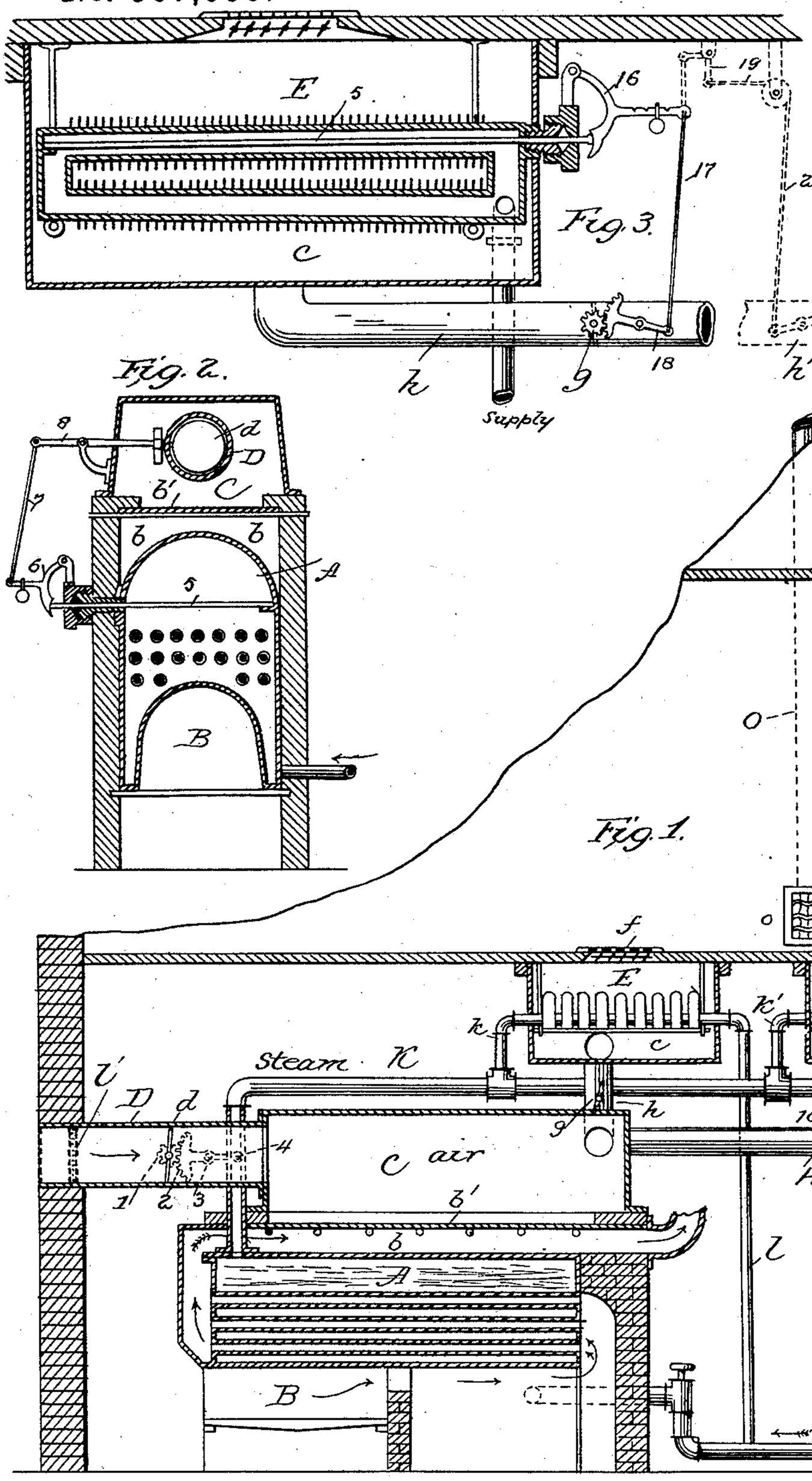
(No Model.)

P. D. PIKE.

HEATING AND VENTILATING HOUSES.

No. 367,660. Patented Aug. 2, 1887.



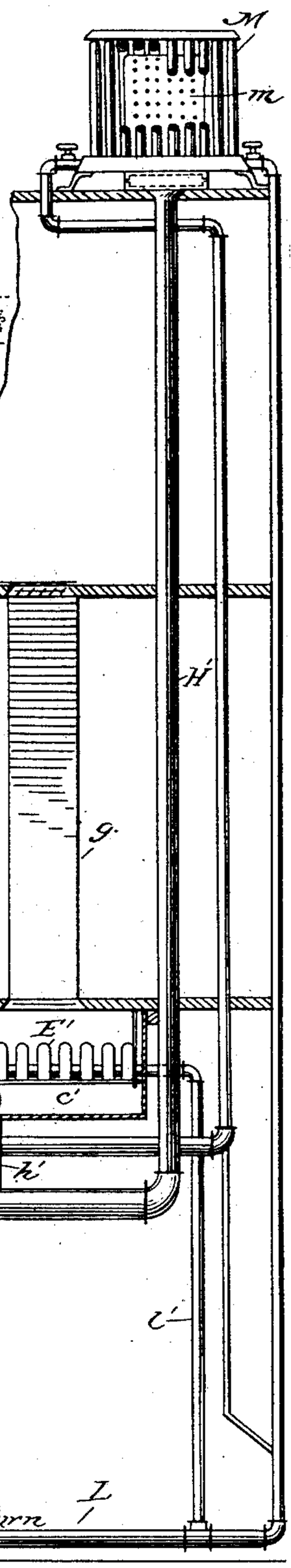


Fig. 2.

