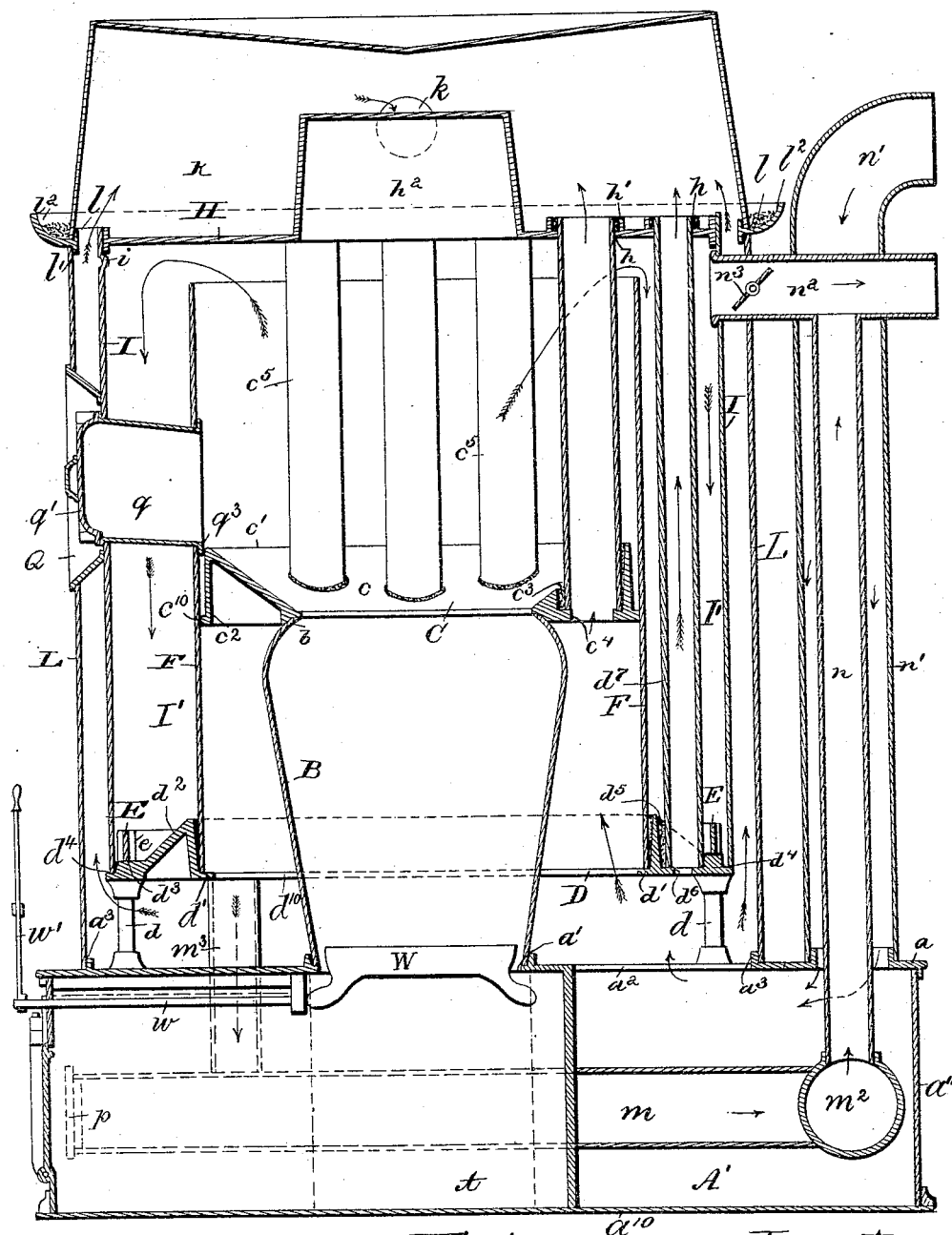


J. EVANS.
HOT AIR FURNACE.

No. 454,264.

Patented June 16, 1891.



