

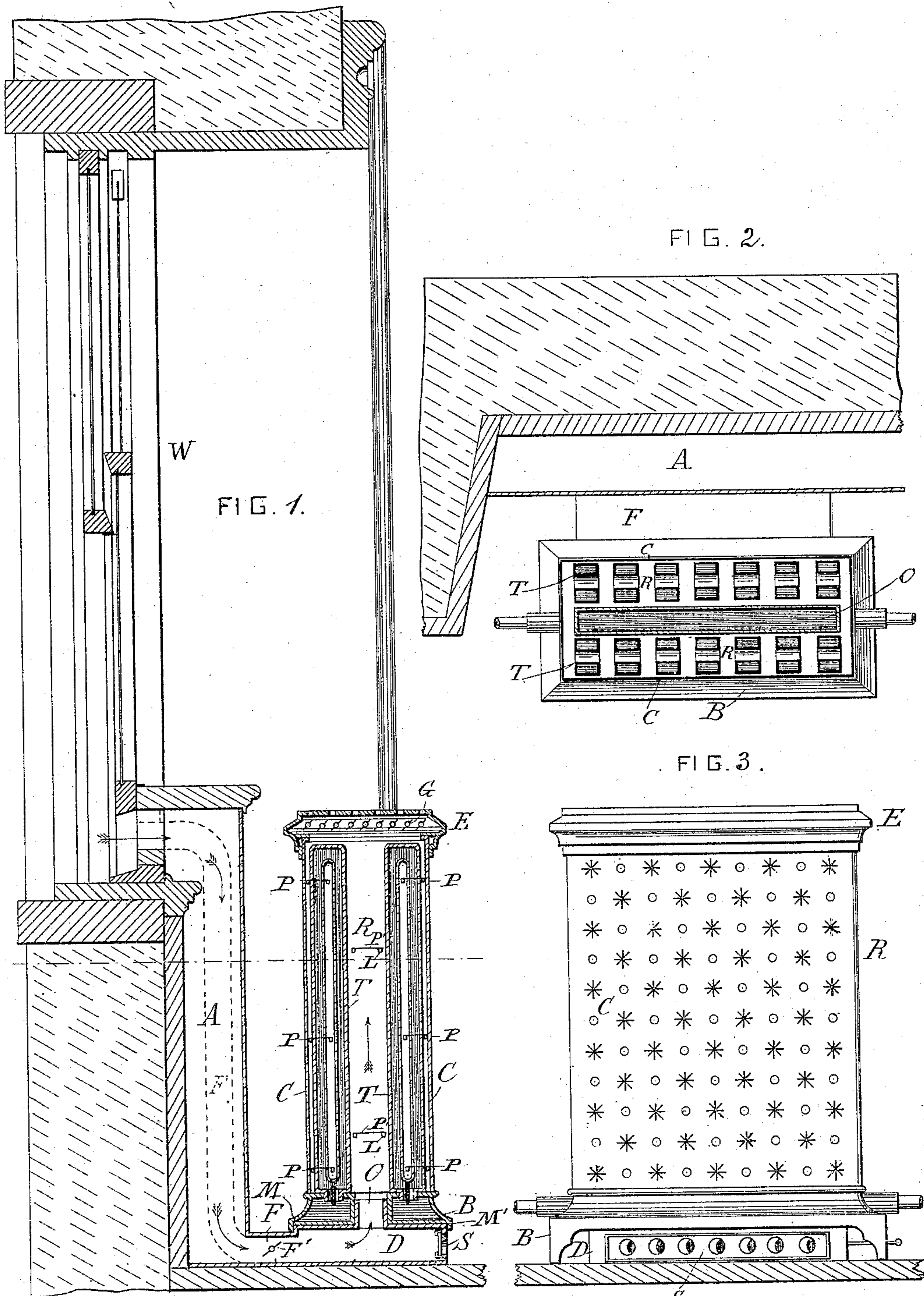
(No Model.)

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HEATING AND VENTILATING APPARATUS AND SYSTEM.

No. 445,763.

