No. 697,833.

Patented Apr. 15, 1902.

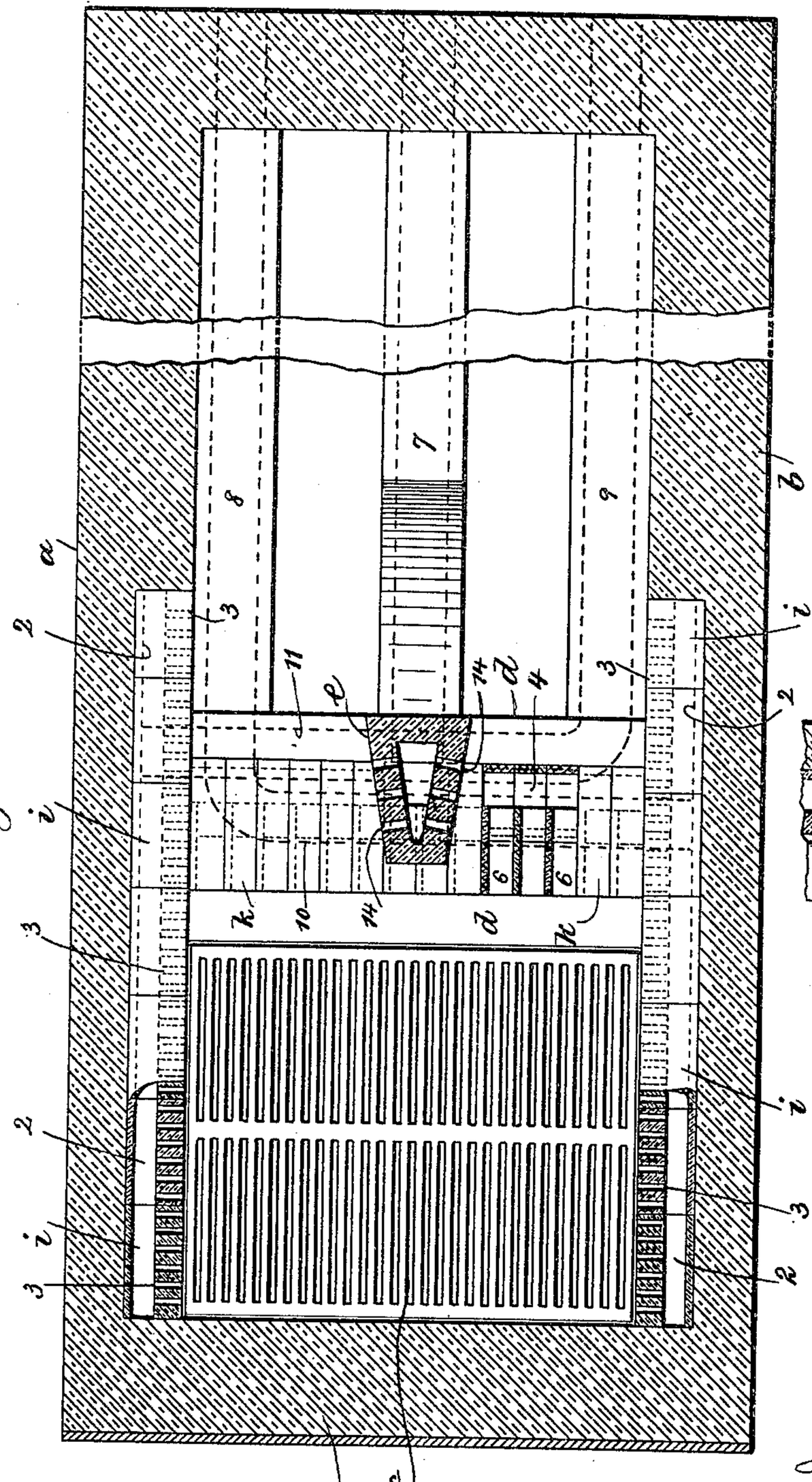
G. S. GALLAGHER.

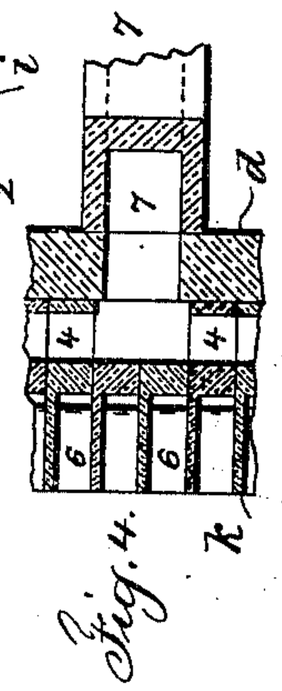
FURNACE.

