No. 645,813. Patented Mar. 20, 1900.

W. H. HORMEL.

SYSTEM OF HEATING AND VENTILATION.

(Application filed Mar. 17, 1898.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 2.

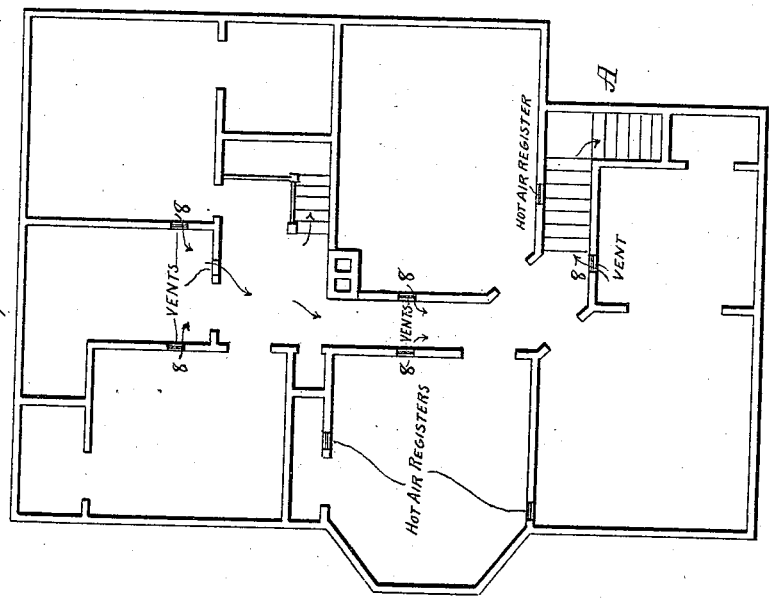
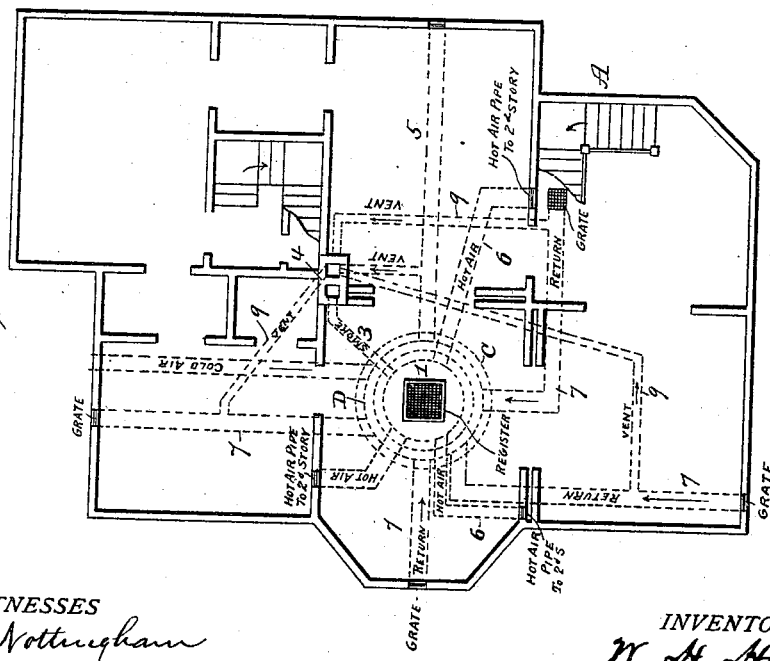


Fig. 1.



