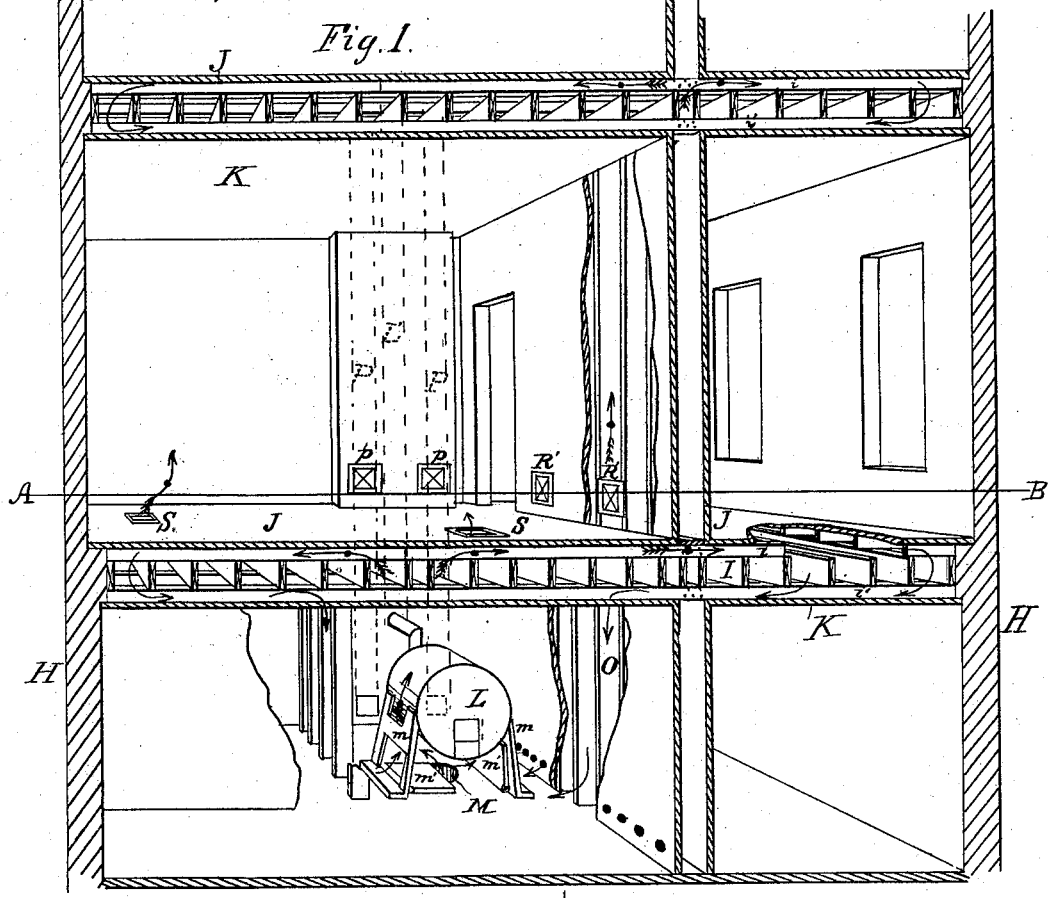
2 Sheets—Sheet 1.

B. R. HAWLEY.

Means for Heating and Ventilating Houses.

No. 209,342. Patented Oct. 29, 1878.

Fig. 1.



