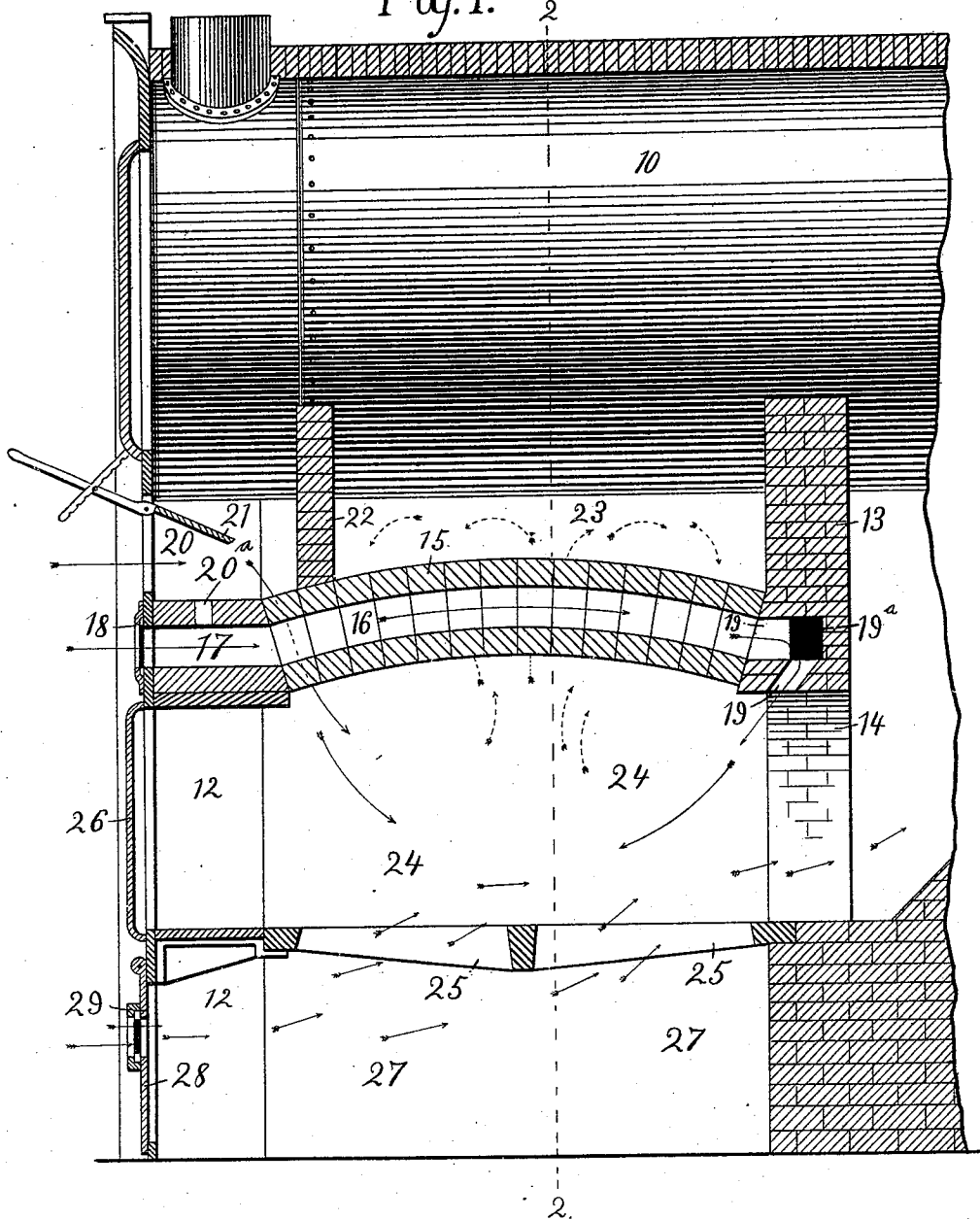


J. M. THOMAS.  
SMOKE CONSUMING FURNACE.

No. 565,307.