Witnesses:
Arthur Ashby
Hermann Bormann.

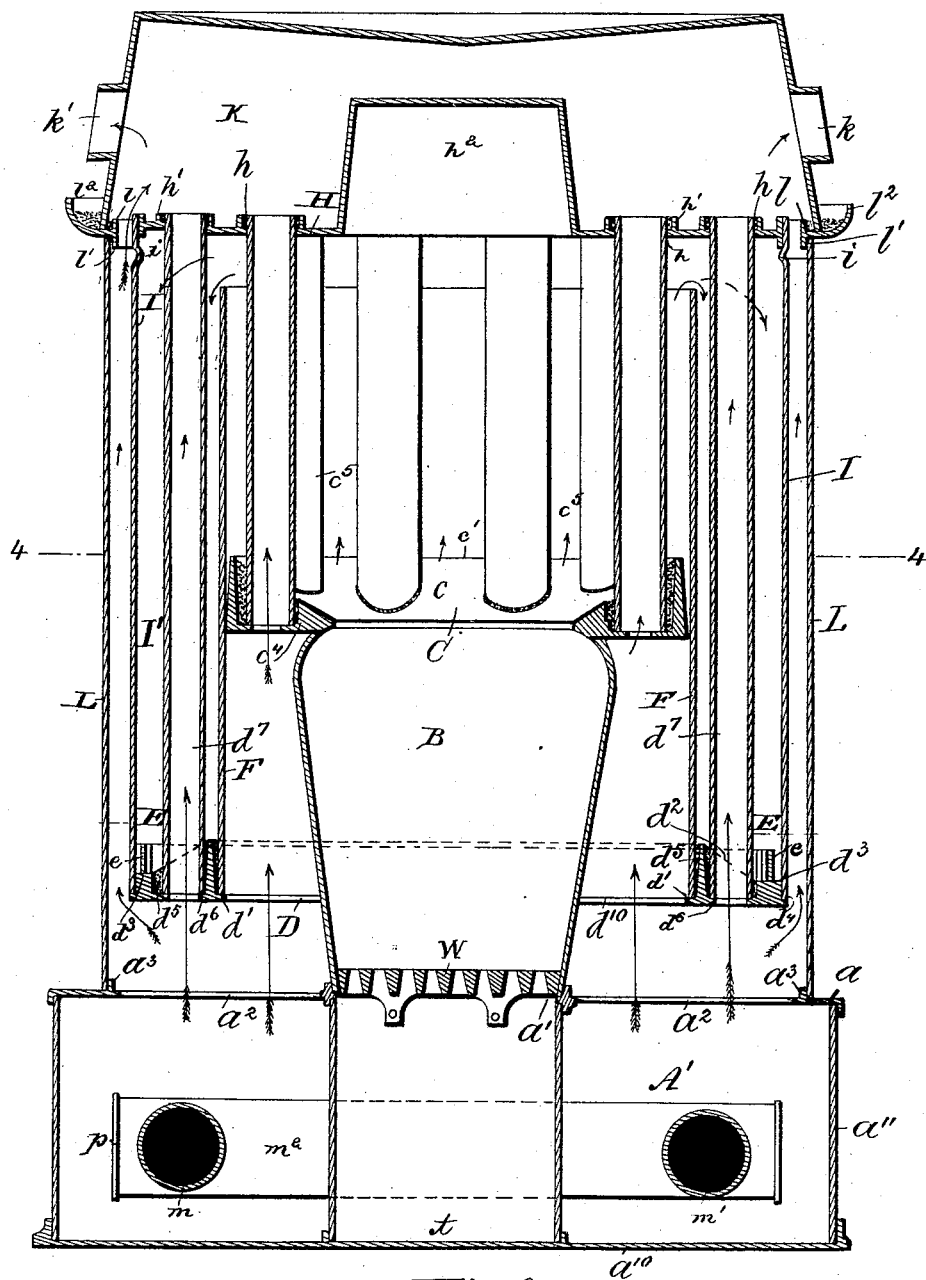
Fig. 1.

