(No Model.) 2 Sheets—Sheet 1.

J. W. WILKINSON.

FURNACE.

No. 520,551. Patented May 29, 1894.

Fig. 1.

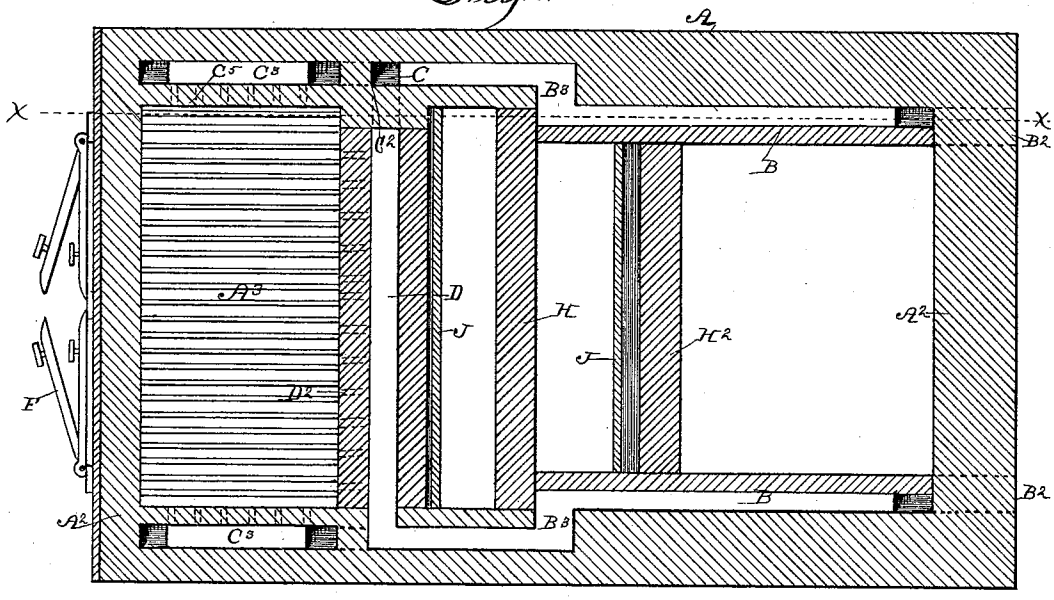


Fig. 2.

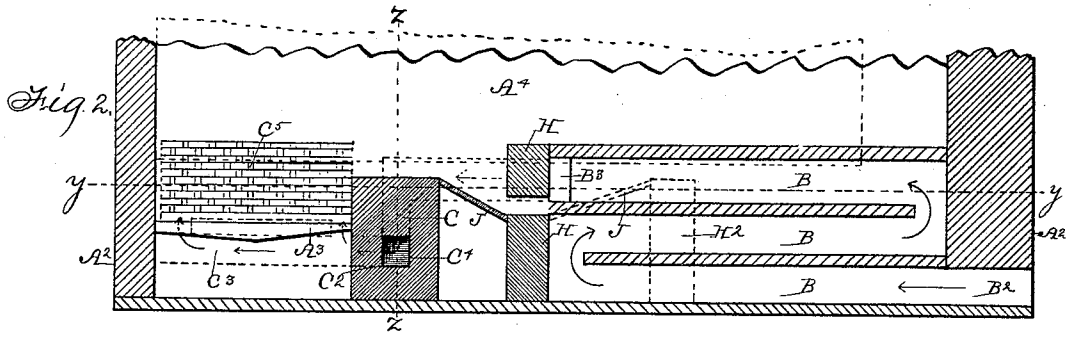
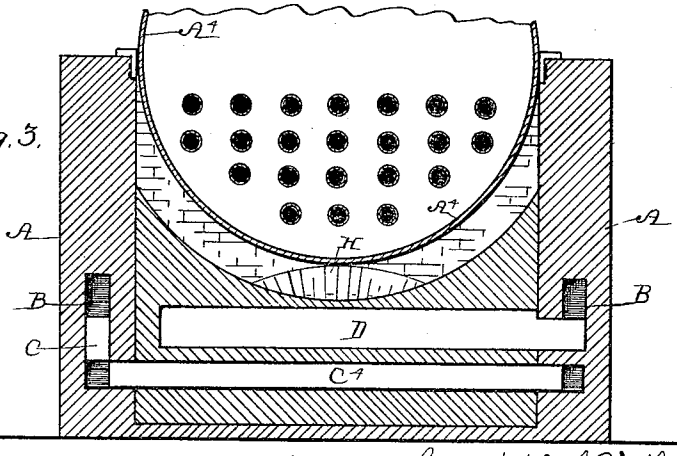


Fig. 3.