Attest:

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HEATING AND VENTILATING HOUSES.

SPECIFICATION forming part of Letters Patent No. 367,660, dated August 2, 1887.

Application filed June 29, 1886. Serial No. 206,625. (No model.)

To all whom it may concern:

Be it known that I, PAPHRO D. PIKE, of Spencer, in the county of Worcester and State of Massachusetts, have invented a new and useful Improvement in Heating and Ventilating Houses; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to the heating and ventilation of houses, and it is applicable to and may include both direct and indirect radiation.

The object sought to be accomplished is, first, the prevention of too rapid condensation and consequent clogging of the radiators by the direct application of cold air thereto; second, to automatically regulate the supply of air to the radiator according to the amount of heat applied thereto.

The general purpose of the construction is to economize fuel, regulate the heat, and to supply it to the rooms for their uniform heating and thorough ventilation; and in connection with the main features of the invention above specified I have included improved details of construction, all as hereinafter set forth.

In the accompanying drawings, Figure 1 represents in vertical cross-section part of the floors and rooms of the house with the furnace and boilers in longitudinal vertical section, and with the pipes and radiators and their connections mainly in side elevation. Fig. 2 is a vertical cross-section of the furnace and boiler. Fig. 3 is a vertical section of a part of the indirect radiator with its pipes and automatic regulating device.

Referring to Fig. 1, A represents the boilers. Underneath is the fire-chamber B, with an ordinary grate. The products of combustion pass over the fire-bridge wall in the direction of the arrow through the return-flues *a* and through a passage, *b*, over the top of the boiler, and thence into the chimney. The passage *b* is formed by a suitable iron plate, *b'*, above which is an air-chamber, C, intermediate between the outer air and the radiators. The shell of this chamber is made of sheet or cast iron and is adapted to contain the air received from the outside and to hold it long enough to allow it to derive some heat from the boiler through the plate which separates it from the passage *b*. The heat thus derived is taken from the products of combustion after they have passed through the boiler, and thus a saving of heat is effected, which would otherwise go to waste. The air is admitted into the chamber C through a large pipe, D, the capacity of which is equal to the sum of the capacity of all the pipes which lead from the chamber C. A valve, *d*, in this pipe regulates the admission of air to the chamber, and outside of this is a filtering-diaphragm, *l'*, composed of sheets of cotton-batting held between wire-netting or perforated plate. The valve *d* has a pinion, 1, on its shaft, which is operated by a segment, 2, pivoted at 3 on an arm. The end 4 of this arm is connected with an expansion-rod located in the boiler or some of its connections, so as to be acted upon by the heat.

The expansion-rod in construction and arrangement is of the ordinary kind, but is shown in Fig. 2, where the rod marked 5 is shown, as being arranged to cross the boiler connected to the end 4 of the segment-arm by mechanism 6 7 8. The intermediate air-chamber, C, is connected by air-pipes to the chambers *c c'*, which surround the radiators E E'. The furnace is supposed to be located in the basement, and the radiators are beneath the first floor.

The air-chamber of the radiator E communicates with the apartments on the first floor by means of an ordinary register, *f*. The air from the chamber *c'* is taken from the air-pipe *g* through a register in the second floor; but manifestly the chamber *c'* and radiator E' might be located beneath the second floor with the same effect. The air-pipe *h* leads directly from the intermediate chamber, C, to the chamber *c*, and a pipe, *h'*, leads from the air-pipe H to the chamber *c'*. Steam-pipes *k k'* take steam from the large steam-pipes to the radiators E E'. The pipes *l l'* are the return-pipes which bring back the water of condensation to the boiler through the main return-pipe L.

From the construction thus far shown it will be apparent that the air brought in from the outside of the building will first be conducted into the intermediate chamber, C,

where it will be exposed to the heat from the bottom over the passage *b* by the heat transmitted from the products of combustion. The air thus heated passes to the chambers *c c'*, which surround the radiators, where air is admitted directly from the outside to the chamber which includes the radiator. The effect of this is that all air of very low temperature—such as that brought from an atmosphere where the thermometer is below zero—is excluded from the radiators, and they are not chilled or clogged by too rapid condensation.

