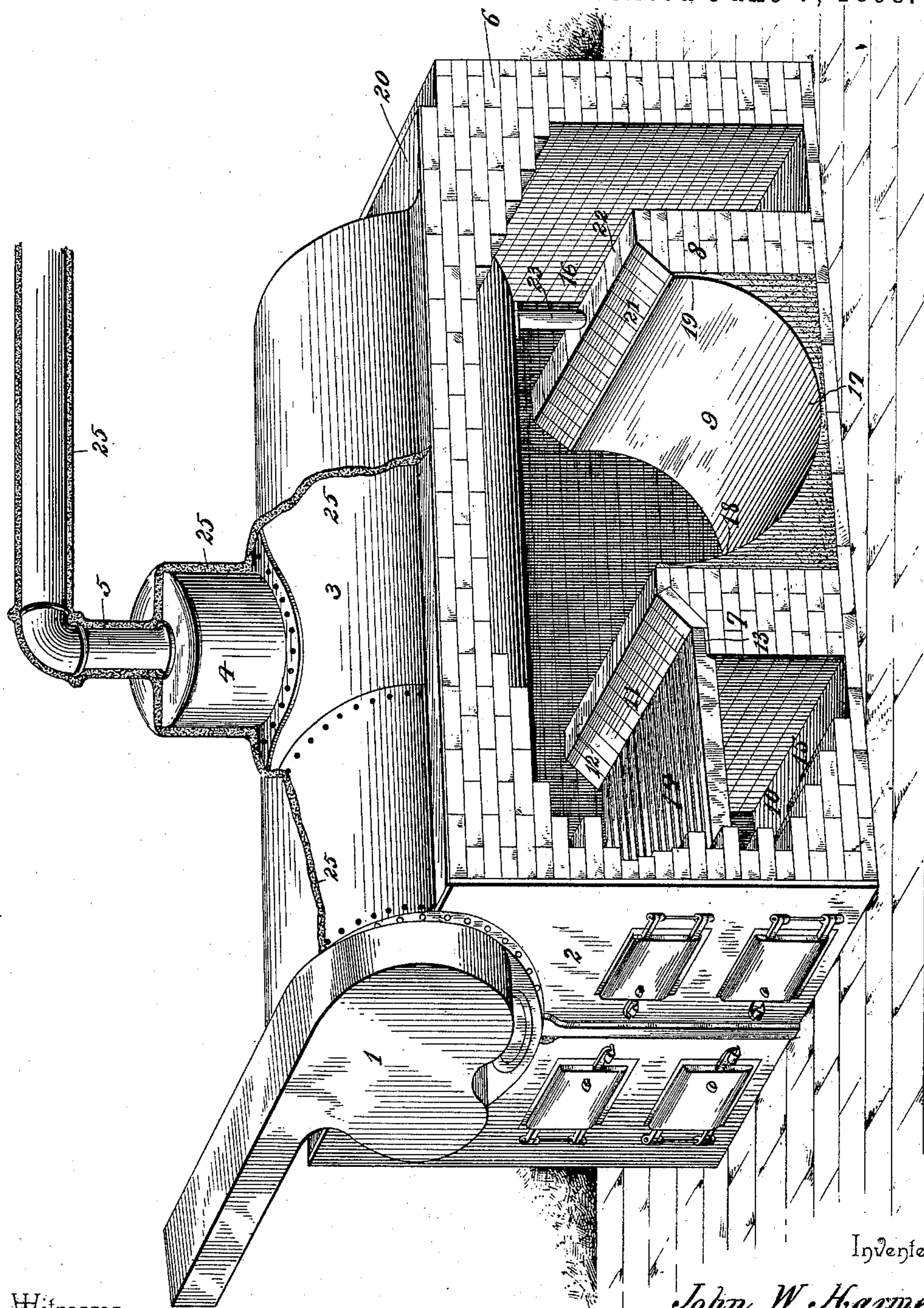


(No Model.)

J. W. HARMEL & W. J. GALLOWAY.  
BOILER FURNACE.

No. 605,281.

Patented June 7, 1898.



Witnesses

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# UNITED STATES PATENT OFFICE.

JOHN W. HARMEL AND WILLIAM J. GALLOWAY, OF PEKIN, ILLINOIS.

## BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 605,281, dated June 7, 1898.

Application filed July 22, 1897. Serial No. 645,533. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN W. HARMEL and WILLIAM J. GALLOWAY, citizens of the United States, residing at Pekin, in the county of Tazewell and State of Illinois, have invented a new and useful Boiler, of which the following is a specification.