Witnesses:
J. Ralph Orwig.
R. H. Orwig.

Inventor: Joseph W. Wilkinson,
By Thomas G. Orwig, Attorney.

THE NATIONAL LITHOGRAPHING COMPANY.
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

J. W. WILKINSON.

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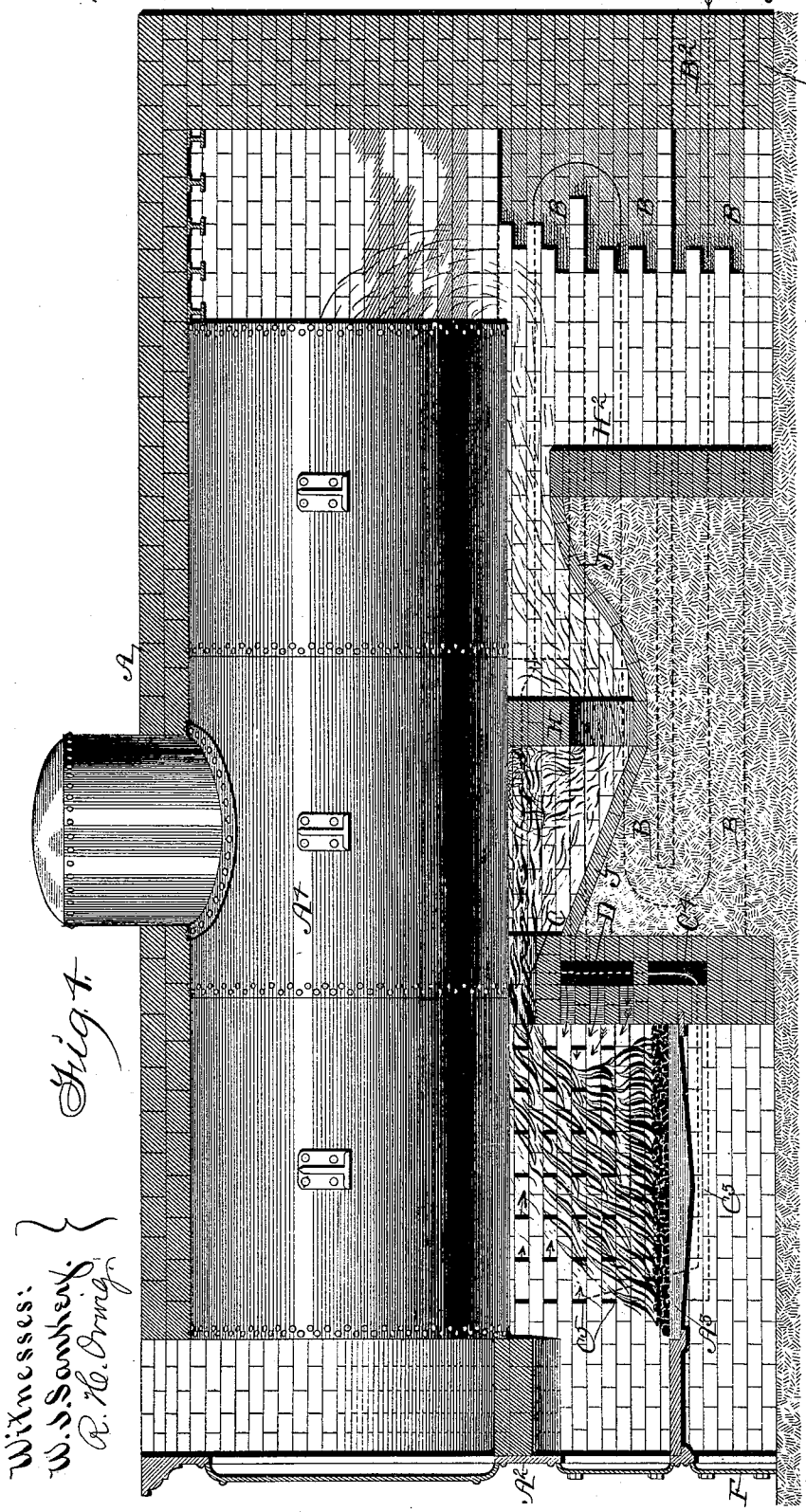

Fig. 1.