Patented Feb. 3, 1891.



WITNESSES

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HEATING AND VENTILATING APPARATUS AND SYSTEM.

SPECIFICATION forming part of Letters Patent No. 445,763, dated February 3, 1891.

Application filed November 2, 1889. Serial No. 329,040. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. SKILTON, of the city of Brooklyn, county of Kings, and State of New York, have invented a new and useful
5 Improvement in Heating and Ventilating Apparatus, Systems, and Arts, of which the following is a specification, and for which I have obtained no foreign Letters Patent whatever.

My invention relates to steam or hot-water
10 radiators and particularly to such radiators provided with open or perforated hollow steam-bases adapted to be located in the rooms or suites of rooms to be heated, or heated and ventilated, and also to devices associated
15 therewith for creating and controlling currents of steam or hot water in circuit-pipes and of air in and through the heating-chamber and the room.

The direct objects of my invention, so far
20 as the immediate apparatus is concerned, are to provide a simple means for controlling, limiting, and directing the radiating action of the radiator, for increasing the movement and work of the steam or hot-water circulation in the radiator, for increasing the efficiency of the radiator by bringing a larger
25 amount of air in contact with it in a given time, and thereby increasing the area it will heat, for increasing the proportion of heating done by convection and diminishing that
30 done by radiation in the room, for increasing the movement of air within the room and to and from the radiator, for unmasking masked portions of the radiator, for masking or preventing the action of certain portions of it
35 upon the adjacent air, and for directing air circulation so as to intercept, warm, and distribute the currents of fresh air entering the room by, through, around, or under a window,
40 window-sash, or other aperture. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a vertical sectional view of the radiator, radiator-case, window-seat, and window. Fig. 2 is a horizontal sectional view of the same; and Fig. 3 is a front view of the radiator-casing, base, and top.

Similar letters relate to similar parts throughout the several views.

50 In another application, Serial No. 329,039, filed November 2, 1889, I have shown the radi-

ator provided with an imperforate or continuous hollow base containing a supply of steam for the tubing connected therewith, and a casing resting on the base so as to form a heating-
55 chamber, which casing is provided with an opening near the bottom for the admission of air to be heated.

The invention herein described and claimed relates to radiators having the perforate open
60 or divided hollow base, which contains a supply of steam and allows air to pass through the bottom of the base, as already in use, and into the heating-chamber formed by the casing when applied thereto, as shown and described herein. The radiator used may be
65 either of the steam or hot-water variety.

R is the radiator, the upright double tubes T of which may be of the form shown or of
70 any usual form.

B is the base, provided with an open, perforated, or divided steam or hot-water chamber or chambers in the base.

C is an outside or external casing composed, preferably, of sheet metal, surrounding the
75 radiator-pipes or upright tubes resting upon the base B, so as to form a heating-chamber and preferably continuous or without openings, except at the top and bottom, as originally made, and before being placed on the
80 base.

The perforate or open base B, on which the casing C rests, only partly closes the bottom of the casing. The opening O through the base may be of any usual form or any form
85 permitted by the construction of the base and radiator pipes; but I prefer the form shown at O in Figs. 1 and 3, for the reason that it furnishes the means for readily connecting the external and internal air-flues therewith,
90 and is so located between the rows of tubes that the incoming air will strike the inner sides of all the double tubes T, and, by abstracting the heat from the steam or water or condensing the steam therein, aid in producing a circulation in unmasking the adjacent
95 and otherwise masked sides of the double tubes, &c. Where it is desired to use a base having holes through it located here and there, or to improve a radiator of that kind
100 already made or in use, the box or flue D may be made without a top or an extension up-

ward, as into the opening O, or, in other words, be left open between the corners M and M', where the box D will then make joint with the bottom of the base B, and permit the incoming air to pass upward through any number of holes in and through the base and into the heating-chamber, or the connection between the base and the box D may be made in any usual manner.