It is to be understood that the air is not held in the intermediate chamber long enough to raise it to the required heat for the rooms, but only long enough to raise it to such a temperature that it will not unduly chill the radiators when it impinges against them. Further, the degree of heat in the boiler determines the amount of air admitted through the supply-pipe. The expansion of the rod in the boiler under heat, operating through segment 2, opens the valve *d*, and a higher degree of heat increases the opening and the amount of air admitted. The contraction of the rod operating the valve in the opposite direction reduces the opening and diminishes the amount of air admitted. This tends to produce a more even and uniform heat in the air and to vary the amount of air supplied with varying temperature of the boiler. I also locate in the branch pipes which supply air to the radiators valves 9 and 10, and connect them by mechanism such as that shown in Fig. 2 to an expansion-rod located within the chambers in which the radiators are placed, so that these pipes are closed automatically by the contraction of the rod when the steam is shut off from the radiators and opened more and more as the heat increases by the introduction of steam to the radiators. When, therefore, the steam is shut off from these radiators, the air is also excluded to a greater or less extent, according to the degree of heat in the radiators, and with this automatic arrangement of valves in connection with the air-pipes and the radiators the apartments are not cooled by the current of cold air when the steam is shut off from the radiators. The arrangement of mechanism by which the valve in the air-pipes *h h'* is operated is shown in Fig. 3, which is a section through the center of the chamber *c* at right angles to the side shown in Fig. 1. It may represent either chamber *c* or *c'*, these being the same. The section is lengthwise through one of the divisions of the radiator E. The expansion-rod 15 bears against a bell-crank lever, 16, the arm of which is weighted and connected by a rod, 17, to the lever-arm 18 of the segment, which meshes into the pinion on the stem of the valve in the horizontal part of the pipe *h*. By means of bell-crank lever 19 and a cord or chain, 20, (shown in dotted lines,) the stem-rod may be made to operate the valve in a distant part of the pipe *h*.

The intermediate chamber, C, may be used in connection with the direct radiator with the same beneficial effect of supplying air to the apartment in which the direct radiator is situated without unduly chilling and clogging the radiator. The continuation H' of the air-pipe H is represented in Fig. 1 as extending to a thin sheet-iron compartment, *m*, located within or by the side of a radiator, M, arranged upon the third floor, which may represent, however, any floor. An extension of the same pipe, K, supplies this radiator, and it is also connected to the return-pipe L to complete the circuit. The air-chamber is perforated toward the branches of the radiator, so that the air, partially warm and supplied from the intermediate chamber, C, is discharged against the radiator, and thus warmed to a sufficient degree for the comfort of the occupants of the room.

The air-pipe H' may also have a valve operated by an expansion-rod connected to the radiator with connections, all as shown in Fig. 3, so that when the steam is excluded from the radiator M the air at the same time will be automatically shut off. The action of the intermediate chamber in relation to the radiator M and the supply of air thereto is the same in appearance as its action and connection with its radiators E E', the difference between the two radiators being that radiator M acts as a direct radiator as well as to heat the air from the perforated chamber *m*, in respect to which it acts as an indirect radiator or air-heating apparatus, while the radiators E E', inclosed in air-chambers and preferably located beneath the floor, act only as indirect radiators and do not radiate heat directly into the room.

I may use in connection with this heating apparatus a ventilating-pipe or system of ventilating-pipes, O, opening into the apartments, as shown at *o*.

I claim as my invention—

1. In combination, a boiler, a radiator or radiators having steam-connections therewith, an air-chamber, C, situated adjacent to the boiler, whereby the contained air is heated, a hot-air pipe or pipes leading from said chamber to the radiator or radiators, an air-supply pipe leading from the said chamber to the outside air, a valve, *d*, arranged therein, an operating extension-rod for said valve located in the boiler and acted upon directly by the heat thereof, whereby when the said heat is great the said valve is opened and when the heat is low the valve will be closed, thus excluding the cold air from the air chamber, pipes, and radiators, all substantially as described.

2. In combination, a boiler, the intermediate air-chamber, a radiator connected with the boiler by steam-pipes, an air-pipe leading from the intermediate chamber to the radiator, a valve in the said pipe, and an extension-rod located in the radiator and connected to the said valve for automatically operating it, all substantially as described.

3. In combination with the boiler, an inter-

mediate air-chamber and its connection with the atmosphere, a direct radiator, M, having steam-connection with boiler, and an air-chamber, as *m*, perforated to discharge air against the radiator, and having air-pipes connecting it with the intermediate air-chamber, all substantially as described.

4. In combination, the furnace B, the boiler, the flues *a* in said boiler, by which the products of combustion are carried back and forth, the passage *b*, extending approximately the length of the boiler for the exit of said products of combustion, the chamber C, adjacent to the said passage *b*, whereby the contained air is heated, radiators and connections to the boiler, radiator-chambers *c*, and connections between the same and the hot-air chamber, and connections from the hot-air chamber C to the atmosphere, substantially as described.

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

PAPHRO D. PIKE.

Witnesses:

ASA T. JONES,

GEO. S. BRADFORD.