

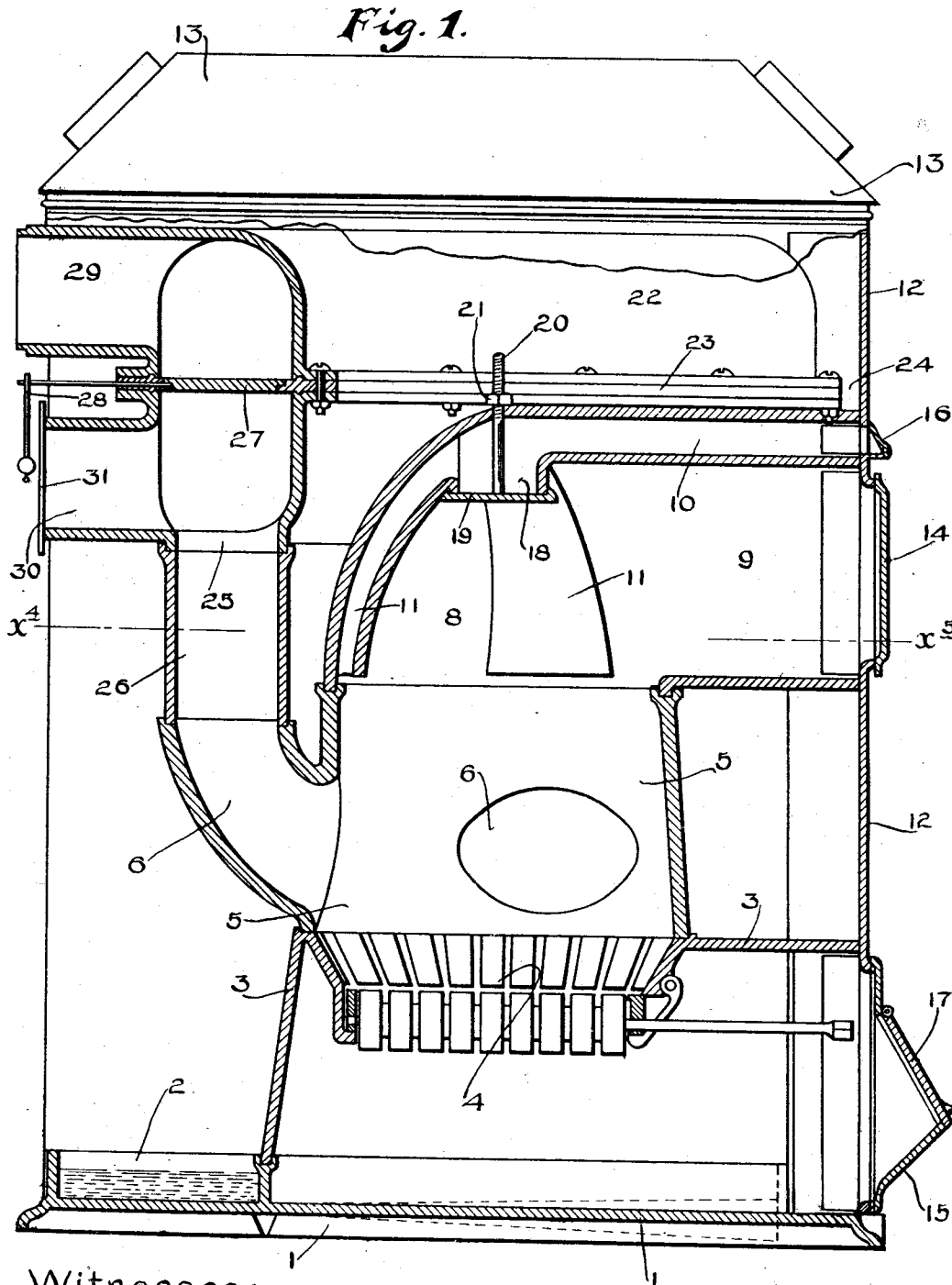
A. P. SMITH.
FURNACE.

APPLICATION FILED AUG. 11, 1911.

1,052,760.

Patented Feb. 11, 1913.

