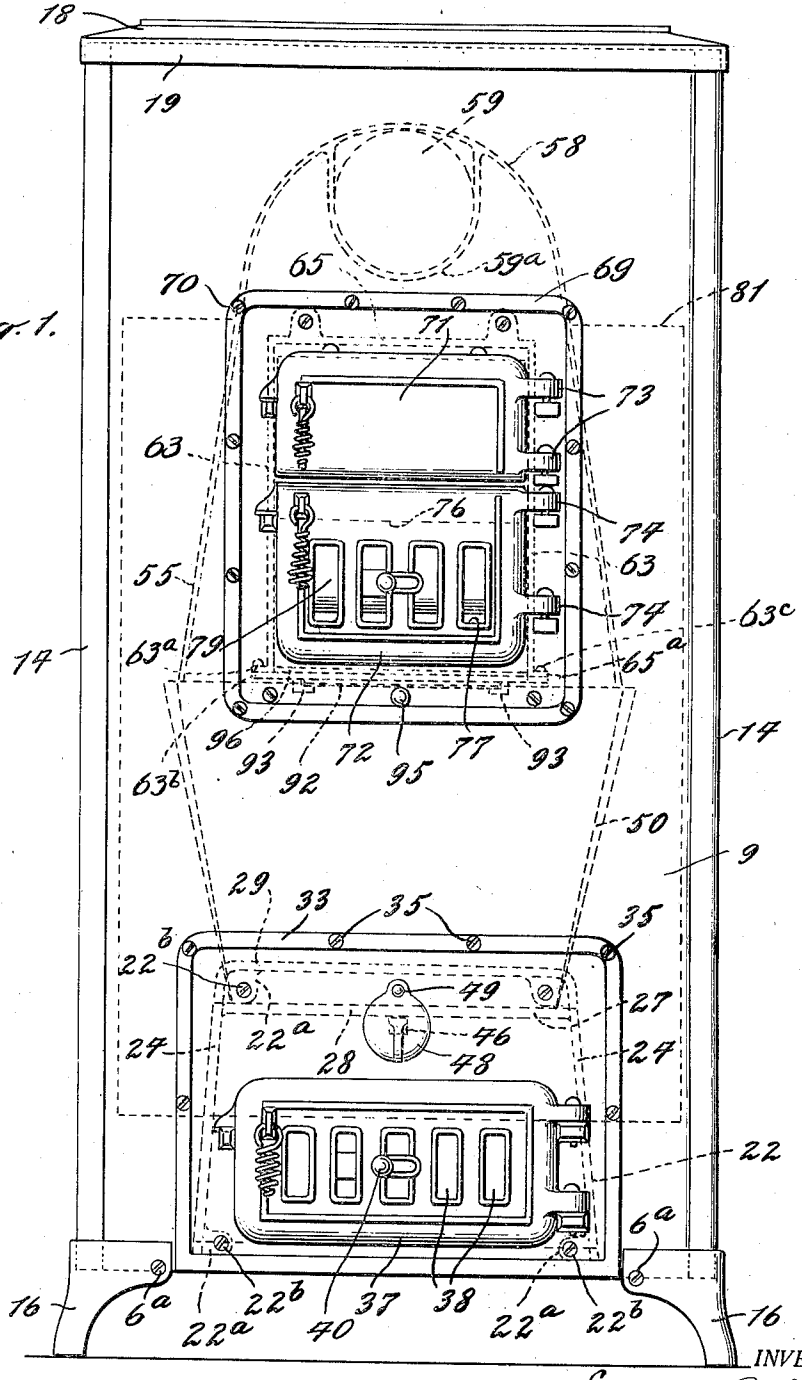
Jan. 12, 1926. **1,569,220**

E. R. DOWNE

HEATING APPARATUS

Filed Jan. 30, 1924 3 Sheets-Sheet 1

Fig. 1.



INVENTOR.
Edward R. Downe
BY
ATTORNEY.