A is a cold-air chamber opening at one end under a window-sash and at the other into a flue F, provided, preferably, with a damper F', and connected with an inclosed box or flue D, leading to or into the opening O. The flue F may be extended to the window-opening as a direct continuous flue to receive the air from without and conduct it through the box D into the casing C; but I prefer the cold-air chamber A, as best calculated to furnish a cold-air supply in sufficient quantity and at a low level, from which it may be readily drawn into the casing under all circumstances. At the front side the flue or box D is provided with a slide or register S to close or open the flue to the inner air of the room. At top the casing may carry the ordinary radiator ornamental cap E with or without the register G, or a cap of any other form provided with a register for opening or closing the top of the radiator-casing. In some cases the original top will go over the top of the casing, in others the casing will be outside the lower flange of the top, or the top edge of the casing may be drawn in to receive the cap, with its flange outside the case.

The operation of the apparatus is as follows: When fresh air from without is desired, the window is raised so as to open the cold-air box A and admit air to the heating-chamber through the flue F and opening O. Since the cool air is admitted directly into the space between the double tubes T T, the steam of the adjacent passages thereof will first and in the largest degree part with its heat to the incoming air, and thereby establish a downward current in one passage and an upward current in the other associated passage of each tube. The casing C will mask the outer passages and to some extent help to maintain a higher heat therein than in the inside passages, thus accelerating the circulation and promoting the rapidity of action and increasing both the volume of heat delivered to the incoming air by the radiator and the amount of air passing to be heated. The steam-base, through which the incoming air enters, being at high heat and provided with a large supply of steam (or hot water where water is used) will give the air a strong and immediate upward tendency that will increase the speed of the current of air without the use of a blower, and when desired diaphragms may be used to deflect the current of air or detain the air, make it pass over a larger heating-surface by moving laterally within the heating-chamber, and thus insuring the heating of it, say, in cases where the tubes T are

not or cannot be suitably made very high. These diaphragms P and P' are shown in sectional view in Fig. 1. The diaphragms P, one or more in sets on each side of the chamber, are so located as to detain the air or check its upward course along the sides or legs of the loops which are to be kept the hottest, and the diaphragms P', one or more, are located adjacent to the sides or legs of the loops which are expected to be the coolest and from which the heat is to be taken in greatest quantity by the air-current passing through the chamber, but should not be so wide as to interfere too much with the air or deflect it against the other sides or legs of the loops that are to be kept the hotter of the two, but only be placed near enough to these legs on each side to insure sufficient deflection to make all the air pass near to them or make contact and take heat therefrom. These diaphragms should be supported by lugs L on the inside of the casing, as shown, or in any usual manner. When it is desired to heat only the air of the room, without special ventilation, the window-sash being shut down, the air may be admitted to the heating-chamber through the slide or register S and by the way of the opening O. The air will then pass upward through the heating-chamber, acting in proportion to temperatures, as described in the case of the admission of external air. In both cases the direct radiation of heat beyond and outside of the casing will be decreased or cut off, first, by the reflection of the casing inwardly, and, second, by the taking up of the radiated heat from the tubes and base by the rapidly-moving air, conduction and convection being substituted for radiation. If the damper or valve F' is left open when the window-sash is pushed down, air will continue to pass down into the chamber A, and thence into the heating-chamber, mingling with the air entering through the register S. At times this will be found advantageous, since air entering around the window will be drawn through the apparatus; but, when desired, the valve F' being closed, air can only find entrance through the register S, and local air circulation will then be established and maintained as long as desired.

One object in placing a register in the top of the casing is that by closing the top the attendant may be able to prevent the passage of air, check the transfer of heat thereto, and hold the temperature of the radiator steady, so as to act back on the boiler or source of heat in preventing waste of heat. The same results in kind, if not in quantity, may be accomplished by closing the register S and the damper F', whereupon but comparatively little heat will be carried away from the radiator, or but a limited area in the room will be affected thereby.

By using a casing, an air-chamber, and the closing devices thus described, in combination with a radiator having a perforate base, a radiator already set up without other

change may be made capable of heating a much larger room-space than could be heated by the radiator without that combination.