4 SHEETS—SHEET 1.



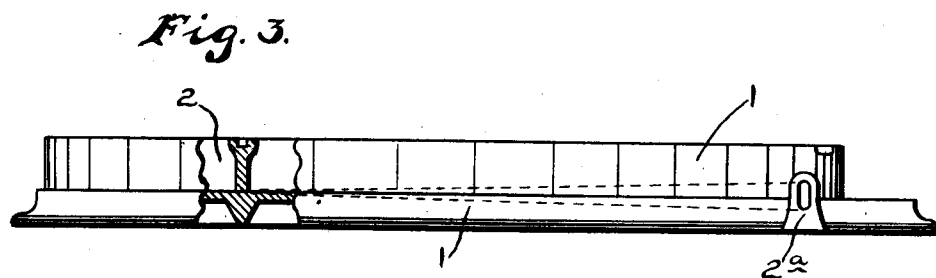
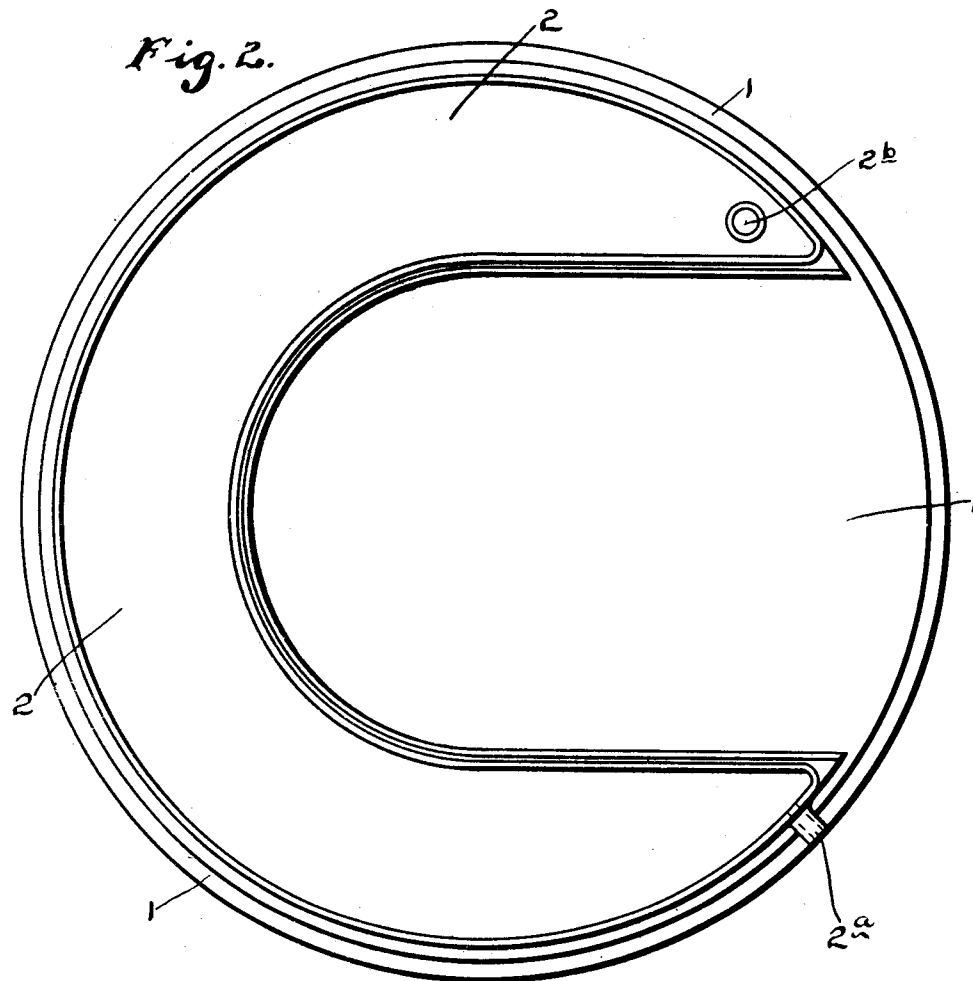
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4 SHEETS—SHEET 2.



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4 SHEETS-SHEET 3.

Fig. 4.