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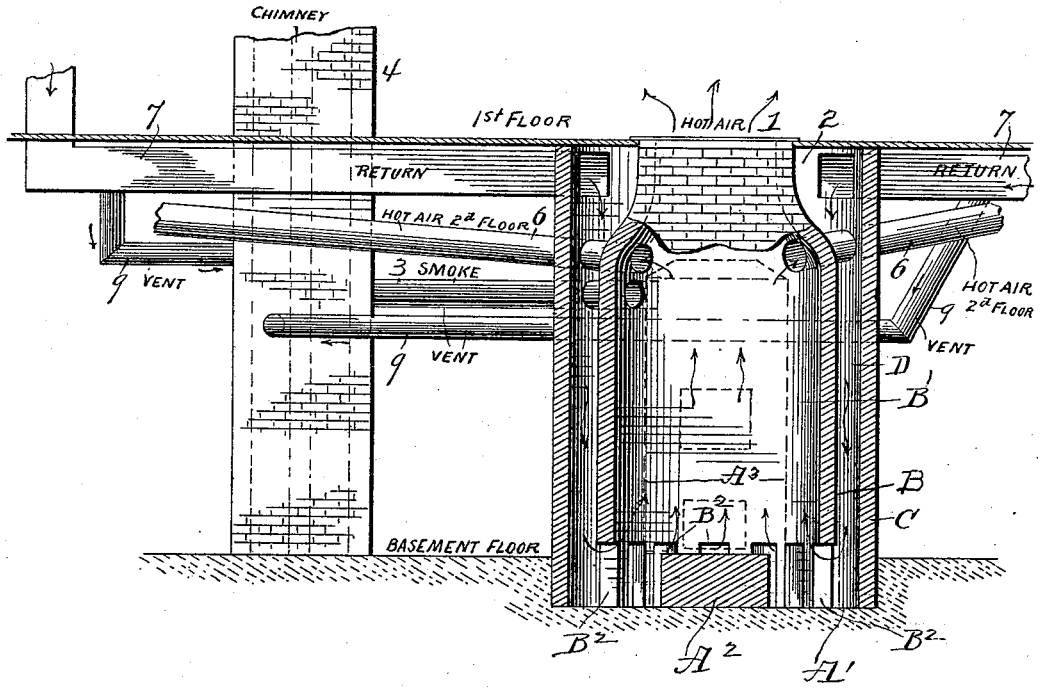

Fig. 3.

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UNITED STATES PATENT OFFICE.

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SYSTEM OF HEATING AND VENTILATION.

SPECIFICATION forming part of Letters Patent No. 645,813, dated March 20, 1900.

Application filed March 17, 1898. Serial No. 674,216. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. HORMEL, a resident of Austin, in the county of Mower and State of Minnesota, have invented certain new and useful Improvements in Systems of Heating and Ventilation; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improved system of heating and ventilating buildings, one object of the invention being to insure a full and free circulation of air adequate to the generating capacity of the furnace.

A further object is to insure the conservation of the heat generated by the furnace.

A further object is to provide a convenient and effective system of ventilation.

A further object is to establish a heating and ventilating system which will result in an actual saving of fuel and heat, so as to afford a temperature which shall be equalized in all parts of the rooms heated and by means of which to insure by a rapid circulation a balmy atmosphere throughout the building.

A further object is to provide a system of heating and ventilation for buildings which shall be simple, which can be carried into effect with the use of a hot-air furnace of any preferred form of construction, which shall be economical, and which shall be effectual in all respects in the performance of its functions.

With these objects in view the invention consists in certain novel features of construction and combinations and arrangements of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figures 1 and 2 are transverse sectional views of a building, showing an embodiment of my invention. Fig. 3 is a detail view.

Heretofore in the ordinary system of hot-air heating the circulation has not been sufficient for the generating capacity of the furnace, and thus the air impeded in its passage through the furnace-chamber has become overheated and is to a greater or less degree deoxygenized; also, a jacket of hot-air has been formed around the furnace, thus rendering the radiating-surface less efficient as a conductor of heat. An unnecessary amount of heat has been wasted in the basement, having been radiated from the furnace-jacket and from an unnecessarily large number of hot-air pipes. For the purpose of ventilation the capacity of the cold-air duct as heretofore arranged has generally been made two or three times the capacity of the ventilating-flue; but it is impossible to draw any more air into the average well-built building than can be simultaneously drawn out by the ventilating-flue. In most cases also the fact is overlooked that the atmosphere in a dwelling can be kept purer by being kept in rapid circulation. Unnecessary expense has been incurred by complications in the usual ventilating apparatus. These objections are all overcome by my improvements.

In the drawings, A represents a building, in the cellar or basement of which (preferably at or near the center thereof) a pit A′ is made, and in this pit a foundation A^2, of brick, is disposed for the reception of a furnace A^3, of any preferred form of construction. The hot-air furnace A^3 is surrounded by a furnace-wall B (preferably of brick) in such manner as to form an annular chamber B′, said wall having an annular series of openings B^2 at its lower end. Another wall C surrounds the furnace-wall B, so as to form an annular chamber D, communicating at its lower end through the openings B^2 with the chamber B′. The upper end of the furnace-wall B is contracted somewhat in size and adapted to receive a hot-air register 1, which may be utilized to convey heated air to a large hall or a room located on the lower floor of a building, preferably at or near the center thereof.

By contracting the upper end of the furnace-wall B, as above explained, and making the inclosing wall C of a uniform diameter throughout its full length the annular chamber D will be enlarged at its upper end, as indicated at 2, for a purpose presently explained.