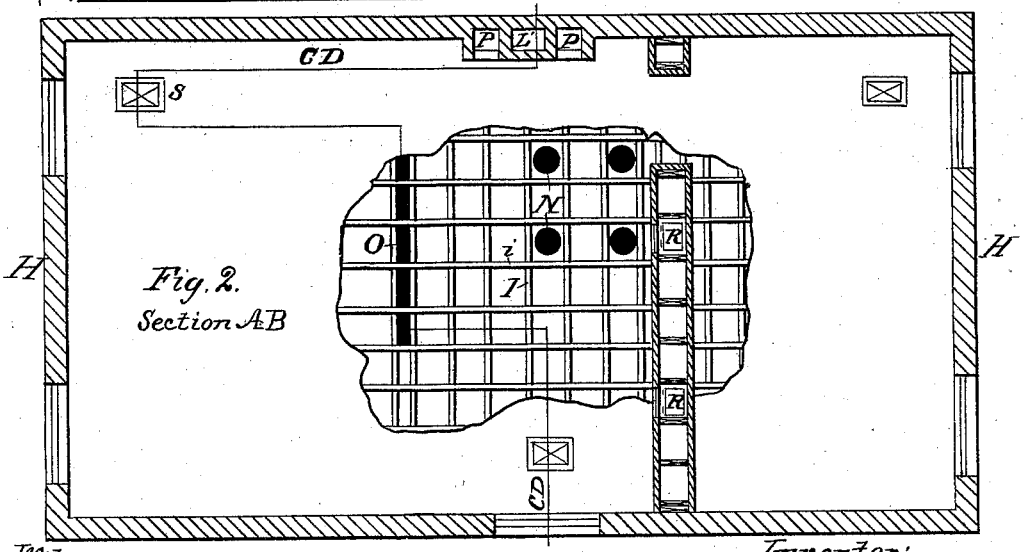


Fig. 2.
Section AB

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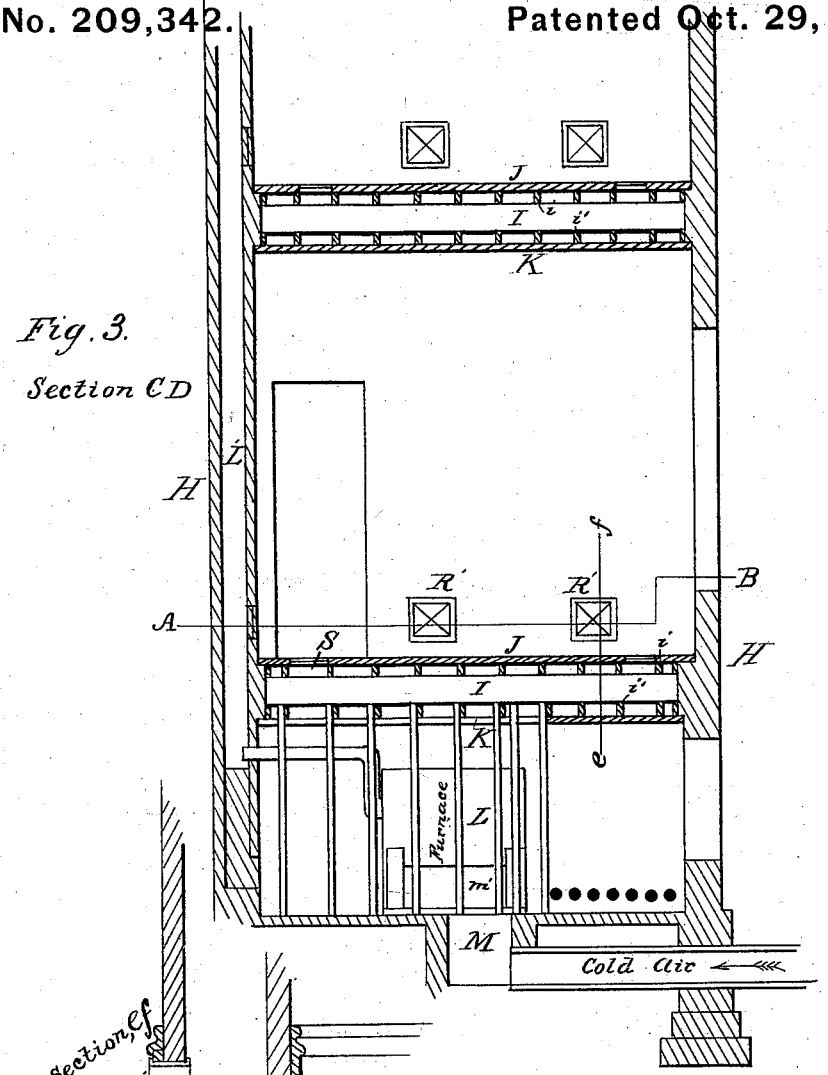
Fig. 3.

