

(No Model.)

J. EVANS.
HOT AIR FURNACE.

No. 471,110.

Patented Mar. 22, 1892.

Fig. 1.

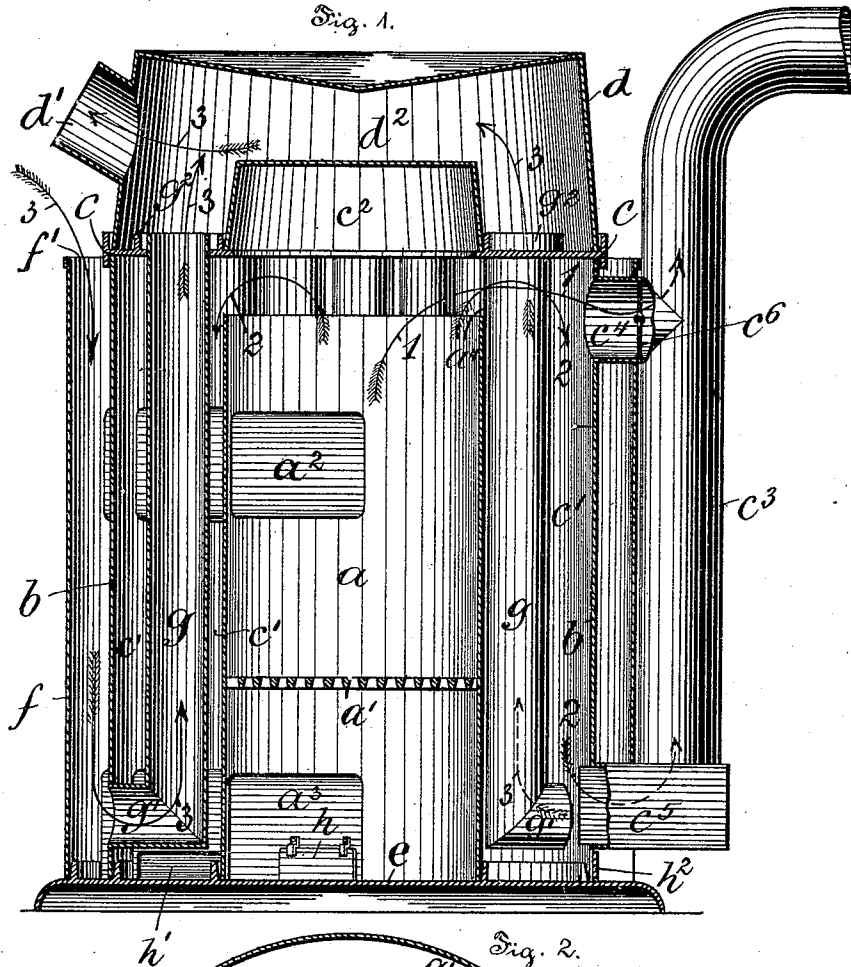
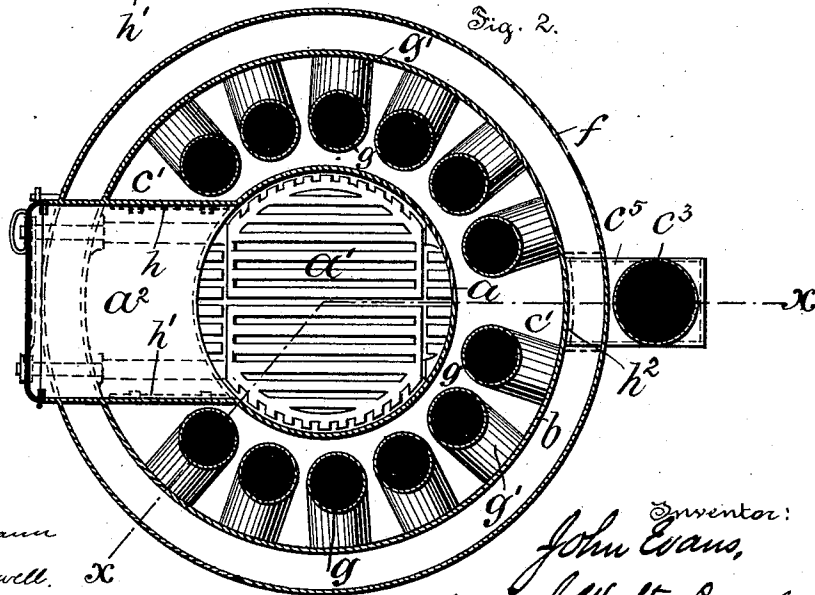