(Application filed July 18, 1901.)

(No Model.)

2 Sheets—Sheet 1.





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2 Sheets—Sheet 2.

Fig. 2

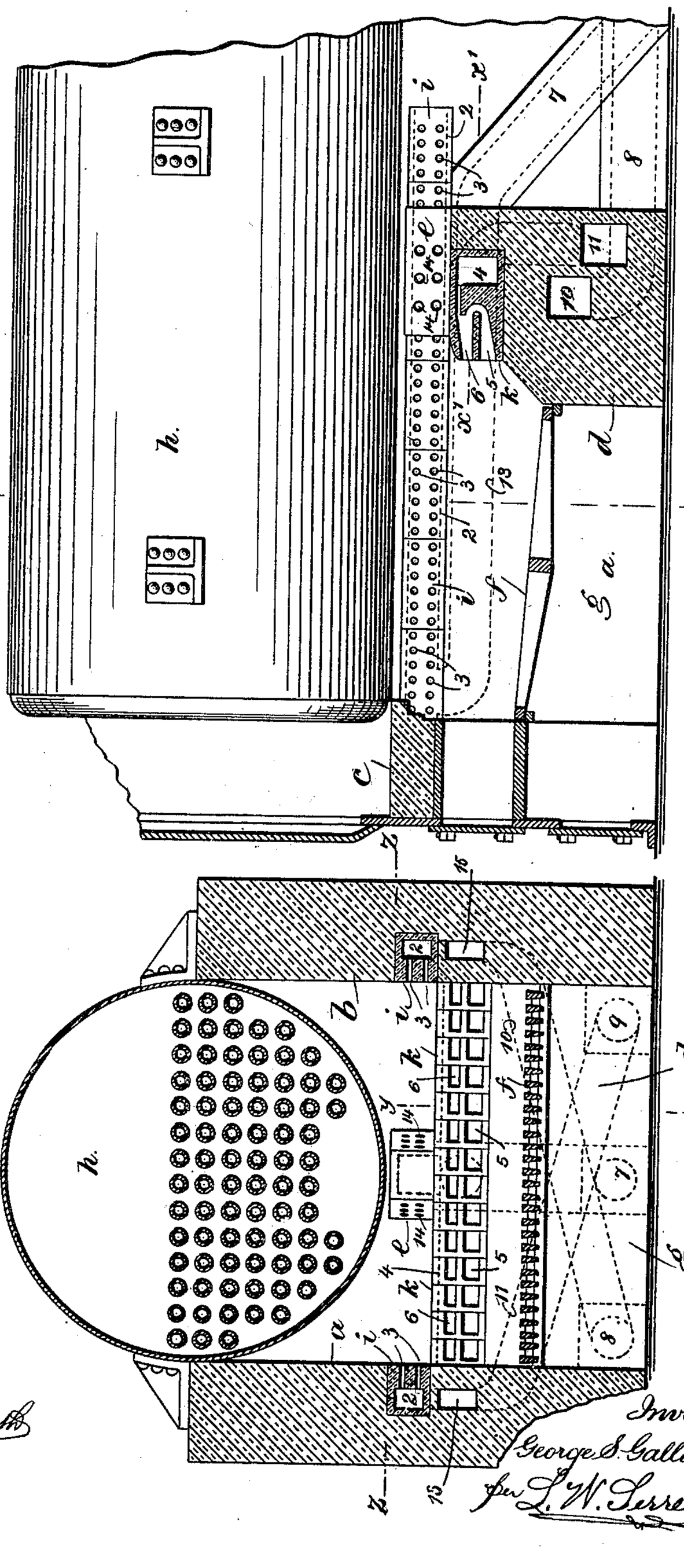

Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE S. GALLAGHER, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE ECONOMY FURNACE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 697,833, dated April 15, 1902.

Application filed July 18, 1901. Serial No. 68,781. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. GALLAGHER, a citizen of the United States, residing at the city of New York, borough of Manhattan, county and State of New York, have invented an Improvement in Furnaces, of which the following is a specification.

My invention relates particularly to steam-boiler furnaces and to devices in connection therewith for facilitating the consumption of smoke and gaseous products of combustion with the object of producing a perfect combustion beneath the boiler, so that all the available units of heat may, if possible, be utilized and the products passing up the chimney not only be colorless and unobjectionable, but be fully utilized and spent.