Witnesses:
W. J. Sawhill
R. H. Orring

Inventor:
Joseph W. Wilkinson,
By Thomas G. Orring, Atty.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOSEPH W. WILKINSON, OF DES MOINES, IOWA, ASSIGNOR TO THE DES MOINES FUEL SAVING FURNACE COMPANY, OF SAME PLACE.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 520,551, dated May 29, 1894.

Application filed November 16, 1893. Serial No. 491,142. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. WILKINSON, a citizen of the United States of America, residing at Des Moines, in the county of Polk and State of Iowa, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

My invention relates to that class of furnaces in which air is fed to the fire above the grate through hollow side walls and the bridge wall. Heretofore furnaces of this class have proven impractical and worthless for the following reasons: First in many of them the air has not been heated to such a degree that its admission under a boiler would not lessen the temperature of the fire to such an extent as to make it necessary to burn a comparatively great amount of fuel to produce a given degree of heat and further when the air has been properly superheated it has been fed to the fire in such a manner that it was possible for a greater amount of the air to pass through one of the air feeding devices than the others so that imperfect distribution was produced and the passages permitted to fill with soot, ashes, &c., and remain inoperative and further the products of combustion arising from the fuel in the grate and the air fed to the combustion chamber above the grate have not been properly commingled so as to allow the volatile products to ignite after leaving the fire upon the grate.

The object of this invention is to produce, in one furnace, the means for heating pure atmospheric air to such a degree that its admission into a combustion chamber will not lessen the temperature thereof, to discharge such air into the combustion chamber equally from the side walls and bridge wall and make it impossible for either one of the three points of discharge, namely the two side walls and the bridge wall to feed a larger proportion of air than another and to produce an equal pressure outwardly from all of said air feeding devices so as to prevent soot, ashes, &c., from entering and lodging therein and my object is further to provide means whereby the products of combustion arising from the grate and the air fed into the combustion chamber above the grate will be thoroughly commingled.

With these objects in view my invention consists in the construction and arrangement within the hottest part of a boiler furnace, namely, the chamber in the rear of the bridge wall, of a superheating sinuous conduit, adapted to feed atmospheric air to the combustion chamber through the bridge wall and a second sinuous conduit in the same chamber to feed air through the side walls and in the arrangement and combination therewith of suitable bridge walls arranged to thoroughly commingle and hold to the boiler all of the products of combustion and the air fed thereto, as hereinafter set forth, pointed out in my claims and illustrated in the accompanying drawings, in which—

Figure 1 is a horizontal sectional view of the furnace taken through the line of section *y y* of Fig. 2. Fig. 2 is a vertical longitudinal section through the line *x x* of Fig. 1. Fig. 3 is a vertical transverse section taken along the line *z z* of Fig. 2. Fig. 4 is a vertical longitudinal sectional view through the complete furnace, showing portions of the sinuous superheating conduit broken away and an arrow passing through said conduit to show the line of air passage therethrough.

Referring to the accompanying drawings the reference letter A designates the side walls and A^2 the end walls of the furnace, A^3 the grate and A^4 the boiler, all of which are arranged in the ordinary manner.

B B designate tortuous air passages entering the furnace through the rear wall at B^2, passed backwardly and forwardly in the chamber in the rear of the bridge walls to allow the air therein to become heated. These passages are made of fire brick and are built up independently of the side walls in close proximity thereto and in a position where all of the heat and products of combustion of the furnace are compelled to pass in close contact with the top and inner sides thereof and the heat is intensified by reason of said passages narrowing the space through which the heat must pass. Walls of the furnace at B^3, pass from thence forwardly to the forward bridge wall, these passages at this point take different courses, the one side passing downwardly at C and divided at C^2 one of its branches being extended forwardly in the side walls

and upwardly into the hollow spaces therein through the passages C^3 while the other branch passes through the forward bridge wall at C^4 and into the hollow side wall on the opposite side in the same manner. These hollow side walls communicate with the fire box through the perforations at C^5 formed by leaving spaces between the bricks in said walls. The passage at the opposite side of the furnace leads from the point in the side wall directly opposite the front bridge wall into a hollow chamber D in the front bridge wall, and does not communicate in any manner with the hollow side walls. Perforations D^2 lead from the said hollow interior of the bridge wall forwardly into the fire box.

F designates draft doors in the front of the furnace below the grate.

By the arrangement of the air passages and draft doors just described, the amount of air fed to the furnace may be absolutely controlled by the said draft doors. When the said doors are opened air will be fed to the fire upon the grate to produce combustion, the heat thus produced will heat the air in the said air passages and create a draft therethrough, thus heated air will be forced into the combustion chamber from its sides and back. When the draft doors are shut the supply of air will be shut off from under the fire, but the supply through the air passages will not immediately be cut off and will force the blaze downwardly and deaden the fire and gradually, as the fire cools off, will cease.