Fig. 2.



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UNITED STATES PATENT OFFICE.

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HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 471,110, dated March 22, 1892.

Application filed June 30, 1891. Serial No. 398,082. (No model.)

To all whom it may concern:

Be it known that I, JOHN EVANS, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Hot-Air Furnaces, of which the following is a specification.

My present invention relates to hot-air furnaces in which the cold or incoming air is warmed or heated by passing it through pipes, tubes, conduits, and chambers externally heated in part by radiation from the combustion-chamber and in part by contact with the escaping products of combustion.

The principal objects of my present invention are, first, to reduce the cost of the furnace by simplifying the construction and arrangement of the parts thereof; second, to increase the efficiency of the furnace by so arranging the pipes or conduits for conveying the incoming air to the furnace as that the same are heated for a distance substantially equal to the length of the combustion-chamber; third, to prevent accumulation of soot and dust from diminishing the efficiency of the heating apparatus, and, fourth, to provide convenient and easy access to the interior of the smoke-passage for removing the accumulation of soot and dust therefrom.

My invention consists of the improvements hereinafter described, and pointed out in the claims.

The nature and characteristic features of the present invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a section on the line xx of Fig. 2, showing the construction and arrangement of the parts of a furnace containing or embodying the characteristic features of my invention; and Fig. 2 is a horizontal section thereof.

In the drawings, a is an interior cylindrical casing adapted to serve as a combustion-chamber and provided with a grate a' and with two projections a^2 and a^3 . These projections a^2 and a^3 are provided, respectively, with doors, and serve to permit of the introduction of fuel and of the removal of ash, clinker, and other extraneous matter.

b is an exterior cylindrical casing closed at the top thereof by an air-drum d of the usual construction and at the bottom thereof by a suitable base-plate e , and adapted to serve as the main housing of the furnace.

c is an annular horizontal partition located near the top of the interior cylindrical casing a , and serving to divide the interior of the casing b into a smoke-passage c' and an air-chamber d^2 . A portion of the side walls of the interior casing a is removed, as at a^4 , in order to permit of the escape of the products of combustion from the combustion-chamber to the smoke-passage c' , and the upper portion or hood c^2 thereof is supported by a flange formed on the upper surface of the partition b .

c^3 is an offtake-pipe for conveying the smoke and gaseous products of combustion from the smoke-passage c' to the chimney. (Not shown.) This pipe c^3 is provided with lateral branch pipes c^4 and c^5 , communicating, respectively, with the smoke-passage c' . The branch pipe c^4 is provided with a damper c^6 , which when open permits the smoke and other gaseous products of combustion to escape from the combustion-chamber directly into the offtake-pipe c^3 , and hence affords a so-called "direct draft." When the damper c^6 is closed, the smoke and other gaseous products of combustion pass from the top of the combustion-chamber downward through the smoke-chamber c' and escape through the branch pipe c^5 into the offtake-pipe c^3 , thus forming a so-called "indirect draft."