Inventor
John Evans,
By J. Walter Sangster.
Atty.

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Arthur Ashby
Bernard Borman

Fig. 2.

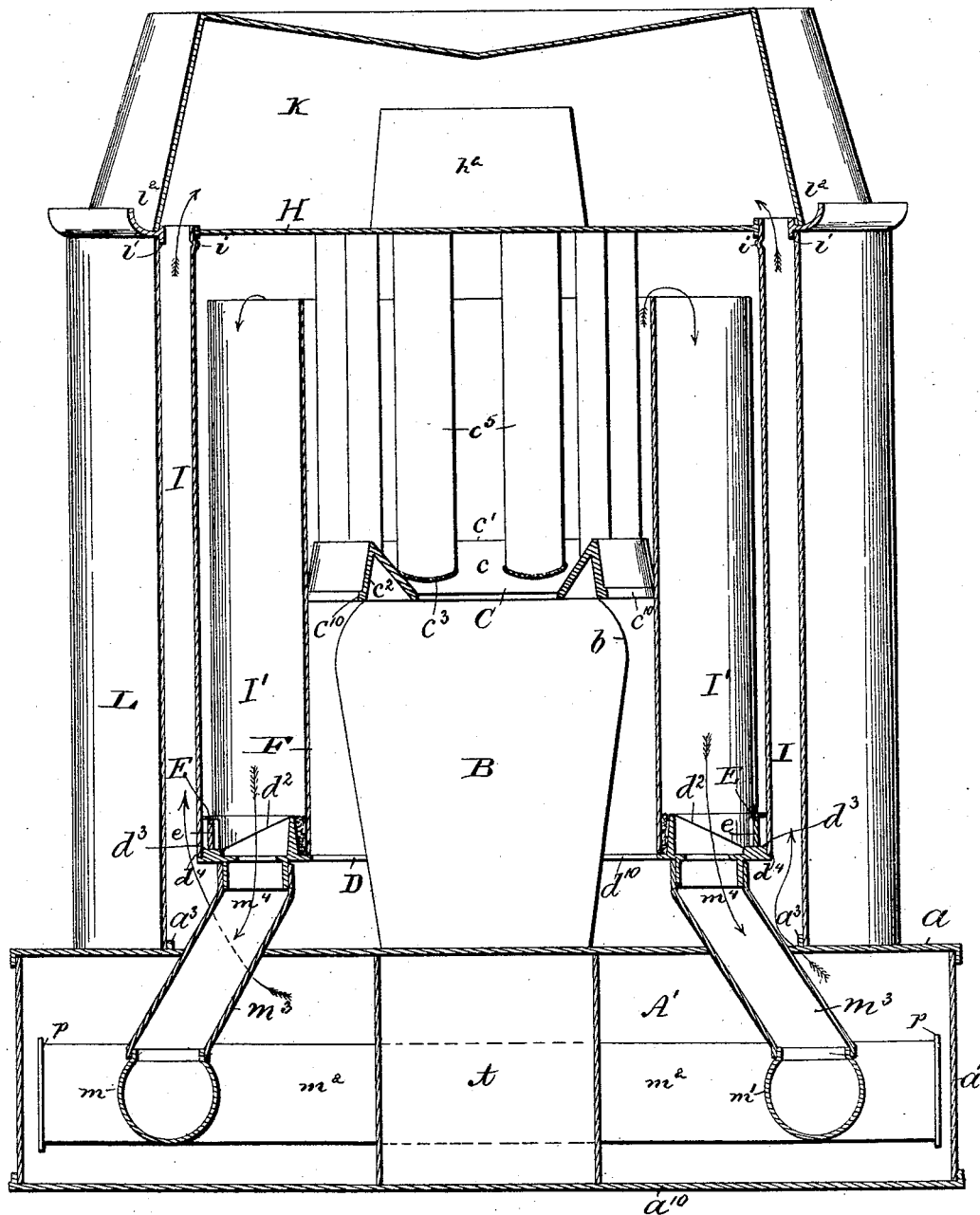
Inventor:

John Evans,
By J. Walter Douglas
Atty.