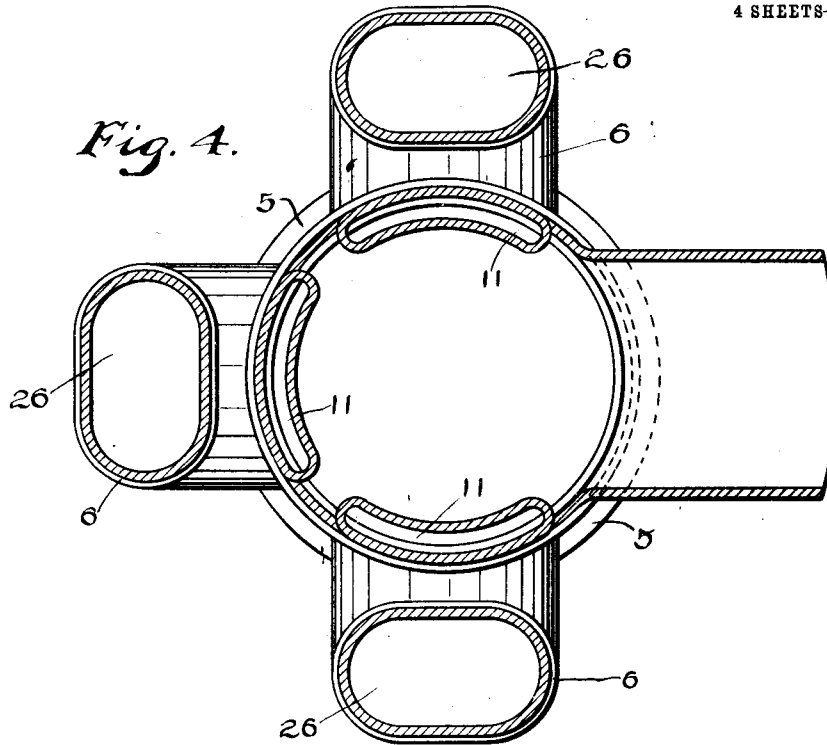
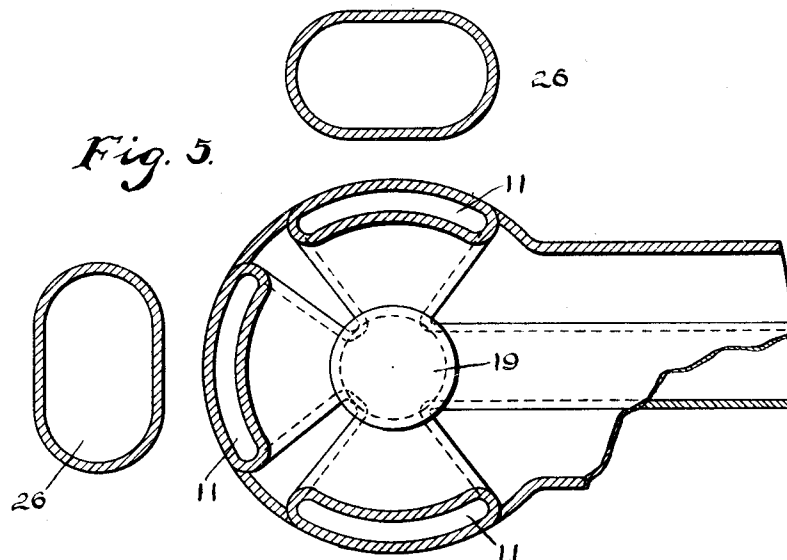


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 7.

