No. 719,613. PATENTED FEB. 3, 1903.

H. C. RYDING.

HEATING FURNACE.

APPLICATION FILED MAR. 19, 1901. RENEWED DEC. 23, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

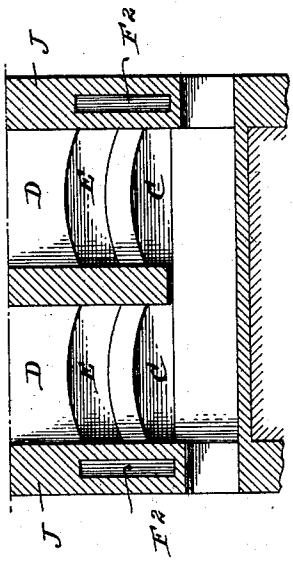


FIG. 5.

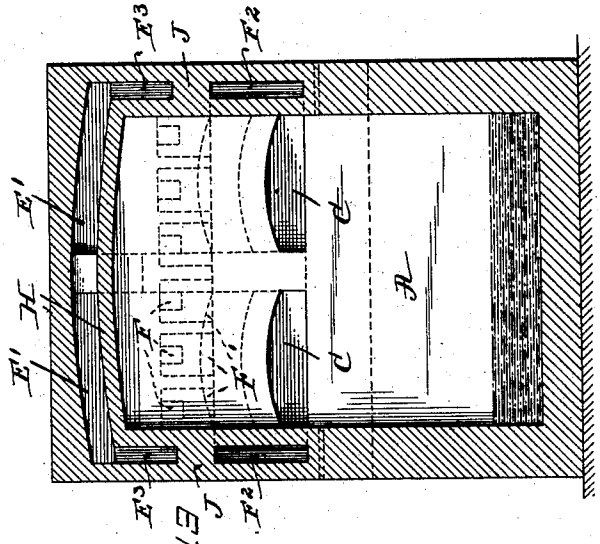


FIG. 6.

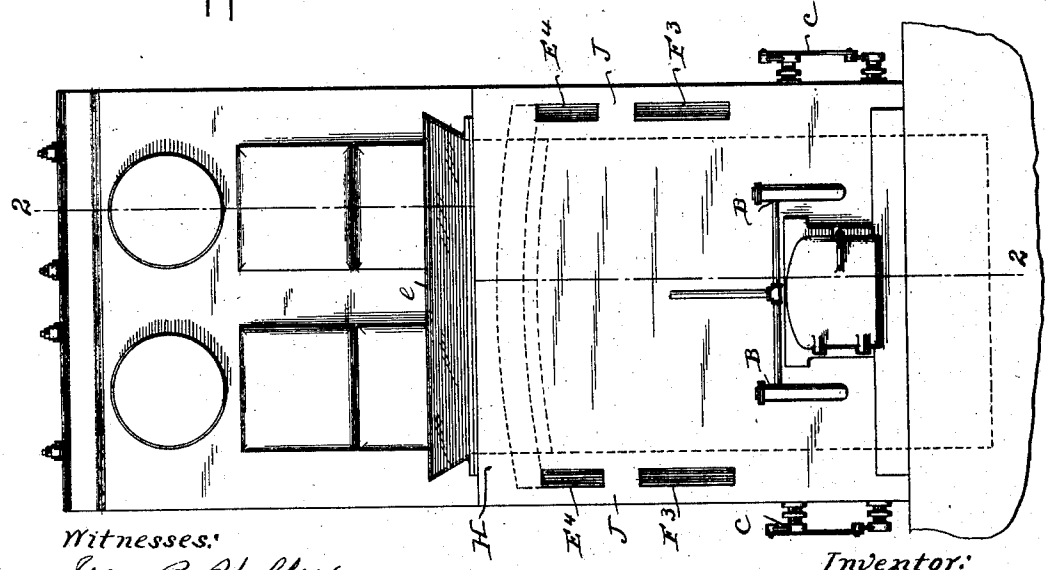


FIG. 7.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 3 SHEETS—SHEET 2.