Patented Aug. 4, 1896.

Fig. 1.



Witnesses

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(No Model.)

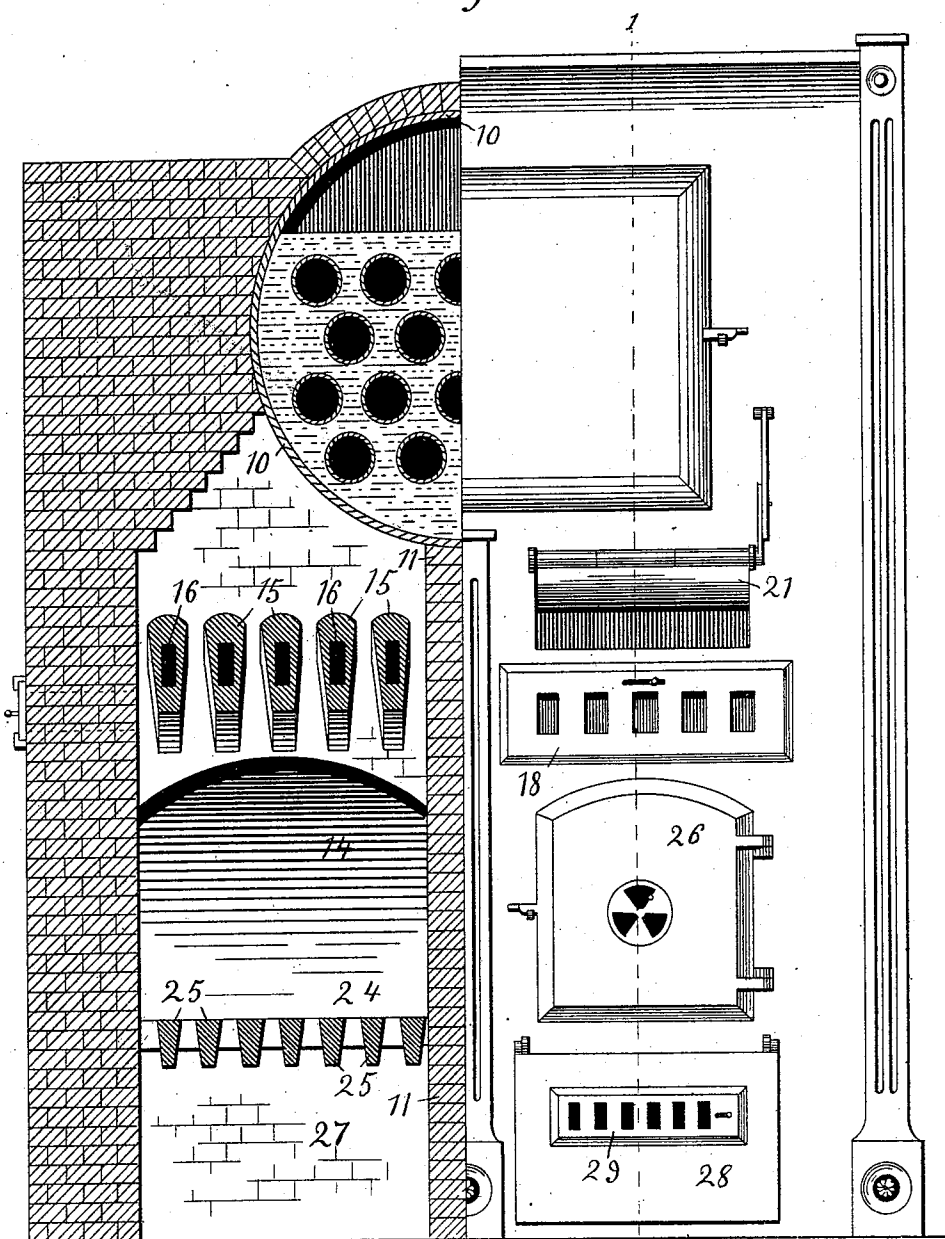
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Fig. 2.