Jan. 12, 1926. 1,569,220

E. R. DOWNE

HEATING APPARATUS

Filed Jan. 30, 1924 3 Sheets-Sheet 2

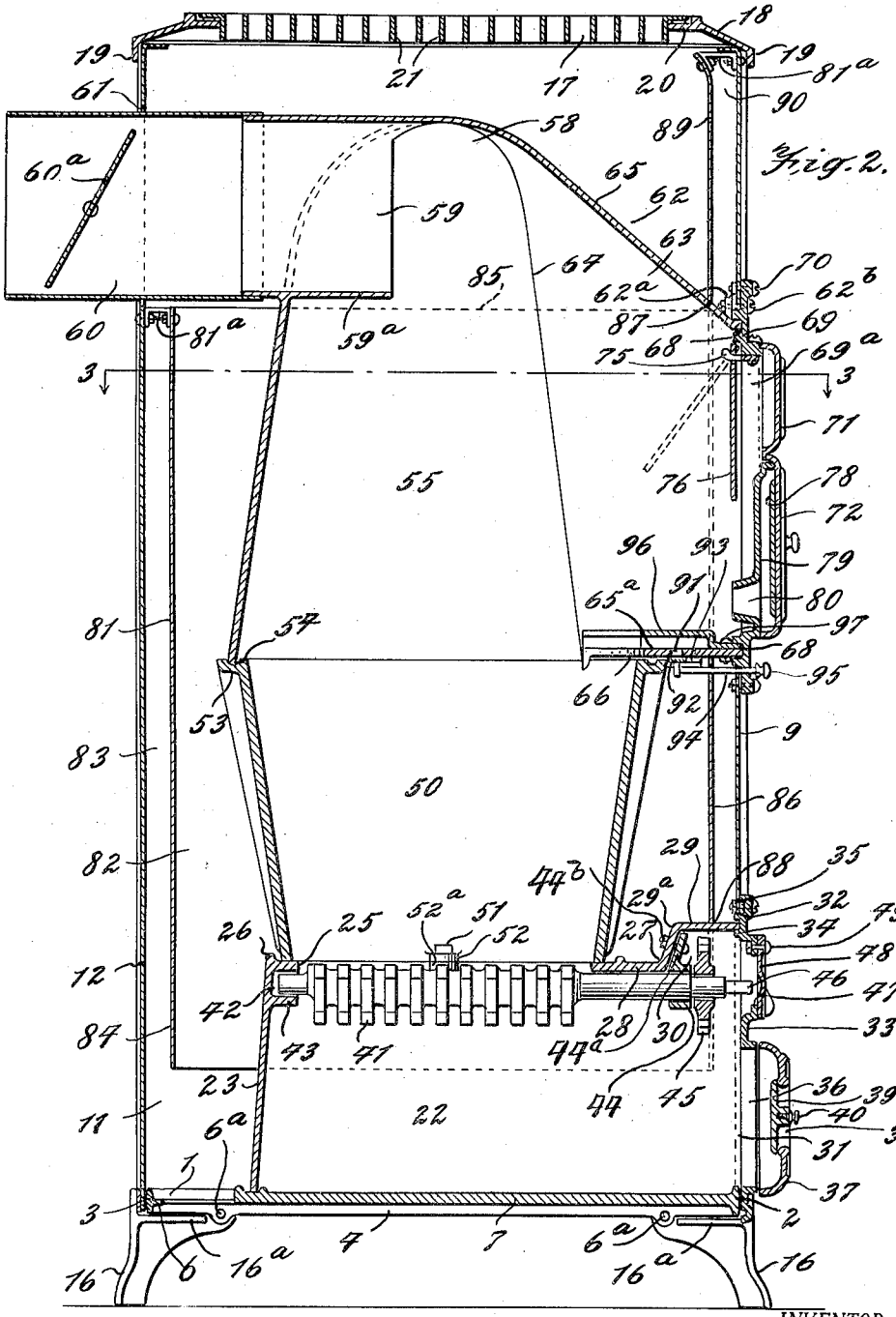


Fig. 2.

INVENTOR.
Edward R. Downe
BY
C. G. Hyltmun
his ATTORNEY.