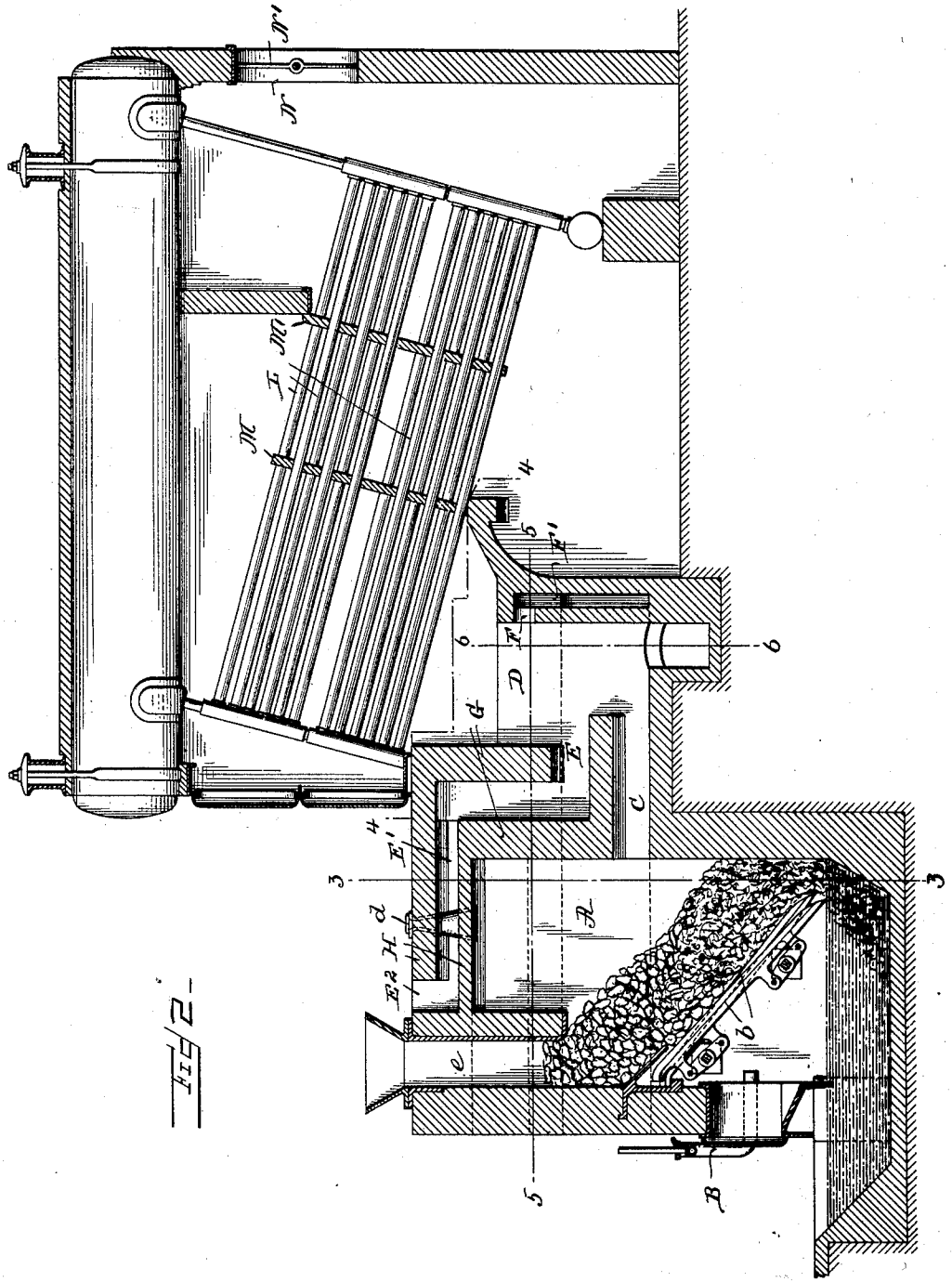


FIG 2.

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HEATING FURNACE.

APPLICATION FILED MAR. 18, 1901. RENEWED DEC. 23, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 4.