Section CD



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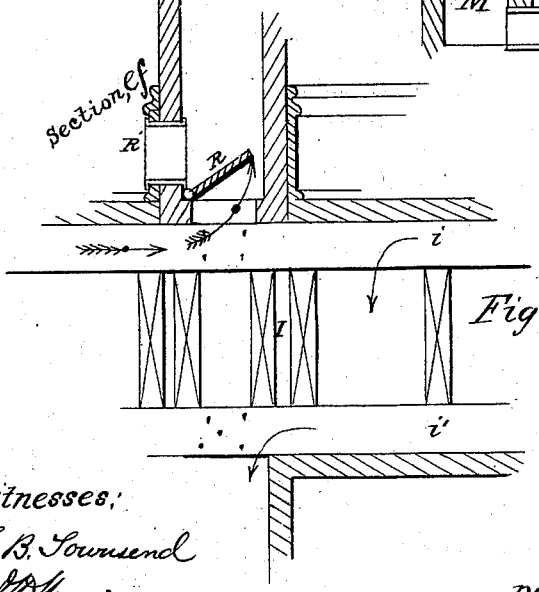

Fig. 4.

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UNITED STATES PATENT OFFICE.

BENJAMIN R. HAWLEY, OF HYDE PARK, ILLINOIS, ASSIGNOR TO AGNES HAWLEY, OF SAME PLACE.

IMPROVEMENT IN MEANS FOR HEATING AND VENTILATING HOUSES.

Specification forming part of Letters Patent No. **209,342**, dated October 29, 1878; application filed September 26, 1878.

To all whom it may concern:

Be it known that I, BENJAMIN R. HAWLEY, of Hyde Park, in the county of Cook and State of Illinois, have invented certain Improvements in Heating and Ventilating Systems for Houses, of which the following is a specification:

My invention relates to a new plan or system for warming the floors of dwelling-houses and other buildings, as well as for warming the air in such buildings and for ventilating the same.

It is an almost universal complaint that by the systems of warming now employed in our dwellings the occupants suffer from cold feet, while the head is oppressed with excessive warmth, and no plan or method of warming the floors heretofore used to obviate this objection can be called successful. I believe one cause of the failure of all such attempts has been the defective construction of the air-passages under the floors, such air-passages not having been made air-tight, so that they permitted the escape of the warm air, and were also subject to counter-currents of cold air. Another and the principal cause of failure has been the lack of provision for the return or escape of the condensed or cooled air, the practice being to provide ample means for the warm air to flow in under the floor; but no return flues or passages seem to have been thought necessary. Under such conditions the warm air can circulate but slowly and imperfectly at best. I propose to overcome these defects by constructing buildings with three series of timbers under each floor, viz: the ordinary joists, strips of furring, or small joists above the ordinary joists and at right angles thereto, and like furring-strips below the joists, and also at right angles thereto, the flooring being laid upon the upper strips and the ceiling secured to the lower ones. There are thus formed above the joists, and between the upper furring channels, through which the warm air will circulate and come in contact with the floor and other channels upon a lower plane below the joists and between the under furring, into which the air is free to descend as it becomes cooled by contact with the floor, and through which it will flow back to the point where it may be reheated, or to an exhaust-flue, as desired.

In the practice of my invention I place a heater in an apartment below the floors to be warmed, and preferably at the center of the building, which apartment is provided with ample fresh-air ducts. Above the heater as many openings are made for the outflow of the heated air as are desired, the same conducting the air into the passages under the floor, which I have already described. If the air-passages are made tight, to warm the floors will require but a fraction of the heat necessary to warm the room, and to warm the room will require very much less than usual if the heat is first diffused under and applied to the floor. This is owing to the fact that the heat is applied at the outset at the point where it is most needed, while, if discharged directly into the room, it would first flow to the ceiling, and the occupant must wait for the room to be heated downward before he receives any benefit from the warming. If the floor be efficiently warmed, as it may be with my invention, this advantage, incident to the floor-warming system, becomes specially marked, as it enables the dispensing with all other sources of warmth except in severe weather.

In the drawings, Figure 1 is a partial perspective of a house, showing my system of warming. Fig. 2 is a horizontal section of the same upon the line A B of Fig. 1. Fig. 3 is a vertical section on line C D of Fig. 2; and Fig. 4, a partial vertical section on line *e f*, Fig. 3.

H H represent the outer walls of the building. I I are the ordinary floor-joists; *i i*, the furring placed upon and at right angles to the joists, and *i' i'* the furring placed below and at the same angle to the joists. J represents the flooring, and K the ceiling, of the different apartments. L is the heater, connected by a smoke-pipe with the chimney L'. A cold-air duct, M, opens into the same apartment in which the heater is located, with its mouth immediately under the heater. This heater is

partially surrounded by a wall, *m*, formed in part by trap-doors *m'*, which, when it is desired to admit the cold air through the duct M, are both raised to the position shown in the drawing of the one upon the right. This makes the wall tight. If, however, it is desired to shut out the cold air and to draw the air to be heated from the apartment, both said doors are closed down over the duct-opening, thus shutting off the cold air, and at the same time leaving openings in the wall *m* for the access of air to the heater at the sides.