Jan. 12, 1926. 1,569,220

E. R. DOWNE

HEATING APPARATUS

Filed Jan. 30, 1924 3 Sheets-Sheet 3

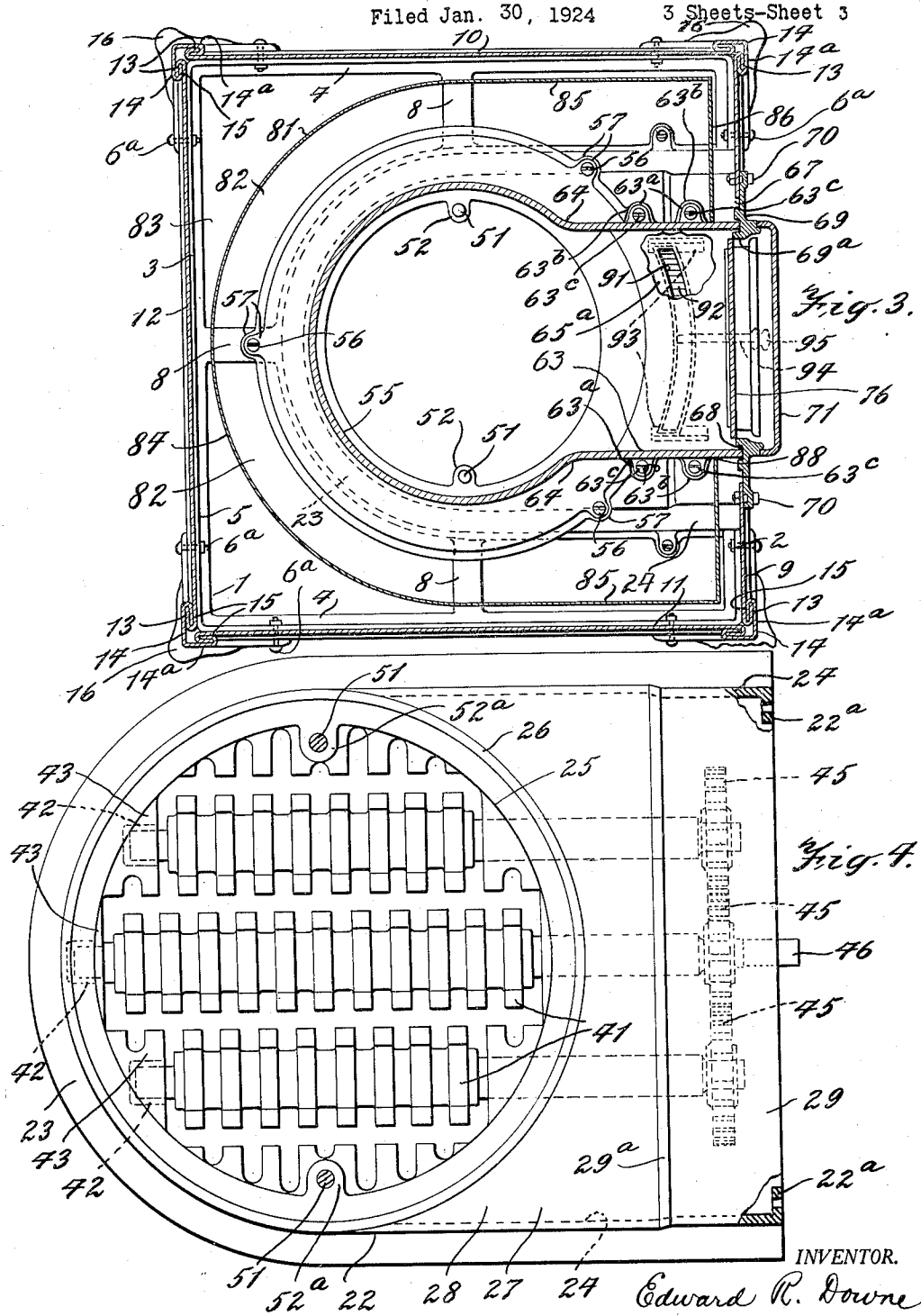


Fig. 3.

Fig. 4.

INVENTOR.
Edward R. Downe
BY
C. E. Mayhew
his ATTORNEY.

Patented Jan. 12, 1926. 1,569,220

UNITED STATES PATENT OFFICE.

EDWARD R. DOWNE, OF LARCHMONT, NEW YORK, ASSIGNOR TO THE FOX FURNACE COMPANY, OF ELYRIA, OHIO, A CORPORATION OF OHIO.