f is an open-top exterior shell or jacket surrounding the housing or main frame b of the furnace and mounted on the base-plate e . The supply of cold or fresh air is introduced at the open top of this shell or jacket f and descends to the bottom thereof. The supply of air is then conducted from the bottom of this shell f to the air-chamber d^2 by means of a series of externally-heated pipes or conduits g , located in the smoke-passage c' and disposed around the rear portion of the combustion-chamber, as illustrated in Fig. 2. These pipes g are provided at the lower extremities thereof with elbows g' , communicating with the lower portion of the interior of the shell or jacket f , and are connected with the partition c at the upper extremities. The union between the top of the pipes g and partition c

may be conveniently effected by providing the portion c with annular flanges g^2 and then filling the space between the flanges g^2 and pipes g with sand or other suitable material, so as to form an air-tight joint that will afford the pipes an opportunity to expand and contract without causing the joints to leak. These pipes g are substantially equal in length to the height of the combustion-chamber, and therefore are exposed to and heated by all the available heat that is radiated therefrom, it being understood that these pipes serve to heat or warm the incoming air. It may be remarked that these pipes or conduits g are preferably located at a little distance—for example, a half inch—from the exterior of the casing a , in order to obviate undue heating or drying of the air. The solid matter carried by the smoke and gaseous products of combustion falls to the bottom of the smoke-passage c' and collects on the base-plate e and beneath the elbows g' , so that it does not prevent the heat radiated from the combustion-chamber from reaching the interior of the incoming air conduits or pipes g .

h and h' are doors located in the side walls of the extension a^3 of the casing a , and h^2 is a door located in the side wall of the casing b and beneath the branch pipe c^3 , at which point the exterior shell f is cut away, as shown in Fig. 2. These doors h , h' , and h^2 afford convenient means for permitting of the removal of soot or dust from the lower portion of the smoke-chamber c' .

The mode of operation of the hereinabove-described heating appliance is as follows: The damper c^6 is opened and a fire is started on the grate a' . The smoke escapes from the casing a , through the space a^4 between the partition c and side walls thereof, into the smoke-passage c' , as is indicated by the arrows in Fig. 1, and the smoke escapes from the passage c' through the branch pipe c^4 into the offtake c^3 , as indicated by the arrow 1 in Fig. 1. After the fire is well started the damper c^6 is closed and the smoke and heated products of combustion pass downward around the pipes g and escape into the offtake c^3 through the branch pipe c^5 , as is indicated by the arrow 2 in Fig. 1, and the direct radiation from the combustion-chamber, as well as the contact of the hot smoke and gases, heat the pipes g . Cold or fresh air is admitted into the shell or jacket f at the open top f' thereof, and descending enters the pipes g , and ascends through the latter into the air-chamber d^2 , from which it is led off through the hot-air flue d' for use. The course of the air is indicated by the arrow 3 in Fig. 1. It will of course be understood that the incoming air is heated by the pipes g , the hood c^3 , and also by the heat radiated from the casing b . Moreover, any accumulation of soot or dirt in the smoke-space c' will collect upon the base-plate e and beneath the heated portions of the combustion-chamber, and therefore will not in any way prevent the heating of the pipes g , and

this accumulation of dust or soot may be readily removed by means of the doors h , h' , and h^2 in the manner hereinabove described.

It will be obvious to those skilled in the art to which my invention appertains that modifications may be made as to minor details—for instance, in the location of the doors h , h' , and h^2 —without departing from the spirit of the invention.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in a hot-air furnace, of a main casing closed at the top by an air-drum provided with an offtake and supported at the bottom on the base-plate, an interior casing forming the wall of the combustion-chamber provided with a grate, a partition located near the top of the furnace and dividing the space between said casings into a smoke-passage and an air-chamber, the wall of said combustion-chamber being partially removed to permit of the escape of the products of combustion therefrom to the smoke-passage, an open-top jacket surrounding said main casing and extending to the base-plate, and a series of air-inlet pipes or conduits in said smoke-passage in communication with said air chamber and jacket, the construction being such that said air-inlet pipes or conduits are exposed to the available heat of combustion the length of said combustion-chamber and soot or other extraneous matter permitted to accumulate at the base of the smoke-passage, substantially as shown and described.