A smoke-pipe 3 communicates at one end with the furnace and at the other end with a chimney 4. A duct or flue 5 for the admission of external cold air communicates at one end with the chamber D, surrounding the furnace, and at the other end said duct or flue extends through the wall of the building. A series of hot-air flues or pipes 6 communicate with the

chamber B′ and are extended to the various rooms of the building, where they communicate with suitable registers placed in the walls of the rooms near the floors, or, if desired, said registers may be located in the floors. Return-flues 7 also communicate with the rooms of the building at points removed as far as possible from the hot-air registers, and these flues extend to and communicate with the enlarged upper end of the annular chamber D, surrounding the furnace-wall B.

The walls between various rooms and halls of the building are also made with openings 8, which serve as vents to permit the free and rapid circulation of hot-air throughout the building.

From the above it will be seen that the heated air leaves the furnace and after circulating through the building is finally returned by the flues 7 to the annular chamber D, which surrounds the furnace, and from said chamber the air enters the chamber B′. During its passage through the annular chamber D the air absorbs considerable heat, and when it passes through the furnace-chamber B′ it will, in a sense, be superheated, and thus all the heat generated by the furnace will be utilized in heating the air which is distributed throughout the building.

In order to ventilate the building and remove all impurities from the air, ventilating-flues 9 will be made to communicate with any desired number of the return-flues 7 and with the chimney.

The combined capacity of the cold-air-return flues (including the duct connected with the hall or large register) should be about equal to the capacity of the cold-air chamber D plus the capacity of the ventilating-flues. (By "capacity" is here meant the carrying capacity of the flues and air-chamber.) The capacity of the ventilating-flues is added to allow for the air that is drawn out of the return-flues by the ventilating-flues connected with them.

It may be here stated that where the return-flues communicate with the rooms of the building suitable registers will be provided the same as for the hot-air flues. The openings or vents in the walls of the rooms may, if desired, be covered with suitable material. The cold-air ducts may be made of wood or of sheet metal, if desired, and may in many cases be built between joists.

It is apparent that the relative capacities of the various flues may be changed in accordance with the plan of the building, the number of rooms, and also their size.

By means of my improvements I provide a full and free circulation of air through the furnace-chamber, which circulation is fully equal to the generating capacity of the furnace. The air will thus not be delayed in the furnace-chamber, so as to become overheated and vitiated and unfit for breathing; also, the heat generated will be rapidly carried off from the radiating-surface of the furnace, and thus more easily conducted from the fire-pot through the iron walls of the furnace, avoiding the waste of heat occasioned by the jacket of air hereinbefore referred to and also preventing the furnace from burning out so rapidly as heretofore. I am also enabled to prevent the wasting of heat in the basement. In ordinary dwellings the basement is used as a cellar and the ordinary furnace unfits it for the storage of fruit and vegetables. My improvements overcome this—

First, by surrounding the furnace-chamber with an outer wall of brick, leaving a space between the two walls from four to six inches in width, according to the generating capacity of the furnace. Into this space all the cold air and the return air is conveyed, being let in at the top and conveyed into the furnace-chamber at the bottom, thus keeping a continual current of cold air around the warm walls of the furnace-chamber and carrying pure warm air up into the rooms instead of allowing any of it to radiate in the basement. By conveying the cool air to the annular chamber D at the enlarged upper end thereof and providing ports or holes B^2 all around the lower end of the inner wall B the air will be thoroughly distributed not only in all parts of the annular chamber D, but also in the inner chamber surrounding the furnace, thus causing all parts of the volume of cool air to come into contact with the furnace and result in a uniform heating of the air.

Second. The waste of heat is obviated by having only one register on the first floor to supply the heat for the rooms ordinarily thrown open together. This register, as above explained, is placed directly over the furnace-chamber, thus allowing the hot air to rise naturally upward from the furnace into the apartments and avoiding a great deal of unnecessary friction and piping. From each room to be heated a cold-air duct is built from the side farthest from the hot-air register, and the cold air in the rooms is thus drawn off and conducted into the chamber between the two furnace-walls, as before explained. Here it is drawn around the warmed wall of the furnace-chamber through the openings at the bottom of this wall and passes into the furnace-chamber, around its hot radiating-surface, and up into the building again. This maintains a rapid current, the hot air rising, the cold air being drawn off from the floors and replaced by warm air, so that the temperature is equalized and steadily kept so in every part and corner of the rooms thus connected. The upper rooms of the building are heated by means of hot-air flues extending up through the walls and provided with registers, and the proper circulation is secured by the vents or openings in the walls of the rooms, preferably at the base-boards, said vents or openings allowing the cold air to be drawn out into the hall and thence downwardly through a good-sized cold-air flue conveniently located in the lower hall,

from whence it returns to the annular chamber D, surrounding the furnace.