HEATING APPARATUS.

Application filed January 30, 1924. Serial No. 689,418.

To all whom it may concern:

Be it known that I, EDWARD R. DOWNE, a citizen of the United States, residing at Larchmont, in the county of Westchester and State of New York, have invented new and useful Improvements in Heating Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to new and useful improvements in heating appartus, and more particularly of the character or type adapted to be located within an apartment or room to be heated, so that the apartment or room will be heated by air circulating or flowing in contact with the apparatus and deriving heat therefrom by convection.

The primary object of the invention, among others which will be apparent from the following description, is to provide a compact and efficient heater which will efficiently transmit its heat by convection to the air within an apartment, whereby the latter will be heated.

A further object is to provide a heater of the character described with means whereby air currents will be efficiently conducted in heat-receiving relation to said heater, and flow into the apartment to efficiently heat the latter.

A further object is to provide a heater of the character described with improved means for supplying secondary air for combustion.

A further object is to provide a heater of the type mentioned and having a fuel-charging opening with improved, efficient and simple means for preventing escape of smoke and gases from said opening when fuel is being charged.

The invention consists in the novel construction and combination of parts to be more fully described hereinafter, and the novelty of which will be particularly pointed out and distinctly claimed.

A preferred embodiment of the invention is illustrated in the accompanying drawings to be taken as a part of this specification, and wherein—

Figure 1 is a view in front elevation;

Fig. 2 is a vertical central section taken through Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a top plan view of an ash-pit and grate-supporting member constituting one of the elements of the invention.

Referring to the drawings by characters of reference, 1 designates a base-frame upon which the various elements or structures are arranged and supported. This frame 1 is preferably rectangular in form, including front and rear members 2, 3, respectively, joined at their respective ends to the ends of side members 4, 4. The said frame-members are preferably in the form of angle-bars or irons, including a vertical web 5 and a horizontal stiffening flange or web 6. Arranged within the rectangular frame just described is a supporting platform or table 7, connected, in any suitable manner, at its front edge portion to the front frame-member 2; and at its side and rear portions said platform is connected to the side bars 4 and rear bar 3 by connecting bars 8 secured at their ends to the edge portions of said platform and to said frame-members, by any suitable means, preferably by welding, in order to provide a rigid and substantial structure.

It will be seen that the side and rear edges of the platform 7 are spaced from the side and rear frame-members 3, 4 to provide open spaces or passages for the flow of air, in a manner and for a purpose which will be more fully described hereinafter.

Upon the supporting frame described is arranged and supported a casing or wall comprising a front wall 9, side walls 10, 11, and a rear wall 12, all preferably of a suitable sheet-metal. These casing walls rest at their lower edges against the vertical flange or web 5 of the base-frame, and are joined to each other at their vertical edges in any suitable manner to provide a rectangular structure. In order to join the vertical edges of said plates, I prefer to provide each vertical side edge with a reversely bent flange 13, and join the said flanges of adjacent edges together by means of a vertical corner piece or key consisting of a rigid angle-iron 14, the webs or flanges 14^a of which extend at right angles to each other, and are provided with inwardly turned edge flanges 15 lying parallel to and spaced from

the flanges 14ª, respectively, and adapted to interlock with the flanges 13 on the casing-plates. It will be understood that the casing-plates are assembled and secured to each other by arranging the vertical edge of one plate adjacent that of another plate, then applying one end of the locking strip with its flanges 15 beneath the ends of adjacent flanges 13, and sliding said strip lengthwise of the joint until the vertical edges of the plates are secured together throughout the length thereof.

The supporting frame and casing are supported on suitable feet or pedestals 16, the latter having horizontal flanges 16ª upon which the frame and the lower edges of the casing rest, so as to be elevated a distance above a floor or other supporting surface, and thus provide for air flow under the lower edges of the casing, and thence upward through the latter. The legs are secured to the casing and frame by bolts 6ª extending through these elements.