The radiator, as shown herein, consisting of the hollow perforate steam-base, upright tubes and cap or cover, and constituting part of the elements of this invention, is old and in common use, except as to position of tubes T.

This invention consists in the various combinations of the outside casing forming a heating-chamber, the air-flues, chambers, and boxes, their closing devices, and the top register, with this old radiator or these old elements, as hereinafter stated, and in the improvement in the art disclosed therein and thereby. The flue F may be extended to the outer air, as shown in Fig. 1, and in lieu of chamber A, without avoiding my invention. The casing resting on the radiator-base becomes an integral part of the radiator, prevents direct radiation from the tubes and upper part of the radiator, forms a heating-chamber closed by a hot and heat-imparting bottom, which radiates heat within the chamber and at the same time permits direct radiation from a part of the same base, and also into the lower part of the room or compartment in which it stands and where it will be useful in warming the feet by downward and lateral radiation without the objectionable effects incident to radiation from the upper part of the radiator, gives direct control over the currents of air entering the chamber and within it, so as to aid in promoting its own circulation, and also that of the steam or hot water; or, in other words, increases the efficiency of the entire apparatus, while diminishing the objectionable effects of the naked radiator to such an extent that a person may sit almost in contact with the casing while the apparatus is in full operation without being annoyed or made uncomfortable by excessive radiated heat or otherwise; permits the masking of tubes that are unmasked in the naked radiator and in the radiator covered by a larger casing resting on the floor; permits the unmasking of tubes that are masked in the naked radiator, and otherwise improves the action of the entire apparatus. These results, together with others incident thereto, are secured in large part by the resting of the casing on the base, which is hollow, as well as perforated, and therefore contains one or more steam-chambers, from which the tubes are supplied.

The object of surrounding a steam or hot-water radiator having a hollow perforate base with double upright circulating pipes or tubes by an outside case or jacket open at top and forming a heating-chamber is that the air which is admitted through one or more openings in the base may be heated by being brought in contact primarily or principally with one side or leg of the double pipes or tubes, so as to take a greater portion of heat from such side or leg, and thereby lowering

the temperature of the heating medium therein below that of the other side or leg to increase the circulation of the heating medium in the pipes or tubes.

The object of combining a radiator with circulating return-tubes and a casing forming a heating-chamber around the same is to thereby improve the circulation of such tubes by accelerating the movement of the heating medium through the controlled action of the air passing through the heating-chamber to be heated and during the process of such heating.

The object of combining a radiator provided with circulating tubes with a casing forming a heating-chamber around the same and with one or more diaphragms or sets of diaphragms is to improve the circulation in such circulating-tubes by detaining and deflecting the currents of air passing through the heating-chamber, so as to abstract more heat from one limb of the tube than from the other.

Where a radiator located in the room to be heated and inclosed in a casing larger in cross-section than the steam-base and forming a heating-chamber in the usual way, as heretofore made, has been used either for heating the air of the room or for heating and at the same time ventilating the room by means of air introduced from the outside through the heating-chamber so formed, the difficulty has been to get sufficiently strong and rapid motion of the air through the heating-chamber to send it to a distance in the room, to draw the air into the chamber, or to force the bad air of the room out by flues or otherwise. The consequence is that only a comparatively small area can be heated or ventilated by such a chamber, for the reason that the chamber used is too large and contains so much air that only a part can make contact. Much of it must depend for its heat upon the poor method of radiation, and consequently the forcing and pumping power of the chamber is small. It has, therefore, been found necessary to use blowers and expensive associated machinery for the purpose of forcing air-currents into, through, and out of rooms.