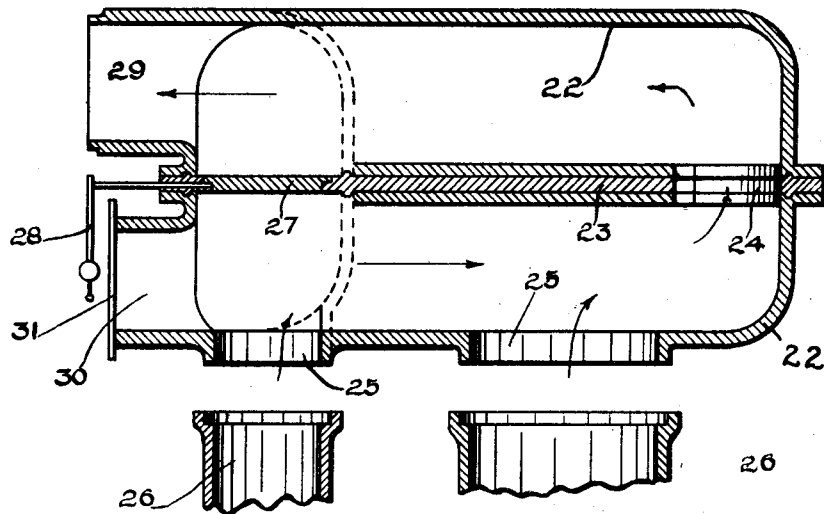
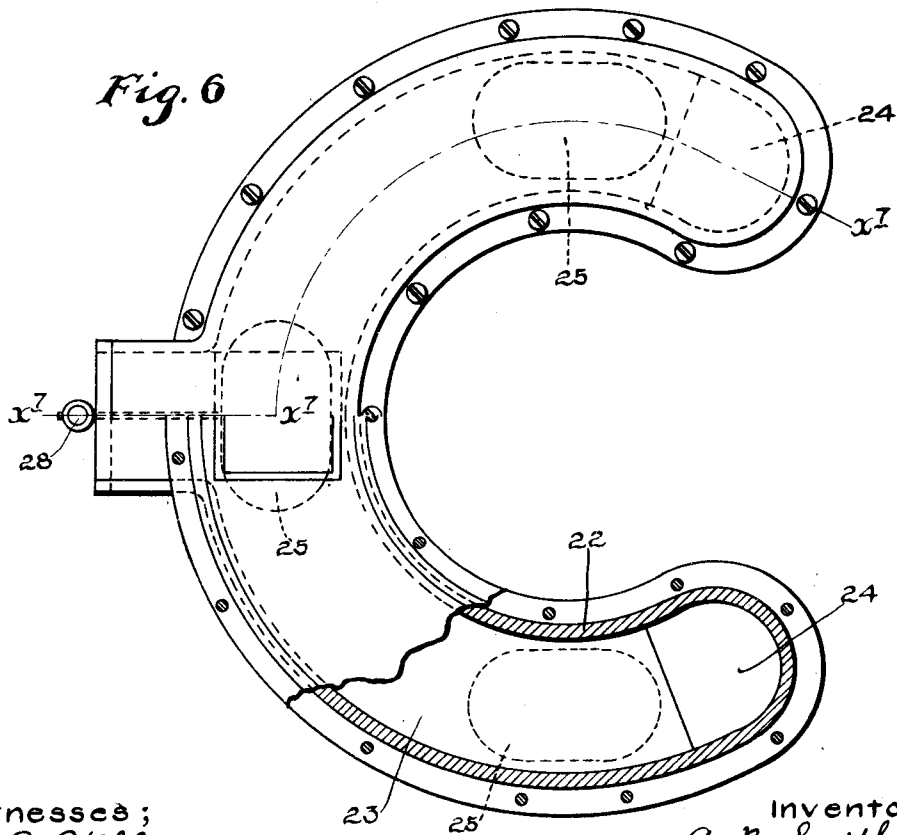


Fig. 6



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UNITED STATES PATENT OFFICE.

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1,052,760.

Specification of Letters Patent.

Patented Feb. 11, 1913.

Application filed August 11, 1911. Serial No. 643,537.

To all whom it may concern:

Be it known that I, ARTHUR P. SMITH, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object to provide a hot air furnace of very high efficiency, and to such ends the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims:

More particularly stated, the invention is directed to the improvement of hot air furnaces wherein a down draft is employed so that the combustion of the coal takes place always close to the grate, and the invention is directed chiefly to a novel and improved arrangement of air supply and draft conduits and radiator. The invention, however, involves other novel and important features of construction, all of which will hereinafter be described and defined in the claims:

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings, Figure 1 is a view chiefly in vertical section, but with some parts in full, showing the preferred form of my improved furnace; Fig. 2 is a plan view of the base of the furnace; Fig. 3 is a side elevation of the same with some parts broken away; Fig. 4 is a horizontal section taken on the line $x^4 x^5$ of Fig. 1, looking downward on the parts; Fig. 5 is a horizontal section also taken on the line $x^4 x^5$ of Fig. 1, but looking upward at the parts, and some parts being broken away; Fig. 6 is a plan view with some parts broken away, and some parts sectioned showing the radiator or secondary combustion chamber of the furnace; and Fig. 7 is a vertical section taken on the irregular line $x^7 x^7$ of Fig. 6, and showing some of the parts separated.

