

5 Claims. (Cl. 98—31)

This invention relates to the air conditioning of buildings and has special reference to a method of and construction for air conditioning the air within a building.

The invention also relates to improvements in the construction shown and described in my copending application for patent on Ventilation of houses, filed September 29, 1934, Serial No. 746,193.

In air conditioning there are two important factors. These are the establishment and maintenance of a proper moisture content in the air within a building and also the establishment and maintenance of proper temperature in such air.

The first of these factors is highly important since air deficient in moisture is not only injurious to furniture and the like by causing cracking of wood work, peeling of veneers and drying out and loosening joints but is also injurious to the health of occupants of the building. Recently many attempts have been made to insure proper moisture content in the air within a building by the employment of more or less elaborate machinery to cause absorption of moisture from some source in the air of a building or room. Such machines not only have a high first cost but entail constant expense for power, water and maintenance. An older means for the purpose of supplying air with moisture was used in connection with hot air heaters, the arrangement being the placing of a pan of water in such position that air either entering or leaving the heater would flow over such water. While this last method was free from the objections connected with the use of air conditioning machines, since no power or moving machinery was required, it was inadequate to accomplish any satisfactory result since the area of the water surface was necessarily so limited that little moisture would be absorbed by the air flowing over the water.

One important object of the present invention is to provide a novel building construction which in itself, without the use of any moving mechanism, effects proper absorption of moisture in the air used within the building.

In this construction it is to be noted that such building materials as brick and other unglazed clay products, stone, cement and the like have the property, through their porous nature, of readily absorbing and holding a very considerable weight of water in proportion to the weight of the material used. Also because of the manner in which such material tends to retain its moisture, such material takes a long time to dry. If, now, a large relatively thin wall of such material be exposed on face to moisture, such as may be obtained by the formation of dew or the impact of rain, the entire wall will become damp. If a thin sheet of air be caused to flow over one face of such a damp wall, the material will lose moisture which will be absorbed by the flowing air.

A second important object of the invention is to provide an improved method of insuring proper moisture content in the air entering a building which consists in causing the air to flow over a large superficial area of damp masonry prior to entering the building.

It is a well known law that warm air expands and rises while cooler air contracts and falls. It is also a well known law that if relatively warm air flows over a relatively cool moist surface a portion of the latent heat of the air will be given off in effecting evaporation of the moisture so that the air will cool and tend to fall. If a wall be constructed with an air space between its outer and inner sides and the wall of one side of the air space be relatively cool and damp, and if relatively warm air be admitted at one or more points at the bottom of such wall, the admitted air will flow up from the points of admission, absorb moisture, spread laterally at the upper part of the air space and fall. Also, if provision is made for the constant admission of air at the lower points and openings for escape of air being provided above the admission point or points, the admitted air will rise, absorb moisture and escape through the upper openings. Thus, if such a wall be the wall of a building and the admission opening communicates with the outer atmosphere while the upper openings open into the building, the outer air will, without the intervention of machinery, automatically flow through such air space, become moist or vice versa and flow into the building thereby conditioning the air in the building so far as moisture content is concerned.

A third important object of the invention is to construct an improved building with a hollow wall one of the confronting faces of which constitutes an air moistener and to provide means whereby air may flow automatically from the outer atmosphere through the space in said wall and into the building thus forming in effect a chimney or flue.

In the cooler part of the year it is also necessary that the air within a building be kept warm as well as moist.

A fourth important object of the invention is to provide means whereby a portion of the air within the wall space may be withdrawn, heated and then returned to such air space to mix with the re-

maining air in the space and thus warm it so that it may absorb moisture and be delivered to the building in a warm and moist condition.

In cold climates trouble is caused by the sweating or collection of frost on the windows, this being due to the deposit of moisture from the air in the building and the freezing of the moisture on the glass.

A fifth object of the present invention is to cause the warm air entering the building to flow across the window while it is still warm so that the window glass will be kept warm and free from frost or sweating.