J. EVANS.
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Witnesses:

Arthur Ashby
Hermann Bormann

Fig. 3.

Inventor
John Evans
By J. Walter Douglass.
Atty.

4 Sheets—Sheet 4.

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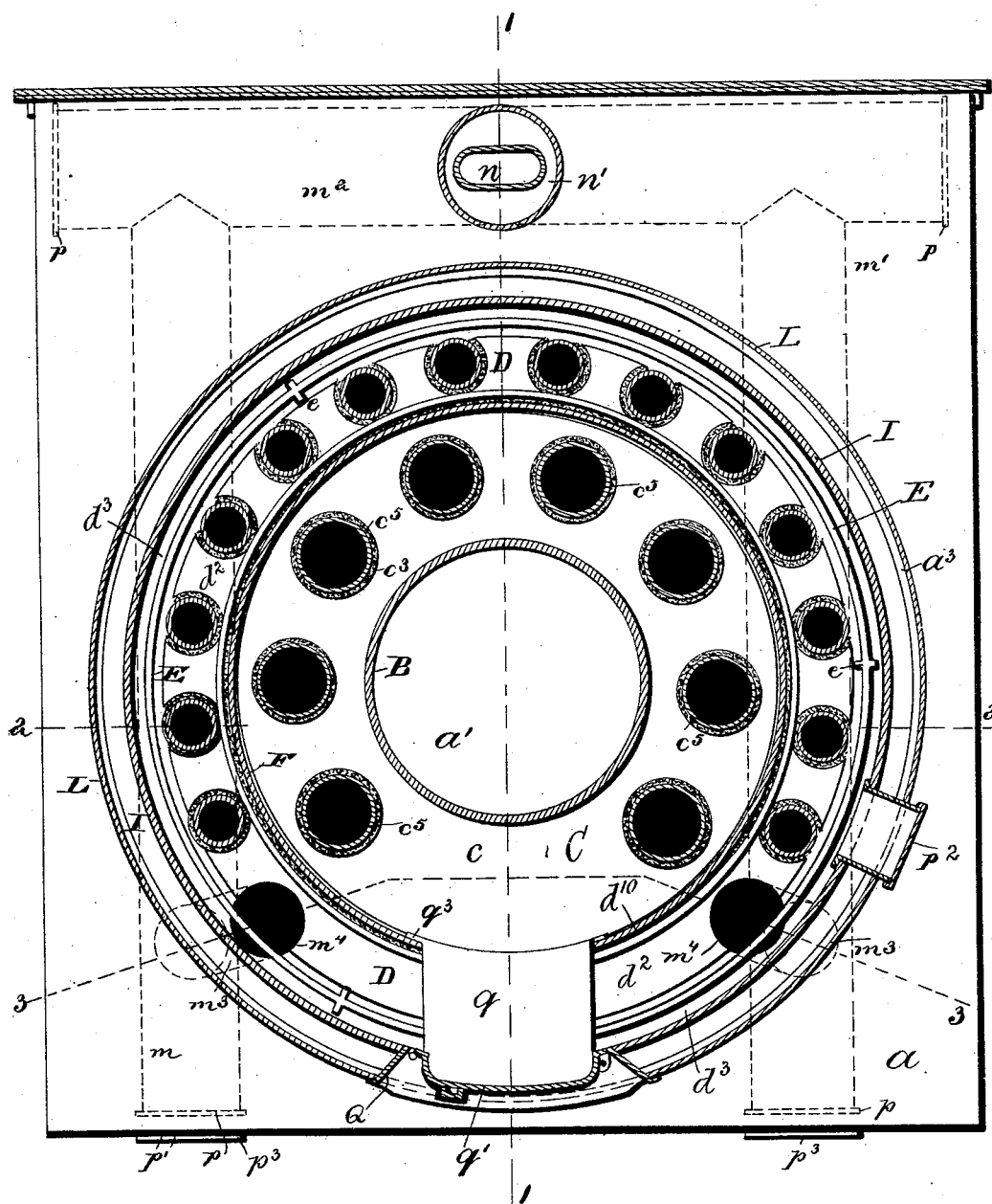


Fig. 4.