At its upper end the casing just described is closed by an open-work grille 17, comprising a rectangular open frame 18 having a surrounding depending flange 19 which, when said frame is in place snugly encloses the upper edges of the walls of the casing, and also the corner joints, whereby rigidity is imparted to the upper portion of the casing. The frame 18 extends inward a suitable distance for a purpose to be described, and is provided with an internal horizontal flange 20, upon which is supported any suitable form of open-work grille, preferably comprising vertically arranged parallel bars 21. It will be understood that my invention is not limited to any specific form of grille work.

Within the casing and supported on the platform 7, is a heat-emitting element preferably in the form of a stove or furnace for the burning of coal, wood or other suitable fuel. The stove just mentioned comprises a base 22, preferably of cast-iron, constituting an ash-pit or receptacle comprising a curved rear wall 23 conforming to the contour of the rear of said platform 7 which constitutes the bottom of the ash-pit receptacle, the ends of said curved portion merging in side walls 24, which extend to the front wall of said casing. The ash-pit or receptacle is formed with a circular grate opening 25 constituting an ash-passage and grate space surrounded by a bead or flange 26, and the upper forward edges of said side walls 24 are joined by a top-plate 27 which extends to the front wall 9, and is preferably cast integral with said side walls. The top-plate is formed with a horizontal rear portion 28, and a horizontal forward portion 29 in a higher plane than the portion 28, said portions being joined by a transverse inclined wall 29ª, thereby forming a recess 30 for a purpose to be presently described. The front of the ash-pit chamber is open, as at 31, and registers with an opening 32 through the lower portion of wall 9, the edge of said chamber contacting a door-frame plate 33 surrounding said opening 32, a joint with said edge being made by a bead or flange 34 on the inner face of plate 33. The base 22 is provided at its front portion, at any desirable points, with inwardly directed lugs 22ª (Fig. 1), which receive bolts and nuts 22ᵇ passing through the door-frame 33 and said lugs, whereby the door-frame is rigidly secured to said base 22.

The door-frame plate is mounted preferably on the outer face of wall 9, and is secured thereto by screw-bolts 35 passing through said plate and wall. Through the lower portion of plate 33 is an opening 36 through which access is had to the ash-pit member for the purpose of removing ashes, said opening being controlled by a hinged closure door 37 having air inlet openings 38 controlled by a sliding closure plate 39 operable by a handle 40 in a well-known manner.

Extending across the opening 25 is a grate, preferably comprising a plurality of rocking or rotary bars 41, the rear ends of which are rotatably seated in sockets 42 in bosses 43, preferably cast integral with the ash-pit member, the forward end portions of said bars having bearing in bosses 44 in a plate 44ª bolted, as at 44ᵇ, against the under face of wall 29ª at the front of said member. In the present embodiment three grate bars are employed. The forward ends of said bars extend into the recess 30, and each bar has fixed thereto a gear 45, said gears being arranged in mesh (see Fig. 4), and the center grate bar having a wrench head 46 in line with an opening 47 in the door-frame plate 33, through which a shaker crank (not shown) is adapted to be inserted to engage the head 46 to shake the grate. The opening 47 is adapted to be covered by a closure-plate 48 pivoted, as at 49, on the plate 33.

50 designates a fuel receptacle or fire-pot consisting preferably of an open bottomed, upwardly flaring casting, the lower end of which is seated on the ash-pit member, and within the head or flange 26. The said receptacle and member 22 are preferably connected by screws or bolts 51 threaded through lugs 52, 52ª on said receptacle and member. The receptacle 50 is provided at its upper end with a circumferential lateral flange 53 having a circular groove 54 in its upper face (see Fig. 2).

Supported on the receptacle 50 is a combustion chamber, preferably comprising a substantially conical shell 55 of cast-metal, the lower edge of which is seated on said flange 53 and within said groove 54, the

abutting edge portions of said receptacle and chamber being secured together by screw-bolts 56 engaging matching lugs or ears 57 on said elements respectively. The upper portion of the chamber 55 is rounded or dome-shaped, as at 58, and opens through a lateral duct member 59 constituting an outlet for the discharge of smoke and gaseous products from the heater. The member 59 is preferably cast integral with the shell 55 and may be connected in any suitable manner to a smoke pipe 60, passing through an opening 61 in the rear wall 12, and controlled by any suitable form of damper, for example, the well-known pivoted plate, as at 60[a]. The inner portion of said duct 59 projects into the upper end of chamber 55 to provide a baffle 59[a] (Fig. 2) to cause the products of combustion to take a circuitous path up into the extreme upper end of said chamber before passing out through said duct.