With the above and other objects in view, the invention consists in general of a novel method of conditioning the air in a building and of means to effect such air conditioning consisting of certain novel details of construction and combinations of parts hereinafter fully described, illustrated in the accompanying drawings and specifically claimed.

In the accompanying drawings, like characters of reference indicate like parts in the several views, and:—

Figure 1 is the basement plan of a house constructed in accordance with this invention.

Figure 2 is a first floor plan thereof.

Figure 3 is a second floor plan thereof.

Figure 4 is a section on the line 4—4 of Figure 2.

Figure 5 is a detail section on the line 5—5 of Figure 2.

Figure 6 is a detail section on the line 6—6 of Figure 1.

Figure 7 is an enlarged typical vertical detail section through a basement and first floor window as constructed in accordance with this invention.

Figure 8 is a detail section through part of the building wall of a building of frame construction.

Figure 9 is a view similar to Figure 8 but showing a building with a brick outer wall.

Figure 10 is a view similar to Figure 8 but showing a building with an outer wall of stone.

Figure 11 is a view similar to Figure 8 but with both inner and outer walls of fireproof material.

Figure 12 is a perspective view of one arrangement of baffle for directing air to the outflow openings.

Figure 13 is a perspective view of a second arrangement of such a baffle.

Figure 14 is a semi-diagrammatic view of an arrangement for controlling the flow of air into the building by humidostatic means.

In order to afford a concrete example of the application of this invention there has been shown in the present drawings a design for a residence equipped with the invention. It is to be most clearly understood, however, that the invention is not confined to these or any other residence designs or even to residences in general since the invention may be utilized for effectively air conditioning not only residences but stores, office buildings, apartments, hotels, factories and in fact any type of building. Obviously, with buildings of different design the detail arrangements may differ while the general principles of the invention remain unchanged. It is therefore to be understood that the present disclosure is only one of a multitude of forms in which the invention may be embodied.

In the embodiment of the invention as herein shown the building is provided with the usual foundation walls 10 wherein is erected the main or outside building wall which, for the purposes of this invention is a hollow wall having an outer wall 11 and an inner wall 12. These walls are spaced throughout to form an air space 13 between the walls and, except for the door and window openings the air space extends all through the side walls of the house. At suitable places in the foundation wall there are provided window openings 14. In each of these openings there is fitted an outer window 15 and an inner window 16, these windows being spaced similarly to the walls 11 and 12. The outer window 15 is fitted to be removable from the window opening as desired and the inner window 16 may be of the ordinary hinged type. The space 17 between the windows 15 and 16 opens upwardlly into the bottom of the space 13. With this construction the air from the outside of the building may be permitted to enter the lower end of the space 13 at desired points by removing or opening desired outer windows 15. Above the basement the window openings are fitted with frames 18 which span the space between the walls 11 and 12 and each of these window frames is provided with a vent opening 19 located inwardlly of the usual sash 20 so that air issuing from the vent will pass into the room. Preferably the vents 19 are located low down on one of the frame sides so that air issuing from the vent will flow across the lower part of the window and, if warmer than the rest of the air in the room, will rise up close to the sash so that the glass of the sash is kept warm. The advantage of this will be presently understood. One of the walls 11 and 12 is constructed in such manner that it will readily absorb moisture so that during rainy weather or in the early hours of the morning when dew is formed such wall will absorb the moisture.