The base 1, of the furnace is preferably a cast structure, and as shown, it is provided with an integrally formed vapor or water pan 2. This vapor pan 2 is approximately

crescent shaped or C-shaped in plan, and its inner wall is preferably grooved to receive the lower edge of the shell 3 of the ash pot. This ash pot shell 3 supports the grates 4 which may be of the usual or any suitable construction.

The fire pot 5 is preferably a cast approximately cylindrical structure, having, however, a slight downward flare, and it is provided with a plurality, as shown, of three outwardly and upwardly curved elbows 6. The fire pot 5 is supported by the ash pit shell 3, the latter being preferably grooved to receive and form a tight joint with the lower edge of the said fire box.

The primary combustion chamber is formed within the fire box 5 and the said fire box supports a dome 8 which is preferably a cast structure having integrally formed therewith, an outwardly extended feed door neck 9 and a fresh air supply conduit 10, which latter terminates within the dome in downwardly curved air conduits 11. The feed door neck 9, the neck of the ash pit 3, and the outer extremity of the fresh air intake conduit 10 all open through the front plate 12 of the outer or inclosing casing 13, and the said conduits are adapted to be opened and closed, respectively, by a feed door 14, an ash pit door 15 and a damper or fresh air controlling valve 16. The ash pit door 15 is shown as provided with the customary draft regulating damper 17. As shown, the fresh air intake conduit 10 is provided with three delivery branches or conduits 11 spaced equidistant circumferentially of the dome and, at their lower ends, opening into the primary combustion chamber approximately at the line of the conjunction between the fire box 5 and dome 8. Also, it will be noted, that the lower or delivery ends of the said conduits 11 are located directly over corresponding draft conduits afforded by the elbows 6. Also it should be noted, that the conduits in the said elbows extend to the bottom of the fire box and close to the grate. At the junction of the branch conduits 11 with the main fresh air intake conduit 10, there is a central opening 18 that is normally closed by a stopper plate 19, shown as provided with a threaded stem 20 extended through the top of the dome and provided with a nut 21, by means of which, the said plate 19 is tightly clamped in working position.

Located within the upper portion of the casing 13, and nearly surrounding the upper portion of the dome 8 is a radiator of approximately the general form, the same being approximately crescent-shape or C-shape in plan. This radiator, as shown, is made up of upper and lower cast sections 22 and an interposed horizontal partition 23. The partition 23 terminates short of the ends of the radiator, thereby leaving a communicating passage 24 between the upper and lower compartments of the said radiator. The lower section of the radiator is provided in its bottom with three ports 25 that are connected by short vertical pipes 26 to the upper extremities of the three elbows 6 of the fire pot 5. The central port 25 directly underlies a central port in the partition 23 which is adapted to be opened and closed, at will, by a damper 27, the stem of which, as shown, extends to the exterior of the casing and is provided with an operating arm 28. Directly above the damper 27, the upper section of the radiator 22 is provided with a smoke pipe 29 that extends outward through the casing and is adapted to be connected to a chimney in any suitable way. The lower section of the radiator, just below the damper 27 is shown as provided with a clean-out pipe 30 that extends through the casing 13 and is normally closed by a stopper plate 31.

The fuel is, of course, delivered into the fire box 5 through the feed door neck 9 and, when desired, it may be piled high into the dome. The fresh air for supporting the combustion, when the damper 16 is opened, is drawn in through the conduit 10 and its branches 11 and delivered through the upper portion of the body of the coal, close to the shell of the fire box, and from thence, is drawn over through the coal and outward through the elbows 6, and from thence, into the radiator 22. This down draft is equally distributed around the outer portion of the body of the coal and the combustion is caused to take place close to the grates, and especially close to the grates and in the immediate vicinity of the elbows 6, which latter will be more or less filled with the burning coal. In this way, all of the gases burned are drawn downward and outward from the body of the coal and are burned partly in the elbows 6 and partly in the radiator 22.