Arthur Ashley
Hermann Bormann

Inventor
John Evans.
By J. Walter Dringham,
Att'y.

UNITED STATES PATENT OFFICE.

JOHN EVANS, OF PHILADELPHIA, PENNSYLVANIA.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 454,264, dated June 16, 1891.

Application filed April 14, 1890. Serial No. 347,784. (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 invention relates to a heating or hot-air furnace in which the internal construction is such as to permit of downward and upward drafts for obtaining a maximum amount of heat from the employment of a minimum quantity of fuel.

The principal objects of my invention are, first, to provide a heating or hot-air furnace of comparatively simple construction and in which the arrangement of the internal parts thereof are such as to permit by the downward and upward drafts a much more thorough or complete heating of the air circulating therethrough; second, to provide a heating or hot-air furnace in which the internal parts and pipes or conduits thereof can be readily caused to assume their proper positions with relation to each other therein and removed therefrom for repairs or otherwise with the least possible trouble and consumption of time, and with internal chambers so arranged as to be readily and effectually cleaned of extraneous matter without taking the furnace entirely apart, whereby is presented an economical and effective hot-air furnace for heating purposes.

My invention therefore consists of a hot-air furnace constructed and the several internal parts thereof arranged and adapted for operation substantially in the manner hereinafter described.

The particular characteristic features of the invention will be more fully understood from the accompanying drawings, forming part hereof, and in which—

Figure 1 is a sectional elevation of a furnace embodying the features of my invention on the line 1 1 of Fig. 4. Fig. 2 is a similar view on the line 2 2 of Fig. 4. Fig. 3 is a vertical sectional view on the line 3 3 of Fig. 4, and Fig. 4 is a transverse sectional view on the line 4 4 of Fig. 2.

Referring to the drawings, A' is an air-receiving chamber of the furnace, provided

with a base-plate a^{10} and a surrounding wall or casing a^{11} , and on the top of which wall or casing is mounted a suitable plate a . Within this air-chamber is located the ash-pit A. The plate a is provided with a central fire-pot opening a' , segmental or other suitable openings a^2 , and flanges or shoulders a^3 .

B is the fire-pot, which may be of any suitable form, but preferably provided with an inner flaring or rounded mouth b at the upper extremity part thereof, and against the surface of which and supported thereby is an annular plate C, having the inner surface c thereof inclined from the top c' to the mouth or opening of the pot B, in order that ash or other extraneous matter may be directed backward or fall by gravity into the fire-pot B.

The plate C has a depending peripheral flange c^2 with an outer shoulder c^{10} , and in the inclined or sloping surface c of the plate C are provided in any preferred manner a series of pipe-apertures c^3 . At the bottom surface or edge of the plate C is provided an inwardly-projecting flange or shoulder c^4 , upon which rests the lower ends of the air-pipes c^5 . The pipes c^5 are of a less diameter than the openings c^3 in the plate C, in order that a space may be left between these openings c^3 and the ends of the pipes c^5 for receiving cement, sand, or other suitable packing to form a tight joint between said parts without offering any appreciable resistance to the removal of the pipes c^5 for repairs or otherwise.