It will be seen that the proportion of air fed through the various sources of supply may be regulated by adjusting their relative sizes, so that the proper amount of air may be supplied to the fire at the requisite points to produce perfect combustion.

The means for holding the flame and heat to the boiler comprises a second bridge wall H in the rear of the first and in the form of an arch, with a like arch beneath it, and a space or throat between the arches to thereby concentrate the heat toward the center of the boiler and to hold the inflammable gases and products of combustion in suspension in the spaces between the arched wall and boiler so that perfect combustion may take place and the heat be held to the boiler for a short period of time before passing to the flue and a third bridge wall H^2 in the form of an inverted arch to direct the heat toward the boiler, and to lengthen the blaze and compel the inflammable gases and products of combustion to be subjected to an intense heat for a long time so that a great portion of said gases and products of combustion will be consumed and add to the heat throughout the entire length of the boiler. Inclined plates J are placed between the bridge walls as clearly shown in Fig. 3 to prevent the heat from passing downwardly.

I am aware that heretofore arched bridge walls have been formed in the rear of the first bridge wall to commingle the products of combustion and hold the heat to the boiler and do not claim the bridge walls when separately considered. But I am not aware that air has ever been superheated in the rear of the bridge wall and discharged laterally over the fuel on the grate from both the side walls, and a separate air feeding device located in the same chamber and discharging superheated air over the fuel on the grate forwardly from the bridge wall and I desire to claim this combination broadly.

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

1. In a furnace having hollow side walls and air chambers adapted to discharge air inwardly over fuel on the grate and a bridge wall in rear of the grate having an air chamber adapted to discharge air forward, but not in communication with the chambers in the side walls, and a roof over the combustion chamber above the grate, the combination of an air-conducting and superheating device in rear of the bridge wall and communicating with the said air discharging chamber in the side walls, and an air-conducting and superheating device in rear of the bridge wall and in communication with the said air discharging chamber in the bridge wall and said air-conveying and superheating devices located in the line of the draft passage leading rearwardly from the grate and combustion chamber over the grate to be subjected to the heat generated in front of the bridge wall, for the purposes stated.

2. An improved furnace, having hollow side walls adapted to discharge air inwardly over the grate and a hollow bridge wall adapted to discharge air forwardly over the grate and separated from the hollow interior of the side walls, means for compelling all of the products of combustion to pass rearwardly through a chamber in the rear of the bridge wall, a sinuous superheating conduit in said chamber adapted to admit atmospheric air and discharge the same into both side walls, a like conduit in the same chamber adapted to discharge into the bridge wall and draft doors beneath the grate adapted to feed air upwardly through the grate, for the purposes stated.

3. An improved furnace, having hollow side walls adapted to discharge air inwardly over the grate and a hollow bridge wall adapted to discharge air forwardly over the grate and separated from the hollow interior of the side walls, means for compelling all of the products of combustion to pass rearwardly through a chamber in the rear of the bridge wall, a sinuous superheating conduit in said chamber adapted to admit atmospheric air and discharge the same into both side walls, a like conduit in the same chamber adapted to discharge air into the bridge wall, draft doors adapted to feed air beneath the grate, an arched bridge wall and a wall inclined downwardly from the front bridge wall, beneath

the arched wall and upwardly in the rear of the arch bridge wall, for the purposes stated.

4. In a furnace, the combination of a side wall having an air chamber adapted to discharge air inwardly over the grate, an air superheating device in rear of the bridge wall communicating with said chamber in the side wall, a bridge wall having an air chamber adapted to discharge air forward over the grate and an air superheating device in rear of the bridge wall communicating with the said chamber in the bridge wall, for the purposes stated.

5. In a furnace, the combination of the following elements, to wit; hollow side walls adapted to discharge air inwardly over the grate, means located in the chamber in the rear of the grate for feeding superheated atmospheric air to the hollow side walls, a hollow bridge wall in the rear of the grate adapted to discharge air forwardly over the grate, a superheating conduit located in the chamber in the rear of the bridge wall adapted to feed superheated air to the hollow bridge wall and means for compelling the products of combustion to pass rearwardly through the chamber in the rear of the bridge wall.

JOSEPH W. WILKINSON.

Witnesses:
N. I. REEVE,
THOMAS G. ORWIG.