At its forward portion the combustion chamber 55 is provided with a fuel-charging member or throat 62, comprising vertical side walls 63 preferably cast integral with and merging at their rear portions into the circular side wall of the chamber, as at 64. The throat has an integral upper wall 65 which at its upper end merges with the rounded portion 58, said wall 65 inclining downward from said portion 58 to the front or entrance end of said throat, as shown in Fig. 2. The lower portion of the charging throat is closed by a bottom wall 65[a], preferably a separate plate projecting forwardly of the top edge of the fuel-pot, the inner edge of wall 65[a] being curved, as at 66, to follow the general inner contour of the fuel-pot (see Figs. 2 and 3). The lower side edges of walls 63 are provided with outwardly extending lugs 63[a], and the outer side edges of plate 65[a] is provided with lugs 63[b] matching lugs 63[a] and secured thereto by bolts 63[c], whereby plate 65 is rigidly secured in position. The forward edges of all of the walls forming said charging member or throat terminate in substantially the same vertical plane, and form a rectangular entrance to said throat located intermediate the fuel-pot and the upper end of the combustion chamber, the upper horizontal edge of said opening being approximately midway the upper and lower ends of the combustion chamber, so that the inclined wall will assure smoke and gases flowing freely toward the outlet 59 when the door is opened, and not be emitted from the latter.

The entrance to the charging throat registers with an opening 67 through said front wall 9, the edges of the transverse and vertical walls of said throat being seated within a groove 68 in the inner face of a door frame plate 69 surrounding said opening 67 located on the front face of said front wall and having an opening 69[a]. The charging throat is provided with integral lugs 62[a], located adjacent the door-frame 69 and secured thereto by screw-bolts and nuts, indicated at 62[b]. The door-frame 69 is secured in place on the outer casing by bolts 70 extending through the same and said wall 9, and carrying nuts on their inner ends.

The opening 69[a] is controlled by two doors 71, 72, mounted to swing horizontally on hinges 73, 74, respectively, and combining to jointly close said opening. The lower door 72 is of the greater vertical dimension than the upper door 71 and constitutes the main fuel-charging door to be used when firing with coal or fine fuel, the upper door being left closed during such firing. If wood or bulky fuel is to be used, both doors may be opened, so that the full capacity of opening 69[a] will be available.

Within the door-frame and at the upper transverse member thereof, are horizontally spaced, hooked lugs 75, upon which is loosely suspended a baffle-plate 76 which is rectangular in contour, the lower edge normally being located below the lower edge of door 71, so that when both doors are opened said baffle will prevent flow of smoke and gases from the door opening. When fuel is being charged into the heater, the plate 76 will readily swing back to the position shown in dotted lines in Fig. 2.

The door 71 may be imperforate, but door 72 is provided with air inlet openings 77 controlled by a manually operable slide closure-plate 78 in a well-known manner. On the rear of door 72 and spaced therefrom, is carried a plate 79 having a discharge duct or passage 80 at its lower portion, so that secondary air may enter openings 77 and pass through said duct into the combustion chamber, thereby serving as secondary air to promote combustion.

By the arrangement above described, it will be seen that an air flow space or passage is provided between the outer casing and the heating element and substantially surrounding the latter, so that air flowing into said space at the open lower end of the casing will pass upward and be heated by convection, finally flowing from the upper open end of the casing into the room to be heated.

I provide means located in said air flow space for absorbing heat by radiation from the heating means, so that the air flowing through said space is divided, a portion being heated by direct contact with the heating element, and another being heated by contact with the means mentioned. This means preferably comprises a vertical wall or partition 81, preferably of sheet-metal, and spaced the proper distance from the heating element and the casing to provide inner and outer air-flow passages 82, 83, respectively. This wall includes a rear curved

portion 84, vertical flat side portions 85, and a flat front wall 86, the latter having upper and lower openings 87, 88, through which, respectively, the charging throat and the ash-pit entrance project. By this arrangement the wall 81 derives heat by radiation from the heating means, and the upwardly flowing air current is heated by convection by flowing in contact with said wall and said element. The wall also serves to protect the casing wall from the direct heat from the heating element. The rear and side members of the wall preferably extend vertically from a point just below the grate to a point above the opening to the fuel throat, and, if desired, the front wall may extend to a point adjacent but short of the casing top, as at 89, to provide an air outlet 90. The element 81 may be supported in position in any suitable manner, for example, by brackets 81ª riveted to the casing wall and said element respectively, and also by resting the upper edges of openings 87, 88 on walls 65 and 29, respectively.