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3 Sheets—Sheet 3.

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*Fig. 3.*

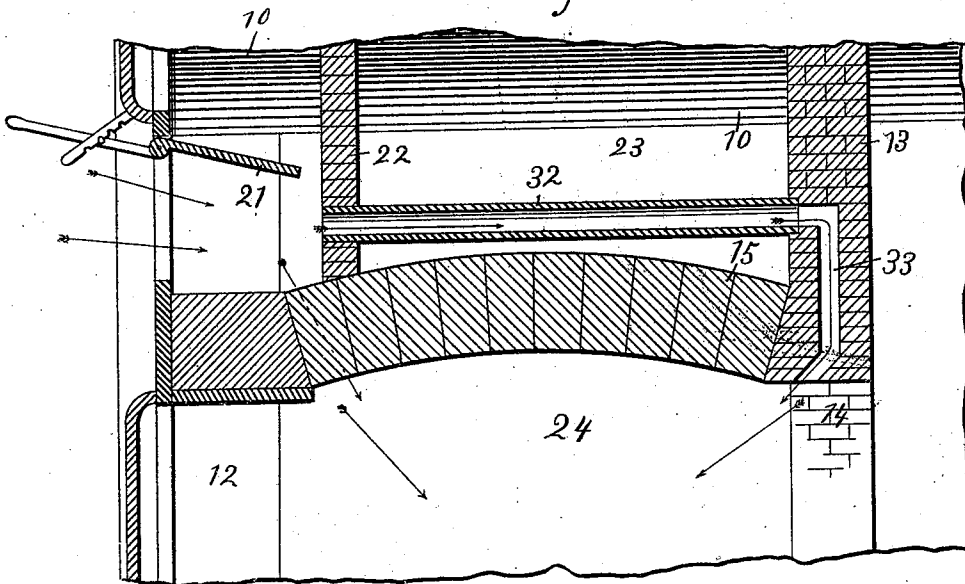
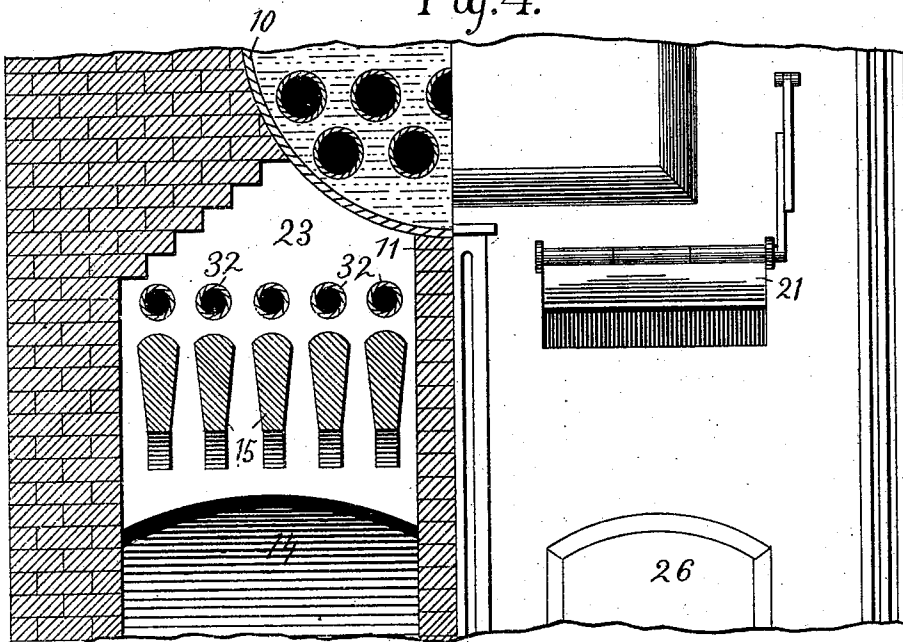


Fig.4.