With a large moist area such as is formed by the wall surface a very considerable amount of moisture will be absorbed by a thin sheet of air flowing over such wall surface. Various constructions of wall may be used for this purpose, examples of which are shown in Figures 8 to 11 inclusive but for the purpose of general explanation reference will be had to Figure 7 in which it will be assumed that the wall 11 is of moisture absorbing character. Preferably the wall 12 is provided on the face next to the wall 11 with insulation 21 and on its inner face with insulation 22 which, above the first floor 23 may be coated with plaster or other suitable material. Then, if the air within the building be deficient in moisture content and the window 15 be removed or opened, the atmospheric air will flow up through the air space, absorb moisture from the wall 11 and pass into the building through the opening 19. If, on the contrary, there be too much moisture in the air a portion of the moisture content will be absorbed by the wall 11 so that the air entering the building through the opening 19 will have its moisture content lowered. To permit fresh air to enter the building it is of course necessary that some of the air already in the building be allowed to escape. To this end, flues 24 are led in from the outer walls of the building and may connect at their inner ends to vertical flues 25 housed in the partition walls 26 or to the flues 27 formed in the chimneys 28. Just below each floor of the building these flues 25 and 27 are provided with openings 29 so that exhaust air may enter the flues and thus be conducted upwardly to the atmosphere above the roof of the building.

Where dormer windows are used in the design the side walls and front wall below each window are provided with air spaces like the main outer

walls as shown in Figures 3 and 4. Also, a wall 30 (Figure 4) may cut off a part of the space above the second floor 31 and beneath the eaves of the roof 32 so that this cut off space forms a passage connecting the air space 13 of the main outer wall with the air space 33 of the dormer wall, the wall plate 34 being provided with suitable openings for this purpose and the air following the course of the arrows in Figure 4 at this point. It is to be noticed that the wall plates preferably cover the top of the space 13.

In order to eliminate the dust which may enter with the air, there is provided above each of the basement windows which are used to admit air to the space 13, a baffle 35 which extends horizontally across the window space.

Under certain conditions it is desirable to cause a certain portion of the air in the space 13 to flow to a particular opening or a particular set of such openings. The manner in which this is accomplished is illustrated in Figure 5. As there shown the space 13 is crossed by a partition 36 which extends up from the foundation 10 to the frame 18 of a first floor window, this partition being beneath one side of the frame. Spaced from the other side of this frame 18 is a second partition 37 which extends vertically upward from the foundation 10 and there diagonally to terminate beneath the frame 18 of a second story window. A third partition 38 extends upward from the side of the first floor window frame 18 nearer the partition 37 and a partition 39 extends horizontally from the upper part of the partition to the second floor window frame above its opening 19. Thus a flat flue 40 leads upward from the foundation opening past the two window frames to form a restricted air path for these windows. In this case the baffle 35 extends from the partition 36 and terminates short of the partition 37 so that a dead air space 41 is formed between the baffle 35 and the bottom of the first floor window frame 18. In order to properly deflect a portion of the air through the first floor opening 19 a baffle 42 extends from the frame 18 above the opening 19 of that frame. Where two windows are on the same level but at right angles to each other as in Figure 12 a baffle 43 may extend around the angle of the wall from one frame 18 to the other. Also a baffle 42 may be used in connection with any opening 19 as shown in Figure 13, such baffle preferably having the end remote from the frame 18 lower than the end at the window.

For supplying heat in cold weather an ordinary hot air furnace 44, preferably equipped with an oil burner 45, is installed in the basement. From the bottom of the air space 13 a flue 46 leads to the bottom of the furnace air space. From the top of the furnace air space or dome extend flues 47 which lead to the several wall sections of the outer building wall to communicate with the air space 13 at such selected points as will effect uniform or desired distribution of heat in such space. In order to insure proper flow of air through the heater there is provided in the flue 46 a blower 48 which is driven by a suitable motor 49. The flue 46 is preferably separated from any adjacent flue 47 by a partition spanning the air space 13 so that the warm air from the flue 47 will not be drawn directly back into the flue 48.

In order to control the flow of air from the openings 19 an arrangement such as is shown at Figure 14 may be utilized. As here shown there is provided in the window frame a hollow side frame 51 wherein the opening 19 is located. In the opening 19 is fitted a hinged door 52 which is connected by a link 53 with an adjustable humidostat 54 having an adjusting nut 55. A door 56 is provided so that one may insert his hand to adjust the humidostat. Thus, the air flowing through the opening 19 is regulated in accordance with the desired humidity of the air in the building.