I also provide novel means for admitting preheated secondary air for combustion to the combustion chamber. For this purpose an air inlet duct or port 91 is provided in said wall 65 at a point between the wall 86 and the wall of the fire-pot, so that a portion of heated air flowing upward through space 82 will be heated by contact with the fire-pot and passes through port 91 into the combustion chamber to facilitate combustion. The passage 91 is controlled by a suitable slide damper 92 arranged in undercut guide lugs 93 carried by the under side of wall 65, and operable by a thrust rod 94 extending through an opening in the door-frame 33 and having an operating handle 95. Over the opening 91 is arranged a cover-plate 96 conforming to said wall 65ª and spaced therefrom, said plate being bolted to the wall 65, as at 97. This plate prevents the fuel charged through the throat from finding access to the opening 91. The secondary air fed to the chamber through port 91 is not only efficiently preheated by coming in contact with the front portion of the fire-pot, but said air also acts to prevent the front portion of the casing from becoming objectionably hot, which might be the case due to the fact that the circulation at this point is somewhat retarded by the projecting portion of the base of the fuel throat. It will also be seen that due to the fact that the port 91 when open communicates with the chimney draft, that a large quantity of air will be drawn through the pasage in front of the fire-pot, thereby serving to effectively cool the front portion of the casing.

By constructing the cover plate 18 so as to project inward over the upper end of the air flow, said frame serves to collect the heated air from the sides of the casing and cause it to flow toward the center, thus creating sufficient pressure to assure proper circulation of the warmed air to the rooms or space to be heated.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A heating apparatus of the character described, comprising a rectangular supporting base, a heat-emitting element supported on said base and including an ash receptacle, a fire-pot and a combustion chamber, a rectangular casing supported on said base structure and surrounding said element and spaced therefrom to provide an air passage between said element and casing, said combustion chamber having a forwardly projecting fuel throat opening through an aperture in said casing, and the ash receptacle having an open portion registering with a second opening through said casing, and a wall in the space between said element and casing and spaced therefrom to divide said air passage vertically, said wall having a rear curved portion, side portions in a plane substantially parallel to the side walls of the casing, and a front wall in a plane parallel to the front wall of the casing, the front portion of said wall having an opening through which said fuel throat projects.

2. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber having an outlet, and an ash-receptacle, a casing surrounding said element and spaced therefrom to form an air pasasge, said combustion chamber being substantially conical in form with a rounded top, a fuel-charging member or throat opening through said casing and including substantially vertical side walls jointed to the combustion chamber, and an upwardly inclined wall joining the upper portions of said side walls and merging with the rounded top of said combustion chamber.

3. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber and an ash-receptacle, a casing surrounding said element and spaced therefrom to form an air passage, said casing having an opening at a point below the upper portion of the combustion chamber, and a fuel-charging throat having an inlet registering with said opening and having an upper wall inclined upwardly and joined at its inner end portion to the upper portion of said chamber, said upper wall constituting a front wall of the combustion chamber.

4. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber and an ash receptacle, a casing surrounding said element and spaced therefrom to form a vertical passage, a wall in the space between said element and casing to divide said passage vertically, said casing

and wall having registering side openings, said combustion chamber having a fuel-charging throat having an inlet registering with said opening in the casing and connected to said fire-pot and passing through the opening in said wall, and a secondary air inlet opening from the space between said wall and element through the wall of said fuel-charging throat.