In the ceiling of the heater-apartment are openings N, through which the air warmed by contact with the heater rises to the passages between the upper furring, *i i*, in which it spreads out in either direction and gives off its heat to the floor covering said passages.

As the heated air becomes gradually cooler and more condensed and heavier, it obeys natural laws and falls down between the joists into the lower passages between the lower furring-strips, *i' i'*, a series of outlets, O, formed between the studding at either side of the heating apartment, conducting it from said passages into said heating-apartment, or to an exhaust at some other point. Such of this air as does not find its way back to the furnace may be withdrawn through foul-air flues P.

When it is desired to heat another floor above the one just described, the warm air is conveyed to it through the partitions, valves R in a portion of the passages between the studding being provided to permit it; or a portion of said passages are left permanently open. When admitted to these passages the air will rise to the interior of the frame-work of the floor above, (which is like in all respects that of the floor first described,) and descend in a similar manner to the lower passages thereof, from whence it will be exhausted through other passages between the same set of studding connecting with the before-mentioned passages O. All other openings between the studding extending to the second story, except those thus used for admitting or drawing the air from the second floor, should be tightly closed.

At R' are registers, one or more, which may be employed, if desired, to take the exhaust-air from the second story into the apartments of the first. They are closed by the opening of the valve R and opened by the closing of the same, as will be fully understood from Fig. 4.

Registers S may be placed in the floors of all the rooms if it is wished to admit the warm air directly into the rooms. Exhaust-registers *p* may also be used in the apartments to take the air from near the floor into the flues P, if it is deemed best so to do.

If more than one register, R', is used with corresponding valves R with each register, then a portion of the passages may be used to admit the air upward and a portion to draw it downward, at pleasure.

I propose to shut off all outside air from the spaces between the floors and ceilings, and to prevent the escape of the warm air therefrom in any way not contemplated by my system, by making them substantially air-tight. To obtain this result at the junction of the floors with the outside wall I build the latter so that it will extend inward a short distance and fill the space between the joists, and be lapped above and below by the floors and ceilings. In this manner each floor is, with the exception of the openings herein provided for, rendered substantially independent of those above and below it. This feature is shown in Fig. 3.

Some of the passages from the second floor down to the first floor may be made continuous with the passages O, into which they lead, by simply boxing the space between the two through the flooring.

Of course, my system may be used to heat stories above those shown or described without material modification or change, and with substantially the same method of carrying up and bringing down the air. Other methods of conveying the air from the heater to the floors to be warmed may obviously be employed, however.

It will be noticed that I dispense with all hot-air pipes, and thereby obviate the danger of firing the building. With my invention no such danger is present; but if the building should ever be fired my plan of constructing the floors independent of each other, in great measure, renders the spread of the flames much slower than in the ordinary construction.

Of the arrows shown in the drawing, those with spots on the shafts indicate the warm air from the heater, and the unfeathered shafts indicate the same air after it has parted with its heat.

I claim—

1. The dwelling or other building having passages for the warm air immediately under its floor or floors, and other passages in a lower plane in the same floor-spaces for drawing off said air as it cools, substantially as set forth.

2. The dwelling or other building having passages formed by furring-strips laid across the joists for the distribution of the warm air to the under surface of the flooring, and other passages for drawing off said air as it cools, formed by furring-strips attached to the same joists below in a direction across the same.

3. The building provided with a heating-room, and with ceilings and floors above said room provided with passages immediately under the floors for warming the same, and other passages in a lower plane in the same floor-spaces for drawing off the air used in heating after it has become cooled.

4. The combination, with the vertical space between the studding, which may serve either as a down-flue for the cooled air from the

room above or as an up-flue for the warm air from below the floor, of the register R′ and valve R, arranged relatively and operating substantially as specified.

5. The combination, with the heater and the cold-air duct, of the wall *m*, composed in part of the trap-doors *m′*, the latter arranged to close the duct or fold into and become part of the wall, according as it is desired to admit or shut off the air from the duct.

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