My present invention relates to a novel combination and arrangement of parts and is an improvement upon devices heretofore patented by me.

In carrying out my invention I provide not only flues in the longitudinal side walls, but flues in the bridge-wall and in the bridge-wall extension, and for such flues I employ tiles of novel construction, which are set end to end or side by side in or upon the brick wall in its construction and over which the brick of the side walls is built. The said tiles not only insure uniformity in the flues and effect economy in the construction of the furnace, but insure a more perfect and lasting structure than where brick and metal are used for the flues and the ejector-openings. The flues in the side walls deliver heated air over the fire, and the tiles across the face of the bridge-wall in which are flues are preferably at a lower elevation than the flues in the side walls, and the said tile structure composing the same is provided with intake and discharge flues, so that the air forced from the flues through the discharge-openings creates a suction to draw in the smoke and gases from off the surface of the bed of fuel and commingle therewith the discharging air, delivering the air, smoke, and gases at a slightly higher level and in proximity to the heated air delivered from the side-wall flues, so that the said mixture may burn and be perfectly consumed above the bed of fuel and beneath the boiler approximately before passing over the bridge-wall and rearward thereof, and any of such products not fully consumed must pass over the bridge-wall between the extension thereof and the flues of the side walls, where further air is commingled therewith, so as to insure the perfect combustion before the said products pass rearward through the tubes of the boiler on their way to the chimney or stack.

In the drawings, Figure 1 is a sectional plan at line $z\ z$ of Fig. 3, representing my invention. Fig. 2 is a longitudinal section at $y\ y$. Fig. 3 is a vertical cross-section at $x\ x$, and Fig. 4 is a sectional plan at $x'\ x'$ of Fig. 2.

The side walls $a\ b$ and the front wall c are of usual character and preferably constructed of brick. The bridge-wall d extends transversely of the furnace, between the side walls, and its upper surface is an appreciable distance below the boiler h. The boiler h is of usual type and is shown in the drawings as of tubular construction supported upon the side walls.

f represents the grate-bars, and g the ash-pit, and e represents a bridge-wall extension rising from the central portion of the bridge-wall above the same nearly to the under surface of the boiler, and the said extension is tapering, being narrowest toward the grate-bars and widest at the back of the bridge-wall.

I employ a series of tiles i, let into the side walls. These tiles may be of any desired length. They are constructed alike and each provided with an open-ended flue 2 and with openings 3 above one another and transversely placed to the flue 2, the said openings 3 being in parallel rows and preferably of circular form, communicating with the flues and with the outside of the tiles. These series of tiles i are built into the side walls $a\ b$ from the front wall along toward, over, and rearward of the bridge-wall, and when the said series of tiles are in place the openings therein form a continuous flue, and said tiles being all alike are employed readily in the construction of the furnace, and the furnace is built with greater facility than would be the

case were the flues constructed in the brick and the lateral openings provided either through the brick or by iron pipe placed therein, as I have heretofore employed.

I employ a series of tiles *k*, let into the face or forward upper corner of the bridge-wall, which tiles are alike and provided with an opening or flue 4, with an intake 5 and discharge 6, the said discharge 6 communicating with the flue 4 by a narrow opening above the level of the divisional piece between the intake and the discharge, and the back of the intake is rounded in the tiles and communicates with the discharge 6. These tiles are not only all alike, but when placed in the bridge-wall and set side by side the openings or flues 4 form a continuous passage-way, and the flat edge of one tile coming up against the edge of the adjoining tile, where the intake and discharge are open, form a closure therefor and complete the passage-ways. The bridge-wall extension *e* is also preferably made of tile, in one or more pieces and of tapering form, with openings 14 communicating with the interior of the said hollow-tile structure and the combustion-chamber of the furnace.

I provide flues 7, 8, and 9 rearward of the bridge-wall and communicating with the back of the brick furnace structure, which flues are for the purpose of bringing in air either under natural or forced draft to the various openings or flues in the series of tiles. The flue 7 is shown as occupying a central position and in Fig. 2 as rising to the upper portion of the bridge-wall and as communicating with the flue 4 in the series of tiles *k* and also communicating with the interior of the bridge-wall extension *e*. The flues 8 and 9 are shown as at either side of the furnace structure and all the flues 7, 8, and 9 are exposed. This provides for heating the air in said flues by the heated products of combustion passing rearward of the bridge-wall and between the side walls *a b*. The flue 8 communicates with an inclined flue 10 through the bridge-wall, rising and forming connection with the flue in the series of tiles in the side wall *b*, while the flue 9 communicates with the transverse rising flue 11 across the bridge-wall and forms connection with the flue in the series of tiles in the side wall *a*. Consequently the air passing through the flues 7, 8, and 9 is considerably heated, and the air passing from the flues 8 and 9 is further heated by passing through the transverse rising flues 10 and 11 across the bridge-wall before the same reaches the flues in the series of tiles in the side walls and is delivered through the perforations 3 into the combustion-chamber.