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# UNITED STATES PATENT OFFICE.

JOSEPH M. THOMAS, OF ST. LOUIS, MISSOURI.

## SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 565,307, dated August 4, 1896.

Application filed April 1, 1896. Serial No. 585,768. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH M. THOMAS, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have invented a certain new and useful Smoke-Consuming Furnace, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to a smoke-consuming furnace, and more particularly to that class of furnaces which are provided with bars or arches of refractory material.

In previous patents, Nos. 519,779 and 535,638, granted to me May 15, 1894, and March 12, 1895, respectively, I have described furnaces in which the bars of refractory material are used as a downdraft fuel-grate. While these furnaces are very effectual in consuming smoke, they are objectionable, as the bars of refractory material soon deteriorate, owing to the high heat to which they are subjected, and probably also because substances contained in the coal form a flux with the material of the bars.

The object of my present invention is the construction of a furnace of this class in which the bars of refractory material will not be liable to rapid deterioration, but which will effectually consume the smoke.

My invention consists in a furnace having bars of refractory material above the fuel-grate and provided with means for admitting air downwardly to the fuel-chamber.

In the accompanying drawings, which illustrate a furnace made in accordance with my invention, Figure 1 is a sectional view on the line 1 1 of Fig. 2. Fig. 2 is a front view, partly in elevation and partly in section, on the line 2 2 of Fig. 1. Fig. 3 is a longitudinal section through part of a furnace, showing a modification, and Fig. 4 is a front view of the same, partly in section and partly in elevation.

Like marks of reference refer to similar parts in the several views of the drawings.

10 is an ordinary steam-boiler supported in the usual manner and provided with a suitable space for the reception of the fuel, re-

fractory bars, &c., which space I have shown centrally divided into two parts by a wall 11, Figs. 2 and 4, running longitudinally of the boiler 10, as this is the usual construction.

12 is the front wall of the furnace, and is provided with suitable openings for the admission of fuel, air, &c.

13 is a wall running parallel to the wall 12, and some distance to the rear of the same. This wall 13 is provided with a suitable archway 14 for the exit of the products of combustion. Extending between the walls 12 and 13 are a series of bars 15 of refractory material. These bars are preferably of an arched form, as shown in the drawings, and have air-passages 16 extending through them.

17 are openings through the wall 12, communicating with the air-passages 16. The admission of air to these openings 17 is regulated by a register 18, placed on the front of the furnace. Leading from the rear of each of the air-passages 16 is an opening 19 through the wall 13. These openings 19 may be connected by a passage 19<sup>a</sup> through the wall 13. These openings 19 deliver the air at the rear of the furnace downwardly and slightly toward the front, as indicated by the arrows in Fig. 1.

Above the bars 15 is an opening 20 through the wall 12, which opening is provided with an adjustable door 21. At a slight distance to the rear of the wall 12, so as to leave passages between the bars 15, a wall 22 is preferably formed between the said bars 15 and the boiler 10, thus forming a chamber 23 above the bars 15 and closed on all sides except the bottom.

20<sup>a</sup> is an opening to allow communication between the passages 17 and 20. If this opening 20<sup>a</sup> be made sufficiently large, it will not be necessary to open both the register 18 and door 21, as the opening of either will admit air to both the front and rear of the furnace. Below the bars 15 is a fuel-chamber 24, provided with grate-bars 25 of the ordinary type. In furnaces in which the boiler is very low, the bars at the center of the furnace may be omitted, the boiler 10 forming the top of the inner side of each fuel-chamber 24. The fuel is admitted to this chamber through a suitable door 26. Below the fuel-chamber 24 is an ash-pit 27, provided with a suitable

door 28, in which is a register 29 for regulating the admission of air to the fire. As no fuel is put upon the bars 15, they can be arranged quite close to the boiler 10, and the bottom of the ash-pit 27 can be made on a level with the ground, thus greatly facilitating the removal of ashes.