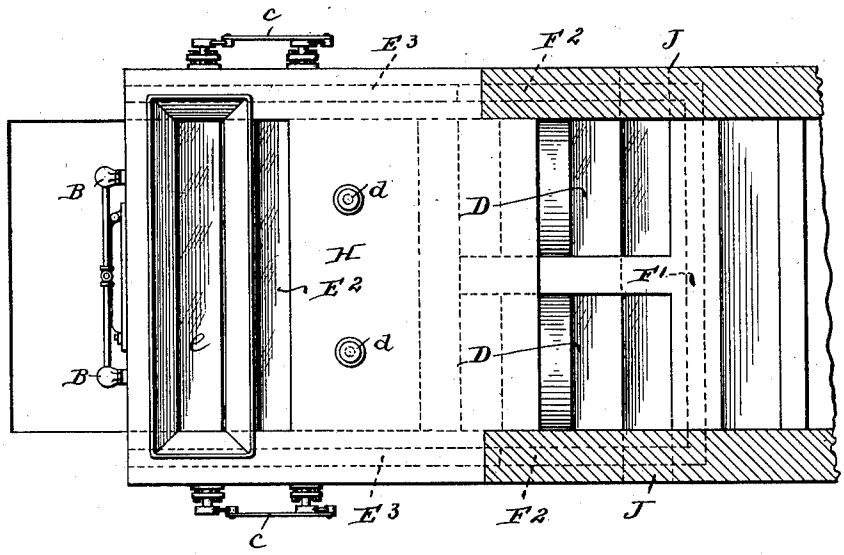
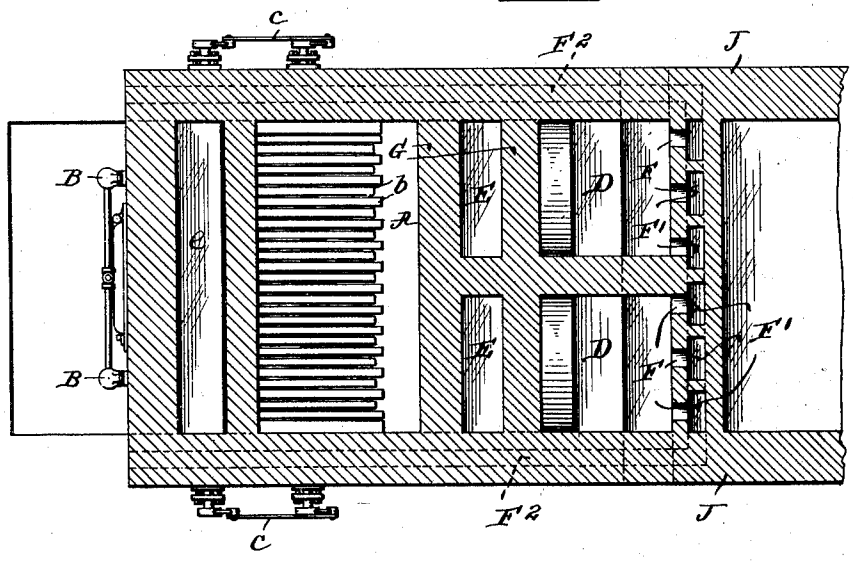


Fig. 5.



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UNITED STATES PATENT OFFICE.

HERBERT C. RYDING, OF ELYRIA, OHIO.

HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 719,613, dated February 3, 1903.

Application filed March 19, 1901. Renewed December 23, 1902. Serial No. 136,408. (No model.)

To all whom it may concern:

Be it known that I, HERBERT C. RYDING, a subject of the King of Great Britain, residing at Elyria, county of Lorain, and State of Ohio, have invented a new and useful Improvement in Heating-Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to an improved form of furnace, my object being to utilize a higher calorific power from the fuel than has hitherto been possible.

My improvement is especially adapted for a boiler-furnace, but may be used to advantage with other characters of furnace.

Though I do not limit the application of my invention thereto, I show my invention in connection with an automatic stoker, with which it has especial value, particularly because by the practice of my invention I am able to almost eliminate the percentage of coke remaining in the ash and to consume all the smoke. In automatic stokers the coke remaining in the ash is sufficiently large to be a very great objection at the present time to their use, while a further loss ensues by imperfect combustion of the gases resulting in smoke. Besides, therefore, the greater efficiency of my furnace it has a distinct advantage for use in cities, being, as it is, a smokeless furnace.

In the practice of my invention I provide the usual furnace containing the grate-bars with means for shaking the same, thereby reducing the necessity of stoking to a minimum; but instead of burning the coal in the furnace I convert it into gas therein. The gas is forced directly into a combustion-chamber closely adjacent to the coal or producer chamber. This combustion-chamber is connected by passages in the wall of the furnace with the outside air. The gas reaching the combustion-chamber is hot, because it has been produced in the same furnace, and the air is also hot by the time it reaches the combustion-chamber, because of its passage through the hot furnace-walls, in which it takes up heat that would otherwise be lost by radiation. The combustion is therefore a perfect one and utilizes the full power of the gas. If used for heating boilers, as in the structure which I have herein illustrated, the products of combustion may be made to pass up and down between baffle-walls through the series of boiler-tubes in the manner known to the art.

My invention also comprehends various more specific features of construction and arrangement, which, though not essential to the practice of my broad invention, are, I believe, of specific novelty and utility.