D is an annular plate preferably disposed above the top plate a of the air-receiving chamber A' and supported in position by suitable posts or columns d , as shown in Fig. 1. This plate D is provided with a central aperture d^{10} and with an inner bottom flange or shoulder d' and an outer downwardly-inclined surface or side d^2 , terminating in an edge or rim d^3 , and which, if preferred, may have an outersoulder or flange d^4 . The inclined surface or rim d^2 of the plate D is provided with a series of pipe-openings d^5 , with inner flanges or shoulders d^6 at the base thereof, and the said openings are of larger diameter than the pipes d' , resting on the shoulders or flanges d^6 , in order that sand, cement, or other suitable packing may be introduced between them for insuring tight joints thereat. These joints will

become packed in the use of the furnace by the falling and lodging of fine ash or other extraneous matter therein, and thus insure gas-tight joints between and around about the same. A ring or other suitable device E, preferably provided at intervals with wings or flanges e , is loosely mounted on the surface or edge d^3 of the plate D, as clearly illustrated in Fig. 4, for a purpose to be hereinafter fully described. Upon the shoulder d' of the plate D is mounted a casing or jacket F, packed or otherwise sealed thereto in any preferred manner. This casing or jacket F extends vertically to near the plate H of the heater and surrounds the pipes c^5 of the inclined surface-plate C, mounted on and supported by the upper part of the fire-pot B, as shown, for instance, in Figs. 1 and 2. The plate H is provided with openings h , through which are introduced the pipes c^5 and d^7 . The plate H is provided with rings or flanges h' of a diameter greater than the pipes extending through the openings h , in order to provide an annular space between the pipes and flanges or rings for the reception of cement, sand, or other preferred packing.

The top plate H is preferably provided with an outer flanged edge, as shown, in order to insure suitable bearing-surface for the jacket or casing I, by which said plate H is supported by means of a head i , preferably formed integral with said casing I and so arranged as that the plate H may be readily removed from contact therewith.

The top plate H may, if preferred, be constructed or provided with a central super-heating-chamber h^2 , disposed above the same, but having the wall thereof preferably formed integral therewith and the said chamber so disposed as a part of the plate H as to be within the hot-air drum K. The casing I, surrounding the jacket F, rests upon the other edge or shoulder d^4 of the plate D. The casing I is surrounded by an outer metallic casing or shell L, mounted on and supported by the top plate a of the wall of the air-receiving chamber A' in any preferred manner. Upon the top of the casing or shell L is supported a ring l , which holds the hot-air drum K in position with its hot-air outlets k and k' . The said ring l is provided with an inner bearing-flange l' and an outer curved or annular flange l^2 to allow of the introduction of cement, sand, or other suitable packing material, to insure a tight joint between said ring l and the bottom of the drum K.

Q is a funnel or other shaped casting secured to the walls of the casings L and I.

q is a tube or other shaped casting provided with an outer door q' , and the said tubular casting extending beyond the jacket F and flanged at q^3 thereto, and the said parts forming the means for introducing fuel into the furnace or fire-pot B.

Around the ash-pit A and within the air-receiving chamber A' are mounted longitudinal smoke-pipes m and m' , such as clearly shown in Figs. 2 and 4, which are connected

with a transverse conduit m^2 at the back of the ash-pit or chamber A. These pipes m and m' are connected by short pipes m^3 and socket or flanged openings m^4 in the plate D with an annular space or chamber I', formed between the casing or jacket F and casing I, in order to convey smoke and the products of combustion from said space or chamber I' to the pipes m , m' , and m^3 . From the pipe m^2 is led a pipe or conduit n , which is extended to the chimney or the outlet-pipe n^2 , and is surrounded by a cold-air conduit n' , mounted on and supported in position by the air-receiving chamber top plate a and extending to and beyond the upper extremity of said pipe n , as clearly shown in Fig. 1. The pipe n merges with a transverse conduit n^2 , extending through an opening provided in the upper portion of the casings I and L, Fig. 1, and in this conduit n^2 , preferably between its connection with the casing I and the vertical pipe n^2 , is interposed a damper n^3 of any preferred construction.

Both ends of the pipe or conduit m^2 and the front ends of the pipes m and m' are provided with removable caps or covers p , and the walls of the ash pit or chamber A, in line with the caps or covers p , are provided with openings p' and doors p^3 to permit of access being had to said caps or covers p for cleaning out or for other purposes.

In the casing or jacket I, adjacent to the ring or annular plate E, is provided a door p^2 , for a purpose to be presently explained.