2. The combination, in a hot-air furnace, of an exterior metallic housing closed at the top by an air-drum provided with an offtake and supported at the bottom on a base-plate, an open-top jacket surrounding said housing and supported on said base-plate, an interior metallic casing forming the wall of the combustion-chamber, with an outlet for the escape of smoke and other gaseous products, a partition near the top of the furnace between the interior casing and exterior housing, and dividing the space between said casing and housing into an air-chamber and smoke-passage, a smoke-offtake, direct and indirect draft-pipes and connections, a series of air-inlet pipes or conduits in said smoke-passage and in communication with said air-chamber and with said open-top jacket near the base of said furnace, the construction being such that the downward current of air entering at the top of said jacket is heated for a distance substantially equal to the length of the furnace, for the purposes described.

3. The combination, in a hot-air furnace, of a main casing or housing closed at the top by an air-drum having an offtake and at the bottom supported on a solid base-plate, an interior casing forming the wall of a combustion-chamber provided with a grate and two projections closed by removable doors for admitting fuel above said grate and removing

extraneous matter from the bottom of said furnace, a partition near the top of the furnace dividing the space between said housing and casing into an air-chamber and a smoke-passage, direct and indirect draft connections, a smoke-offtake, an open-top jacket surrounding said main casing and supported on said base-plate, and a series of pipes located in said smoke-passage and in communication with said air-chamber and with said jacket near the base of the furnace, substantially as shown, and for the purposes described.

4. The combination, in a hot-air furnace, of a main housing closed at the top by an air-drum provided with an offtake and at the bottom supported on a solid base-plate, an interior casing forming the wall of a combustion-chamber having a grate mounted therein and projections or extensions closed by removable doors to permit of the supply of fuel to the furnace above said grate and to permit of the removal of extraneous matter from the furnace at or near the bottom thereof, a partition near the top of the furnace dividing the space between said housing and casing into an air-chamber and a smoke-passage, an open-top jacket surrounding said housing, incoming air-pipes extending nearly to the bottom of said smoke-passage, a series of doors located at the base of the wall of said passage to afford access to the interior of the smoke-passage beneath said incoming air-pipes, and a smoke-offtake, substantially as shown, and for the purposes described.

5. The combination, in a hot-air furnace, of a main casing closed at the top by an air-drum provided with an offtake and supported on the base-plate of the furnace and surrounded with an open-top jacket, a smoke-offtake, direct and indirect draft connections, an interior casing forming the wall of a combustion-chamber provided with projections having doors adapted to permit of fuel being

admitted and of extraneous matter being removed from the furnace, a partition dividing the space between said casings into an air-chamber and smoke-passage, a series of incoming pipes located in said passage, the construction being such that said pipes are heated for a distance equal to the height of the combustion-chamber, and the currents of air conducted downward between said jacket and main casing heated in its upward passage between the walls of the combustion-chamber and main casing to said hot-air drum, substantially as shown, and for the purposes described.

6. A hot-air furnace provided with a main casing closed by an air-drum provided with an offtake and supported on a solid base-plate, a centrally-located combustion-chamber, a smoke-passage surrounding the same, a series of incoming air-pipes located in said passage, a smoke-offtake, direct and indirect draft connections, an open-top jacket surrounding the main casing, and the incoming air extending in a downward direction to near the bottom of said furnace and heated in an upward direction in said pipes between said main casing and chamber, for the purposes described.

7. The combination, in a hot-air furnace, of the base-plate *e*, the casings *a* and *b*, the extension *a*³, smoke-chamber *c*¹, the doors *h* and *h*¹ in the walls of said extension, and the door *h*² in the wall of said casing *b*, all arranged, substantially as described, to permit of the removal of soot or dust from the lower part of said smoke-chamber.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JOHN EVANS.

Witnesses:

THOMAS M. SMITH,
RICHARD C. MAXWELL.