5. A heating apparatus comprising a heat-emitting element including a fire-pot combustion chamber and an ash receptacle, a casing surrounding said element and spaced therefrom, said combustion chamber having an outlet at the upper portion thereof, a fuel-charging throat projecting from the front wall of said combustion chamber and opening through said casing, said throat including a bottom wall, side walls joining the combustion chamber wall, and an upper wall joining said side walls and inclined upwardly from the inlet of said throat to the top of said combustion chamber and toward said outlet whereby said inclined wall deflects smoke and gases toward said outlet.

6. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber and an ash receptacle, a casing surrounding said element and spaced therefrom, said combustion chamber having an outlet duct at the upper rear portion thereof, a fuel-charging throat projecting from the front wall of said combustion chamber and opening through said casing, said throat including a bottom wall, side walls joining the combustion chamber wall, and an upper wall joining said side walls and inclined upwardly from the inlet of said throat to the top of said combustion chamber and toward said outlet duct whereby said inclined wall deflects smoke and gases toward said outlet duct, said outlet duct including a portion projecting into the upper portion of the combustion chamber below the upper wall of the latter and constituting a baffle to direct products into the upper portion of the combustion chamber.

7. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber and an ash receptacle, a casing surrounding said element and spaced therefrom to form an air passage, said combustion chamber being substantially conical in form with a rounded top, and said combustion chamber having an outlet at the upper rear portion thereof, a fuel-charging throat projecting from the front wall of said combustion chamber and including a bottom wall, side walls joining the combustion chamber wall, and an upper wall joining said side walls and inclined upwardly from the inlet of said throat to the top of said combustion chamber and toward said outlet, and merging with said rounded top whereby smoke and gases are deflected by said wall to said outlet.

8. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber and an ash-receptacle, a casing surrounding said element and spaced therefrom to form a vertical air passage, said casing having an opening, a fuel-charging throat having an inlet registering with said opening in the casing and connected to said fire-pot, and a secondary air inlet through the wall of said fuel-charging throat and having an inlet communicating with the space between said heating element and casing.

9. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber and an ash-receptacle, a casing surrounding said element and spaced therefrom to form a vertical air passage, said casing having an opening, a fuel-charging throat having an inlet registering with said opening in the casing and connected to said fire-pot, a secondary air inlet through the wall of said fuel-charging throat and having an inlet communicating with the space between said heating element and casing to receive heated air, and means for controlling said secondary air inlet.

10. A heating apparatus comprsing a heat-emitting element including a fire-pot, a combustion chamber and an ash-receptacle, a casing surrounding said element and spaced therefrom to form a vertical air passage, said casing having an opening, a fuel-charging throat having an inlet registering with said opening in the casing and connected to said fire-pot, a secondary air inlet through the wall of said fuel-charging throat and having an inlet communicating with the space between said heating element and casing to receive heated air from said space, a guard in said fuel-charging throat and extending over said secondary air inlet, and means in the space between said heating element and casing for controlling said secondary air inlet.

11. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber and an ash receptacle, a casing surrounding said element and spaced therefrom to form an air passage, said casing having an opening at a point below the upper portion of the combustion chamber, a fuel-charging throat having an inlet registering with said opening and an upper wall inclined upwardly and joined at its inner end portion to the upper portion of said chamber, said upper wall constituting a front wall of the combustion chamber, closure means for said fuel-charging throat inlet, and a baffle pivotally suspended adjacent said inlet and at the lower portion of said inclined wall, whereby smoke and gases

are prevented from issuing from the throat inlet and are deflected by said baffle against said inclined wall.

12. A heating apparatus comprising a heat-emitting element including a fire-pot, a combustion chamber and an ash receptacle, a casing surrounding said element and space therefrom to form an air passage, said casing having an opening at a point below the upper portion of the combustion chamber, a fuel-charging throat having an inlet registering with said opening and an upper wall inclined upwardly and joined at its inner end portion to the upper portion of said chamber, said upper wall constituting a front wall of the combustion chamber, upper and lower doors hinged on the casing and cooperating to control the inlet to said throat, and a baffle pivotally suspended adjacent said inlet and at the lower portion of said inclined wall, the lower edge of said baffle depending below said upper door whereby when said doors are opened smoke and gases are prevented from issuing from the throat inlet and are deflected against said upper inclined wall.

In testimony whereof I have hereunto subscribed my name.

EDWARD R. DOWNE.