The mode of operation of a furnace of the type hereinbefore described is as follows: A fire is first kindled on the grate W, provided with an arm w , extending beyond the outer shell or casing L and having a vertical operating lever-arm w' applied thereto, and the products of combustion from the fire-pot B are conducted directly into the chimney by opening the damper n^3 . After the fire has been kindled the damper n^3 is then closed and the products of combustion from the fire-pot B first act upon the pipes c^5 , inclosed by the jacket F, when the heat is imparted to the top plate H and then to the annular space or chamber I', formed between the jacket F and the casing I, thereby heating up the pipes d^7 and the casing I. The products of combustion then pass to and through the pipes or conduits m^3 , thence to the pipes m , m' , and m^2 to the pipe n , and through the pipe n^2 to the chimney. The cold air entering the conduit n' is warmed by the smoke-pipe n , and the air then passes into the air-receiving chamber A', surrounding the pipes m^2 , m , and m' , and then passes upward in proximity to the fire-pot B and the smoke space or chamber I', then passing through the pipes c^5 d^7 and the annular space or chamber formed between the smoke-casing I and outer shell or casing L, and thence continuing upward into the hot-air drum K, and thence led off through the conduits k and k' for use. The providing of socket-openings c^3 in the annu-

lar plate C and similar openings d^5 in the annular plate D and the extension of the flangeless pipes c^5 and d^7 above the top plate H admit of these pipes being readily inserted in position in the erection of the furnace or removed for cleaning out the furnace or other required purposes and replaced with facility and comparatively little labor.

As the pipes c^5 and d^7 are flangeless and do not support any of the plates or other parts of the heater, they are free to expand, and as the sand or other seals used in or at their joints with the plates and rings C, D, and H directly contacts with the pipes said joints are not broken, but pack the harder as the pipes expand.

The use of the flangeless pipes c^5 and their above-described joint connections with the ring C and plate H admits of withdrawal of said pipes when worn out through the fire-box by first raising the pipes out of the sockets c^3 , then moving their lower ends laterally toward the fire-box center, and at the same time moving or drawing them downwardly until their upper ends may be disengaged from the openings in the plate H. By simply reversing the above-described action new pipes c^5 may be readily inserted in position without dismantling any of the parts of the heater, a feature which is especially desirable in the present form of heater, as said pipes are directly exposed to the flames, and hence rapidly deteriorate as a matter of fact.

It will be observed from the foregoing explanations that the construction and arrangement of the furnace of my invention are such that the parts can be readily put together and likewise taken apart with facility for the required purpose. Moreover, that the internal construction and arrangement of the parts of the furnace are such that in use any ash or other extraneous matter accumulating on the plate D by reason of the inclined surface thereof will be detached and descend by gravity in the direction of or toward the ring or annular plate E, and by simply opening the door p^2 and rotating the plate or ring around and around the ribs or lateral flanges e thereof in the rotation will cause such ash or extraneous matter to be presented at the door for removal, or is adapted to permit of the movement of the same toward the openings m^4 of the pipes m^3 to dump the same into the pipes m and m' , from which the ash may be removed by a scratcher or other suitable device. The superheating-chamber h^2 of the top plate H being directly in line with and located above the fire-pot B, a greater heating-surface is thereby insured and the air in the drum K is subject to the direct as well as the indirect heat of the furnace.

It will be obvious that as to minor details of construction and arrangement of parts of the furnace modifications may be made without departing from the spirit of the present 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. In combination, a hot-air furnace provided with a fire-pot having a tapering ring provided with a series of holes, a series of air-pipes mounted on said ring and extending into an air-drum, a jacket surrounding said pipes and supported by a sloping-surfaced ring provided with a series of apertures, a second series of air-pipes mounted on the last-mentioned ring and extending into said air-drum, a jacket surrounding the latter air-pipes, and an outer casing supporting the air-drum, substantially as and for the purposes described.