I have shown in Figs. 2 and 3 by full and dotted lines a flue 13 beneath the series of tiles *i* in the side wall, which flue at the forward end has a rising portion communicating with the flue 2 in the series of tiles at the forward end, and the rear end of this flue 13 joins with the flue 11 as the same emerges from the bridge-wall. This flue is duplicated advantageously on the opposite side of the furnace where the flue 15 joins with the flue 10. In this way the air from either the flues 8 or 9 is passed through either the flues 10 or 11 into the flues 13 and 15 and along about on a level with the fire and up at the forward ends into the flues 2 in the series of tiles. In this manner the air would be still further heated and prepared for ready combustion.

With the devices of my present invention strength is added to the structure, economy is effected in the building of the structure, its active life is prolonged by devices specially prepared and adapted for service, and the results attained are superior and more uniform to those of devices heretofore employed by me.

I claim as my invention—

1. The combination in a furnace adapted for the consumption of smoke and gases, with the side walls and the bridge-wall, of a series of tiles built into the side walls in a continuous line each tile comprising in the structure a flue or opening through the back portion and parallel openings connecting the flue with the face of the tile, said openings or flues, when the tiles are set up, forming a continuous passage-way through the side walls and the said parallel openings forming passage-ways for the delivery of the air of the flues into the combustion-chamber of the furnace, and air-flues communicating with the flues of the side walls and the flue of the bridge-wall from the rear of the furnace and exposed for the purpose of heating the air therein, substantially as set forth.

2. The combination in a furnace adapted for the consumption of smoke and gases with the side walls and the bridge-wall and flues in the side walls and delivery-openings therefrom, of a series of tiles let into the face of the bridge-wall toward the fire-chamber, the tiles being alike and each having an open-ended transverse flue or opening, an intake-opening and a discharge-opening communicating with one another and the discharge-opening communicating with the flue, and the flues, when the tiles are set together, forming a complete passage-way across the bridge-wall, substantially as and for the purposes set forth.

3. The combination in a furnace adapted for the consumption of smoke and gases, with the side walls and the bridge-wall and flues in the side walls and delivery-openings therefrom, of a series of tiles let into the face of the bridge-wall toward the fire-chamber, the tiles being alike and each having an open-ended transverse flue or opening, an intake-opening and a discharge-opening communicating with one another and a discharge-opening communicating with the flue, and the flues, when the tiles are set together, forming a complete passage-way across the

bridge-wall, and a bridge-wall extension of tapering form and hollow, rising from the top of the bridge-wall centrally toward the under surface of the boiler, and a flue extending forward from the back of the furnace and communicating with the flue in the series of tiles in the bridge-wall and with the flue in the bridge-wall extension, substantially as set forth.

4. The combination in a furnace adapted for the consumption of smoke and gases, with the side walls, of series of tiles let into the side walls and forming therein continuous rows along the combustion-chamber, each tile having an open-ended flue and parallel rows of circular openings at right angles to the said flue and forming exit passage-ways for the air from said flue into the combustion-chamber, the said flues, when the tiles are set up, forming a continuous passage-way through the side walls, inclined crossing flues in the bridge-wall communicating at the ends with the flues in the tiles of the side walls, and air-flues communicating therewith from the rear of the furnace and exposed for the purpose of heating the air therein, substantially as set forth.

5. The combination in a furnace adapted for the consumption of smoke and gases with the side and front walls and the bridge-wall, of a series of tiles let into the side wall each having openings through the tiles and said openings collectively forming a continuous passage through the side wall and each tile having parallel rows of openings through the same communicating with the said flue and opening into the combustion-chamber, a flue in the side wall beneath and parallel with the said series of tiles, a flue at the forward end of the furnace connecting the flue of the series of tiles and the parallel flue beneath the same, a flue through the bridge-wall connecting with the latter flue in the side wall and a flue extending rearward therefrom, substantially as set forth.

Signed by me this 10th day of July, 1901.

GEORGE S. GALLAGHER.

Witnesses:

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BERTHA M. ALLEN.