My improvements also overcome the usual complications and unnecessary expense for ventilation in connection with a furnace. Proper ventilation can only be had by the rising of warmed air in the flue used for ventilating purposes. The capacity of the one or more ventilating-flues must be the measure for the capacity of the duct carrying cold air from out of doors into the cold-air chamber. Dwellings are built as near air-tight as possible. Therefore we cannot expect to carry more air into the house than is carried off by the ventilating-flue. The rule now generally followed is to make the combined capacity of the warm-air flues the measure of the capacity of the cold-air duct, making the latter two-thirds the capacity of the former. Main dependence for circulation is placed on the cold-air duct from outside. In most homes the ventilating-flue has not one-fourth the capacity of the cold-air duct, thus largely reducing the circulation of the air, delaying it in its passage over the radiating-surface of the furnace, and thereby overheating the atmosphere and defeating one of the chief means of ventilation—viz., the continual and rapid movements of the particles of air upon each other.

Instead of running a ventilating-duct from each room into the ventilating flue or chimney the ventilating in my improved system is carried on from the return-flues. The air which has been breathed is that which has been in the rooms the longest, and will also be the coolest. This will be found next to the floor, and is drawn off into the cold-air ducts, where it goes its way to the furnace-chamber of the system. This is the air which needs ventilation. For this purpose my improvements make the capacity of the return-air ducts large enough to supply a free and full circulation for the furnace and to allow for air drawn from them through the ventilating-ducts running from them into the ventilating flue or chimney. Only a small amount of piping is needed, as the distance from the ventilating-flue to the nearest point in a return-flue is very short, because the flue is generally near to the furnace. As the supply of air for all the rooms heated passes through the cold-air duct and the return-air ducts, when the latter is ventilated the entire furnace-supply is ventilated.

My improvements are simple, but experience has shown that the results which they produce are important, and they are effectual in every respect in performing their important functions.

Various changes might be made in the details of construction and in the arrangement of my improvements without departing from the spirit of my invention or limiting its scope, and hence I do not wish to limit myself to the precise details herein set forth.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The herein-described system consisting of a heater inclosed by two concentric walls spaced apart to form an annular chamber between them, the inner wall forming an annular chamber around the heater, said inner wall having an annular series of ports or holes at its lower end connecting the outer annular chamber with the annular chamber surrounding the heater, means for conducting cool air to the upper end of the outer annular chamber and means for conducting heated air from the chamber surrounding the furnace.

2. The herein-described system of heating and ventilating consisting of a heater located below the lower floor of a building, a wall surrounding the heater so as to form an annular chamber surrounding the heater, said wall having an annular series of constantly-open holes at its lower end, the upper end of said wall forming a hot-air outlet and constituting the sole means for supplying heat to said lower floor, a second annular wall inclosing the first and spaced therefrom, return-flues communicating with rooms of the building and with the upper portion of the annular chamber formed by the two annular walls, and flues connecting the return-flues with the chimney, substantially as set forth.

3. The combination with a furnace, of a wall surrounding the same so as to form an annular chamber, an outer wall surrounding the first so as to form a second annular chamber in constant communication at the lower end with the first by means of an annular series of openings, said outer annular wall having a uniform diameter throughout and the upper end of the inner wall having a contracted diameter to enlarge the upper end of the outer annular chamber, return-flues communicating with said enlarged upper end of the outer annular chamber and hot-air flues communicating with the inner annular chamber, substantially as set forth.

4. The combination with a heater, of two concentric walls forming an inner chamber surrounding the heater and a chamber between said walls, an annular series of ports connecting the lower ends of said chambers, the upper end of the inner wall contracted and provided on its upper end with a register to supply heated air to the lower floor of a building and means for conveying cool air to the upper end of the chamber between the concentric walls.

5. In a heating and ventilating system, a heater, two concentric walls surrounding said heater to form an inner and an outer chamber surrounding the heater, an annular series of ports connecting the lower ends of said chambers, means communicating with the inner chamber for conducting heat therefrom, ventilating-flues and cold-air-return flues

communicating with the upper end of the outer chamber around the heater, the capacity of the cold-air-return flues being substantially equal to the capacity of the outer chamber surrounding the heater plus the capacity of the ventilating-flues, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM H. HORMEL.

Witnesses:
L. A. LOWRY,
KITTIE LORD.