2. In combination, a hot-air furnace provided with a fire-pot, a series of pipes supported thereon and communicating with an air-receiving chamber, an air-drum, a jacket surrounding said pipes and extending below the top of said fire-pot, a ring supporting said jacket, and a series of pipes communicating with said air-receiving chamber and drum, a casing surrounding said series of pipes, and an outer shell, substantially as and for the purposes described.

3. In combination, a hot-air furnace provided with a fire-pot, an air-drum, an air-receiving chamber, a series of air-pipes mounted on the fire-pot and communicating with the air-receiving chamber and drum, a ring located below the top of said fire-pot and supporting a second series of air-pipes, and a double casing for conducting the products of combustion from said fire-pot to and through smoke-pipes leading to the chimney and an outer surrounding shell, substantially as and for the purposes described.

4. In a hot-air furnace, an air-drum, an air-receiving chamber, an ash-pit located in the air-receiving chamber, an air-conduit leading to the air-receiving chamber, and within which is mounted a smoke-pipe communicating with the chimney and with a branch smoke-conduit, a smoke-chamber having the walls thereof supported on a ring, a series of air-pipes communicating with the air-receiving chamber and drum and supported on said ring, a fire-pot, a second series of air-pipes located on top of the fire-pot and communicating with the air-receiving chamber and drum, and an annular air-chamber, substantially as and for the purposes described.

5. In combination, a hot-air furnace provided with an ash-pit located in an air-receiving chamber, a smoke-pipe mounted therein, an annular smoke-chamber supported on a ring above the air-receiving chamber and communicating with said smoke-pipe and combustion-chamber, an outer shell surrounding said smoke-chamber and forming an annular air-space, a series of air-pipes located within said annular smoke-chamber and supported by said ring, and another series of air-pipes located within the combustion-cham-

ber and communicating with the air-receiving chamber and air-drum, substantially as and for the purposes described.

6. In combination, a hot-air furnace provided with an ash-pit located in an air-receiving chamber, an air-supply pipe having mounted therein a smoke-pipe leading to the chimney, a branch smoke pipe or conduit located in the receiving-chamber, an air-drum supported by the outer shell of the furnace, two concentric jackets forming an annular smoke-chamber located between the air-receiving chamber and the drum and communicating with the combustion-chamber and branch smoke-pipe, a series of air-pipes located within the annular smoke-chamber, and another series of pipes supported within said combustion-chamber and both series of pipes communicating with said air receiving chamber and drum, substantially as and for the purposes described.

7. In combination, a hot-air furnace provided with a fire-pot, a series of air-pipes located thereon, two jackets forming an annular smoke-chamber surrounding the fire-pot and air-pipes, another series of air-pipes located within said annular smoke-chamber and adapted to be heated by the escaping products of combustion, an outer shell surrounding the smoke-chamber and forming an annular air-space, and an air-receiving chamber and an air-drum communicating with each other by said air-pipes and annular air-space, substantially as and for the purposes described.

8. In a hot-air furnace, the combination of

an annular smoke-chamber having an inclined bottom provided with openings adapted to convey away accumulating extraneous matter from said chamber, and a ring rotatable on said bottom and provided with laterally-projecting wings or scrapers adapted to collect said matter and force the same through said openings, substantially as described.

9. In a hot-air furnace, an ash-pit and air-receiving chamber having a flanged plate mounted thereon and provided with a flanged central opening, a fire-pot with a contracted mouth mounted on said flanged plate and supporting an annular plate having slanting and flanged surfaces and rims and with flanged openings therein, a channel-plate, casings F and I, forming a smoke-chamber, supports mounted on said ash-pit top plate and supporting in position above the base of the fire-pot a channeled plate with an outer rim and edge or shoulder and supporting the said casings F and I, a plate II, with a superheating chamber h^2 , forming part thereof, and said plate supported in position against the casing I, flangeless pipes extending from the plates C and D to and through the plate II, and smoke-pipes n , n' , and n^2 , the latter provided with a damper, substantially as and for the purposes described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN EVANS.

Witnesses:

FRANK H. MASSEY,
J. R. MASSEY.