The principle of my new or improved system is that by reducing the size of the chamber below that heretofore used and considered necessary I obtain strong and rapid motion of the air, and thereby compel the air to make contact with the heating-surfaces and abstract the heat therefrom by direct contact and conduction as much as possible and with little dependence on radiation to warm the air. In other words, I use the principle of high tension. Where such contact is made, the air need not be delayed to secure efficient action, since heat is instantly imparted, thereby developing a state of high tension and quick and strong action. With increased rapidity and strength of movement I secure the means of sending the air to a greater distance in the room after it is heated and of

drawing the air to be heated from a greater distance, and consequently am able to heat rooms of larger size by the use of radiators of the same power or without increasing the size of the radiator and without the aid of blowers and other expensive apparatus. At the same time the rapidly-moving air, taking up the heat by contact and conduction and absorbing one mode of motion or changing it into another, prevents the heating of the outer casing to such an extent that the hand or person will not suffer when in contact with the casing as they would at the same distance from the radiator if the casing were absent. I reduce the chamber in this instance and effect the high-tension heating described by resting the lower edge of the casing on the hollow steam-base in close proximity to the upright pipes, thereby leaving small air-space in the chamber and compelling all the air to either make contact or pass very near to the hot surfaces and to receive heat quickly and also coincidentally strong upward impulse. In this way I secure the same superior heating effects in transferring the heat to the air noticed when the hand is placed in direct contact with a heated surface as against those realized when the hand is held at some distance away. Where a hot-air furnace is located in a cellar and supplies the rooms on upper floors with heated air in the usual way, there is a strong draft caused by long high flues full of heated air; but where the cased radiator is located in the room to be heated and obtains its air on the same level, as heretofore constructed, there is no such rapid movement of air, or rather where there are the usual spaces in the heating-chamber and the same heating-surface heretofore provided a much smaller volume of air will be drawn through the chamber and heated and less power for air movement will be generated. I diminish the size of the chamber in proportion to the heating-surface, and thereby obtain more intensity of action and more power to heat and move the air in proportion thereto, and I use the power so gained to draw in air and force air to a greater distance in the room and up or along escape-ventilating flues without the aid of fans or blowers.

Ventilation and the distribution of heated air in spaces to be heated finally resolve themselves into a question of heat and heat-power. The use of blowers to effect ventilation and distribution requires engines, extra boilers, other machinery, engineers, and other expense, all of which it is my object to avoid by the use of a high-tension heating-chamber, in which I obtain the power to move the air, force it up escape-flues, or send it wherever it is wanted directly without the intervening use of other motor mechanisms, and therefore cheaply and by a method that can be easily understood, managed, and made effective in small or large rooms or buildings, where one radiator only or where many are

required, without the aid of experts and by persons of ordinary intelligence.

I have described the radiator, hollow perforate base, upright tubes, and cap or cover shown as old and in common use; but as formerly used the upright tubes were placed at right angles to the positions shown and described herein. I have changed their positions so that one leg is located adjoining or adjacent to the opening O and the air flue or space above it, and the other leg is removed as far as possible therefrom and therefore out of the direct air-current passing through the heating-chamber. The object of this new disposition of the double circulating-tubes is to avoid taking the heat equally from both legs, as formerly, to take it principally from one leg of the double or circulating pipe, and thereby differentiate the pressure in the two legs and increase the flow of the two currents—viz., that of the heating medium, steam or water, and also that of the air being heated.

In the application already mentioned and filed at the same time with this application, the base being imperforate, the air is admitted to the heating-chamber through the casing above the base and so as to come in contact only with its top. In this application, however, the base being perforate or open, an advantage is obtained by admitting the air through the base vertically, preferably in its center, where it will meet the hottest surfaces, and whence it may pass directly upward between the double tubes in such a way as to abstract the heat more largely from one limb of the tubes than from the other. By the words "perforate," "open," and "divided," relating to the hollow base, I mean perforate or open to the free passage of air therethrough. I consider it a fault in previous constructions, in which a casing has been used around a radiator as a heating-chamber, that the casing has been placed too far from the radiator-tubes or other radiating-surfaces, and, therefore, made too large to produce the required amount of propelling-power in or upon the air passing through the heating-chamber and the required convection-power for heating purposes. This fault I avoid by making the chamber of such a size that the area of a horizontal section of the casing will be smaller than that of the base, so as to bring the casing close to the tubes or pipes, and thereby obtain substantial gains in both respects. This is one of the objects of resting the casing directly on the base in the manner shown and described.