Considering now some of the various types of wall construction which may be used in carrying out this invention it will be seen in Figure 8 that an all frame construction may be used. In such construction the outer wall 11 and inner wall 12 each have a row of scantlings 57. Both faces of the outer row are covered with insulation 58. On the outer insulation 58 is laid the sheathing 59 which is covered by clapboards, shingles or the like as at 60. On the inner face of the inner row of scantlings 57 is fixed an insulating sheet 61 on which is laid a suitable finish 62 such as plaster or the like. Between the scantlings 57 of the inner row is a filling 63 of moisture absorbing material such as brick or the like. In Figures 9 and 10 the inner wall 12 is the same as in the form shown in Figure 8 except that the filling 63 is omitted and the air space face of this row of scantlings is covered with sheet insulation 64. In Figure 9 the outer wall 11 is made of brick 65 and in Figure 10 this outer wall is shown as made of stone or cement blocks 66. In Figure 11 the outer wall is of fireproof material such as brick 67 and the inner wall is made of brick or tile 68 insulated on both sides as at 69 and having the room side suitably finished as at 70. In each of these forms the inner and outer walls are connected by ties 71.

In all of the forms here shown the passage of the air through the air space 13 will effectually condition the air so that when it flows into the building the entire air content of the building will be conditioned and it will be observed that the conditioning of the air is effected by causing a thin sheet of air to travel over the surface of a large area of moisture absorbing material before it is introduced into the building.

There has thus been provided a highly efficient construction and method of the kind described and for the purpose specified and it is to be noted that this construction and method are not to be restricted to the particular constructions here described and shown but are to be fully commensurate with the appended claims.

What is claimed is:—

1. In building construction, a double outside wall including an outer wall, an inner wall composed at least in part of moisture absorptive material on the side facing said outer wall, the remainder of said inner wall being impervious to moisture, said inner wall being spaced from the outer wall to provide an air circulation space between the walls, means to admit atmospheric air to the lower part of the space between said walls, means to permit air to pass from said space into the interior of the building, means to draw air from said circulation space, and means to heat the drawn off air and return it to the air space between said walls.

2. In building construction, a hollow outside wall including an outer wall, an inner wall parallel to the outer wall and spaced to leave an air circulation space between the inner and outer walls, one of said walls including moisture absorptive material, means to admit air to the lower part of the space between said walls, means

to permit air to pass from said space into the interior of the building, windows in said wall having frames spanning said air space, said frames being each provided on the inner side of its window with an opening communicating with said air space, and baffles in said air space directing air to the said openings.

3. In building construction, a hollow outside wall including an outer wall, an inner wall parallel to the outer wall and spaced to leave an air circulation space between the inner and outer walls, one of said walls including moisture absorptive material, means to admit air to the lower part of the space between said walls, means to permit air to pass from said space into the interior of the building, windows in said wall having frames spanning said air space, said frames being each provided on the inner side of its window with an opening communicating with said air space, and partitions spanning said air space to direct the air in the space along definite paths to the several openings.

4. In a building construction, a hollow outside wall including an outer wall, an inner wall parallel to the outer wall and spaced to leave an air circulation space between the inner and outer walls, one of said walls including moisture absorptive material, means to admit air to the lower part of the space between said walls, means to permit air to pass from said space into the interior of the building, windows in said wall having frames spanning said air space, said frames being each provided on the inner side of its window with an opening communicating with said air space, baffles in said air space directing air to the said openings, and partitions spanning said air space to direct the air in the space along definite paths to the several openings.

5. In building construction a hollow outside wall including an outer wall, an inner wall parallel to the outer wall and spaced to leave an air circulation space between the inner and outer walls, one of said walls including moisture absorptive material on the side facing the other wall, means to draw air from the lower part of said air space, means to heat the drawn off air, means to return the heated air to said air space at selected points thereof, and baffle means in said air space positioned to prevent direct flow of the heated air to the point at which it is drawn from said space.

WILLIAM C. COULTON.