In the accompanying drawings, which illustrate one specific embodiment of my invention used for heating boilers, Figure 1 is a front view of a structure embodying my invention. Fig. 2 is a longitudinal section in the line 2 2 of Fig. 1. Fig. 3 is a transverse section on the line 3 3 of Fig. 2. Fig. 4 is a plan view, partly in section, on the line 4 4 of Fig. 2. Fig. 5 is a horizontal section on the line 5 5 of Fig. 2, and Fig. 6 is a transverse section on the line 6 6 of Fig. 2.

A is the coal-chamber, into which the coal (indicated in Fig. 2) is fed through the oblong passage *e*, the coal being carried by the grate-bars *b*, which are connected in the usual way, so as to be shaken from the outside of the furnace by the mechanism *c*, Figs. 1, 2, 4, 5. Holes through the top of the furnace through which pokers may be passed are shown at *d*.

At B is shown a steam-injector by means of which steam and air are forced into the furnace below the grate-bars *b* and thence upward through the hot coal, forming the usual gases which pass through the short passage C into the combustion-chamber. It is obvious that the usual coal-combustion chamber of the boilers is in this arrangement a gas-producer and that the combustion-chamber D being in the same structure as the producer and so closely adjacent thereto the gases reach the combustion-chamber without any loss of heat.

Through the walls of the combustion-chamber D are air-openings E E and F F on opposite sides of the chamber at different altitudes therein. The lower passages E E pass up through the wall G, which separates the producer and combustion chambers, and then connects with a passage E′ through the top of wall H of the producer-chamber, this passage E′ being fed with air by an inlet E^2 in the wall H and by passages E^3, Fig. 3, in the side walls J of the producer from inlets E^4 in the front

of the same. The air-openings F, leading into the combustion-chamber, are connected by vertical passages F′ in the rear wall of the combustion-chamber D with passages F^2 in the side walls J J of the furnace, which receive air from inlets F^3 in the front of the furnace. It will thus be seen that the air drawn into the chamber D at E and F to meet with the producer-gas is thoroughly heated by its passage through the hot walls of the furnace, so that the combustion is between hot gas and hot air. The full advantages of an automatic stoker are gained, yet the highest possible efficiency of the coal has been gained because of the burning of gas rather than coal, with the virtual elimination of coke from the ash and also with the greater economy due to the combustion of those gases which in the ordinary furnace pass off as smoke.

The products of combustion leaving the chamber D pass upward through the battery of tubes L, then downward through the same between the baffle-walls M M′, and then upward to the right of wall M′, and then to the stack by the opening N, controlled by damper N′.

It is obvious that the specific mechanism which I have herein shown may be modified without departing outside the scope of my invention. Thus where desirable a forced draft for the air may be provided instead of the natural draft of the stack depended upon in the specific example of the invention described. Similar immaterial modifications might readily suggest themselves to those skilled in the art.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In a boiler-furnace, the combination of a gas-producer chamber, a combustion-chamber, a bridge-wall between the same having an opening directly connecting the two chambers, a passage in the roof of the gas-producer opening at one end into the air and at the other end into the combustion-chamber and passages through the said side walls opening at one end into the air and at the other end into the said combustion-chamber at the side thereof opposite to the entrance of the passage through the roof.

2. In a boiler-furnace, the combination of a gas-producer chamber, a combustion-chamber adjacent thereto, a bridge-wall having a straight flue connecting the two chambers, air-heating passages passing through the roof of the gas-producer chamber and terminating in the combustion-chamber, and similar passages in the side walls of the producer also terminating in the said combustion-chamber.

3. In a boiler-furnace, the combination of a gas-producer chamber, a combustion-chamber, a bridge-wall between said chambers having a passage directly connecting said chambers, a wall of the combustion-chamber opposite said bridge-wall, and air-heating passages passing through the walls of the structure and also through the said bridge-wall and opposite wall respectively, and opening into the combustion-chamber from said opposite walls.

4. In a boiler-furnace, the combination of a gas-producer chamber a combustion-chamber, a bridge-wall between said chambers having a passage directly connecting said chambers, a wall of the combustion-chamber opposite said bridge-wall, and air-heating passages passing through the walls of the structure, one of said passages passing through the roof of the combustion-chamber, thence through the said bridge-wall and opening therefrom into the combustion-chamber, the other of said passages passing through the side walls of said structure and also through said opposite wall of the combustion-chamber and opening therefrom into the combustion-chamber.

In testimony of which invention I have hereunto set my hand, at Elyria, on this 16th day of March, 1901.

HERBERT C. RYDING.

Witnesses:
R. H. WATERMAN,
GEO. H. BROWNELL.