I have filed three other applications, which are now pending, and in which are shown as elements a casing or jacket, a radiator with a hollow base, and other elements. These applications are as follows: Serial No. 265,838, filed March 1, 1888; Serial No. 273,821, filed May 14, 1888, and Serial No. 329,039, filed November 2, 1889. In the last-mentioned appli-

eration all the combinations require or are limited to a radiator with a hollow or chambered base or to a base and associated tubes connected therewith. In this application the limitation is to a perforate base as one of the elements of the invention. All the inventions not set forth nor allowed in the claims as finally presented and allowed in this nor in the three applications above mentioned are disclaimed so far as this application is concerned and in favor of application, Serial No. 265,838, and all the inventions set forth in the claims of said three applications as finally allowed are also disclaimed as to this application.

I do not desire to limit this invention to the use of pipes, tubes, or channels for receiving steam or hot water from the base of any particular size or of any particular proportions relative to the base so far as the chambers and passages are concerned.

What I claim as my invention is—

1. A steam or hot-water radiator having a perforated hollow base for the passage of air through the same and pipes, tubes, or channels receiving their supply of steam or hot water from the hollow base surrounded with an outside casing or jacket resting upon the base and forming a heating-chamber, into which air is admitted through the base.

2. A steam or hot-water radiator having an open or perforated base chambered for steam or hot water and tubes, pipes, or channels supplied with steam or hot water therefrom, provided with an outside casing or jacket around the same, forming a heating-chamber partly closed by the base, and connected with a flue leading from the open air through the base.

3. A steam or hot-water radiator having an open or perforated hollow base and pipes, tubes, or channels receiving their supply of steam or hot water therefrom, provided with a jacket or casing around the radiator, forming a heating-chamber partly closed by the base, and connected with a flue leading from the air of the room into the chamber through the base.

4. A steam or hot-water radiator having an open or perforated base chambered for steam or hot water and pipes, tubes, or channels connected with and supplied therefrom, provided with a casing or jacket around the same, forming a heating-chamber partly closed by the base, and connected with a valved flue leading from the open air through the base.

5. A steam or hot-water radiator having an open or perforated hollow base and pipes, tubes, or channels connecting therewith, provided with an outside jacket or casing around the radiator, forming a heating-chamber partly

ly closed by the base, and connected with a valved flue leading from the air of the room into the chamber through the base.

6. A radiator surrounded by a jacket or casing resting upon a hollow perforated base which is provided with connecting pipes, tubes, or channels, and forming a heating-chamber which receives the air to be heated through the base, in combination with an air-box connected with flues or chambers leading from the outer air, and also from the inner air of the room into and through the base and into the heating-chamber.

7. A steam or hot-water radiator having an open or perforated hollow base and pipes, tubes, or channels connecting with and supplied therefrom, provided with an outside jacket or casing resting upon the base and forming a heating-chamber into which air is admitted through the base by flues or chambers connecting with the outer and inner air, respectively, each of which is provided with independent opening and closing devices.

8. A heating-chamber formed by an outside jacket or casing around a radiator, in combination with a perforated hollow radiator base and top or cover, the jacket or casing resting on the base, surrounding the pipes, tubes, or channels connecting therewith, receiving the air to be heated through the base, and delivering it into the room through the top or cover.

9. A steam or hot-water radiator consisting of a hollow or chambered base and double or circulating pipes or tubes connected therewith, surrounded by a jacket or casing resting upon or supported by the base and forming a heating-chamber into which air is admitted through openings or perforations through the base leading into the spaces between the mutually-masking circulating pipes or tubes.

10. The following elements in combination: first, a hollow perforate radiator-base and upright pipes or tubes; second, a sheet-metal casing resting on the radiator-base, forming a heating-chamber, and, third, a radiator-top resting on or in the radiator-casing, as shown and described.

11. A steam or hot-water radiator having an open or perforated hollow base, with pipes, tubes, or channels connecting therewith, provided with an outside jacket or casing around the radiator, forming a heating-chamber partly closed by the base, connected with a valved outlet-opening leading from the chamber into the room.

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