Inasmuch as the draft is downward through the body of the coal, the upper portion of the coal will be kept comparatively cool, but by conduction, the metallic walls of the fresh air supply conduits 11 will be quite highly heated, so that the air delivered to the coal therethrough will be super-heated or very considerably heated, and hence, delivered to the burning coal in better condition to effect complete combustion and there-

by eliminate production of smoke. The production of smoke is, as well known, due to poor or incomplete combustion.

For starting the fire, or any other time when an extremely strong draft is desired, the damper 27 may be opened so as to thereby directly connect the fire box and the smoke pipe. If heating efficiency is desired, the said damper 27 is closed, and then all other products of combustion must pass through the lower compartment of the radiator 22, to the end ports 24, thence upward into the upper section of the said radiator, and through the latter to the smoke pipe. This latter condition will, of course, be the one usually maintained when the furnace is in running condition.

The vapor or water pan 2, it will be noted, covers the entire bottom portion of the air space between the furnace proper and the inclosing jacket, so that all dust or light particles precipitated within the jacket from the air which is circulated therethrough and heated therein, will drop into the water contained in the said pan. The air is thus continuously purified or relieved from dust particles which are carried therewith. The water in the pan should be changed from time to time to carry off the precipitated particles, and supplied with clean water for evaporating purposes. To facilitate this action, the water pan 2 is provided at one extremity with a water inlet port 2^a, and, at its other extremity, is provided with a drain port 2^b. Also in a direction from the port 2^a toward the port 2^b, the bottom of the pan is gradually inclined downwardly to facilitate draining. Any suitable source of water supply may be connected to the port 2^a, and the port 2^b may be provided any suitable valve or plug and may be connected to any suitable form of drain pipe or conduit.

What I claim is:

1. In a furnace, a fire pot having a grate structure and provided with combined draft conduits and combustion chambers extending from the sides thereof and from points immediately above the said grate structure, in combination with a dome overlying said firepot and provided with a central air chamber in its top, an air intake conduit leading to said air chamber, and a multiplicity of air conduits leading downward from said air chamber and opening into the upper portion of said fire pot immediately above the corresponding combined draft conduits and combustion chambers.

2. In a furnace, the combination with a fire pot having a multiplicity of draft conduits affording combustion chambers, opening from the sides of the said fire pot, of air supply conduits in number equal to said draft conduits and located with their lower delivery ends immediately over the inner extremities of said draft conduits.

3. In a furnace, the combination with a fire pot having combined draft conduits and combustion chambers extending outward and upward from the lower portion thereof, of a dome covering said fire pot and provided with a lateral fuel passage, with a centrally located air chamber, with an air intake conduit leading to said chamber, and with downwardly extended branch air conduits following the walls of said dome and delivering into the upper portion of said fire pot immediately above the respective combined draft conduits and combustion chambers.

4. In a furnace, the combination with a fire pot having a plurality of circumferentially spaced, upwardly extended draft conduits leading outward from the sides thereof, a radiator to which all of the said draft conduits are connected, the said radiator having a damper-equipped passage and a smoke pipe connection directly connected to one of the said draft conduits, an air conduit for supplying air to the upper portion of said fire pot, and a dome overlying said fire pot and provided with a feed door neck and a fresh air intake conduit, said latter having a multiplicity of branch conduits extending along the inner surface of said dome and arranged to deliver the fresh air directly to the upper portion of said fire pot.

5. In a furnace, the combination with a fire pot having a plurality of circumferentially spaced draft conduits radiating upward from the sides thereof, of a dome overlying the said fire pot and provided with a feed door neck and with a fresh air conduit following the said feed door neck and terminating in a plurality of branches following the inner wall of said dome and terminating in position to deliver air to the upper portion of the said fire pot.

6. In a furnace, the combination with a fire pot having a plurality of circumferentially spaced draft conduits radiating upward from the sides thereof, of a dome overlying the said fire pot and provided with a feed door neck and with a fresh air conduit following the said feed door neck and terminating in a plurality of branches following the inner wall of said dome and terminating in position to deliver air to the upper portion of the said fire pot, the delivery end of each of said branch air conduits being located directly over one of the said draft conduits.

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

ARTHUR P. SMITH.

Witnesses:

HARRY D. KILGORE,

F. D. MERCHANT.