In Figs. 3 and 4 I have shown a modification in which the bars 15, instead of having passages through them, are made solid. Above the bars 15 are a series of tubes 32, leading from the space in front of the wall 22 to the wall 13. Leading from the rear end of each of these tubes 32 is a passage-way 33 opening into the rear of the fuel-chamber 24, in the same manner as the passage 19, previously described. In this arrangement the door 21 controls the admission of air to both the front and rear of the fuel-chamber. The tubes 32, being somewhat protected from the direct heat of the fire by the refractory bars 15, are able to withstand the heat.

My furnace can also be used with solid bars 15 by admitting the air to the rear of the fuel-chamber 24 through the cross-passage 19, Fig. 1, in the wall 13, which cross-passage may communicate with the atmosphere at each side of the furnace, but as the air is not heated to any very considerable degree in passing through this passage, I prefer to use the hollow bars 15 or the pipes 32.

The operation of my furnace is as follows: The fuel is fed through the door 26 upon the grate-bars 25. As soon as fresh fuel is supplied to the fire, the door 21 and register 18 are opened to admit air to the front and rear of the fuel-chamber 24. This prevents any smoke being made by the green fuel, as the air so admitted to the fuel-chamber is at a very high temperature. It appears that the currents of air at the front and rear of the chamber 24 check the draft to some extent and cause the smoke to rise, as indicated by the broken arrows in Fig. 1, against and between the incandescent bars 15, so that it is consumed. After a few seconds, all the smoke from the green fuel being consumed, the door 21 and register 18 are closed, air being ordinarily admitted to the furnace only through the register 29. In this manner my furnace can be pushed to its fullest capacity and the reheat fuel used without producing any appreciable amount of smoke. The bars 15, as they do not come in contact with the fuel, will last for a much greater length of time than they do when used as a fuel-grate.

I am aware that it is old to admit air up-

wardly to a furnace through bars or arches of refractory material arranged above a fuel-grate.

I am also aware that it is old to have the products of combustion pass upwardly through and against bars or arches of refractory material to the surfaces to be heated. I therefore disclaim such devices.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a furnace, a fuel-chamber provided with a suitable updraft fuel-grate, bars of refractory material forming the top of said chamber, air-passages subjected to the heat of the furnace and opening downwardly into the rear of said fuel-chamber, a chamber above said refractory bars and communicating with said fuel-chamber through spaces between said refractory bars, said chamber above the fuel-chamber being closed at the sides by suitable walls and at the front and rear by the walls 22 and 13 respectively, substantially as described.

2. In a furnace, a fuel-chamber provided with a suitable updraft fuel-grate, bars of refractory material forming the top of said chamber, air-passages through said bars and opening downwardly into the rear of said fuel-chamber, a chamber above said refractory bars and communicating with said fuel-chamber through spaces between said refractory bars, said chamber above the fuel-chamber being closed at the sides by suitable walls and at the front and rear by the walls 22 and 13 respectively, substantially as described.

3. In a furnace, a fuel-chamber provided with a suitable updraft fuel-grate, bars of refractory material forming the top of said chamber, air-passages through said bars and opening downwardly into the rear of said fuel-chamber, a chamber above said refractory bars and communicating with said fuel-chamber through the spaces between said refractory bars, said chamber above the fuel-chamber being closed at the sides by suitable walls and at the front and rear by the walls 22 and 13 respectively, and means for admitting air downwardly between said refractory bars to the front of said fuel-chamber.

In testimony whereof I have hereunto set my hand and affixed my seal in the presence of the two subscribing witnesses.

JOSEPH M. THOMAS. [L. s.]

Witnesses:

A. C. FOWLER,  
JOHN F. GREEN.