Our invention relates to improvements in boiler setting and covering; and the object that we have in view is to improve the construction of the boiler-setting in a manner to provide a combustion-chamber in rear of the bridge-wall, into which chamber the heat and products of combustion are delivered from the fire-grate chamber, so as to be consumed in said combustion-chamber to generate an intense heat and effect economy of the fuel required to maintain the steam in the boiler.

To the accomplishment of this end our invention consists in the combination, with a setting, a bridge-wall, and a boiler, of a second bridge-wall situated in rear of the ordinary bridge-wall and spaced in parallel relation thereto to form between the two walls a combustion-chamber. The bottom of this combustion-chamber is of curved form, with its middle portion on the level of the bottom of the ash-pit and with its ends extended upwardly toward the top edges of said walls, that portion of the concave or curved bottom forming a deflector by which the circulating products of combustion in said chamber are thrown backwardly from the rear wall and are caused to circulate within the chamber to effect the combustion of the carbon in the smoke to the best advantage and to increase the volume of heat derived from the consumption of the fuel supplied to the grate-chamber. One of the important features of our invention consists in extending the rear wall upwardly toward the bottom of the boiler, so as to have its upper edge terminate on a plane above the upper edge of the ordinary bridge-wall, and thus form a throat or passage between the rear wall and the boiler of less area than the passage between the boiler and the ordinary or front bridge-wall. This throat or passage between the boiler and the rear wall is not, however, of an area restricted to less than the cross-sectional area

of the fire-tubes in the boiler, whereby the throat or passage provides for the passage of the heat from the combustion-chamber to the boiler without impeding the draft, but at the same time operates to check the passage of the unconsumed and heavier products of combustion to enable the deflecting-surface in the combustion-chamber to throw such unconsumed products of combustion back into the combustion-chamber to be converted by the flame therein into heat; and the invention further consists in the novel construction and arrangement of parts, which will be hereinafter fully described and claimed.

We have illustrated the preferred embodiment of our invention in the accompanying drawing, forming a part of this specification, in which the figure represents a perspective view, partly broken away, of a boiler embodying our invention.

In the drawing, 1 designates the boiler-front. 2 is the breeching. 3 is the boiler proper. 4 is the steam-dome. 5 is the steam-pipe, and 6 are the walls of the boiler-setting. These parts may be of the usual or any preferred construction; but we construct the space below the boiler and within the setting in accordance with our invention, as will now be described.

7 and 8 designate the bridge-walls, which are erected below the boiler 3 and are spaced within the masonry setting to form between them a combustion-chamber 9.

The front wall 7 is arranged adjacent to the front of the boiler in the ordinary way of bridge-walls, and this wall 7 forms, with the boiler-front, the usual grate-chamber 10. The bridge-wall 7 extends up from the ground or hearth a suitable distance, and the top edge or surface of said wall 7 is constructed with a sloping face 11 between the horizontal top edge 12 and the horizontal front ledge 13. The usual grate-bars 14 are supported on this horizontal ledge 13 of the front wall 7 and on the boiler-front 1, the latter being provided with any suitable means for holding the grate-bars. An ash-pit 15 is provided, as usual, between the wall 7, the boiler-front, and the grate. It will be observed that the inclined face 11 of the wall 7 extends upwardly and



backwardly from the grate 14, thus providing for the uninterrupted flow of the heat and products of combustion over the bridge-wall 7 into the combustion-chamber 9.

5 The rear wall 8 is erected adjacent to the back wall of the boiler-setting and in a vertical plane near the rear end of the boiler 3, where it receives the heat and gases from the combustion-chamber. This rear wall 8 extends from the hearth or ground upwardly  
10 near the lower surface of the boiler; but the bridge-wall does not extend to the boiler, but terminates a suitable distance below the same to provide a throat or passage 16 between the  
15 upper edge of the rear wall 8 and the boiler 3. This throat or passage 16 is of less area than the passage between the boiler and the front bridge-wall 7; but the cross-sectional area of said restricted throat or passage 16 is  
20 somewhat greater than the cross-sectional area of the fire-tubes in the boiler 3. We prefer to make this throat 16 about ten per cent. greater in area than the area of the fire-tubes in the boiler for the purpose of giving to the  
25 heat and gases the necessary uninterrupted current or flow from the combustion-chamber to the boiler-flues, and thus avoid impairment to the draft through the combustion-chamber and the boiler; but this arrangement of the  
30 rear wall serves in a measure to prevent the heavy and unconsumed products of combustion from having free egress from the combustion-chamber to the boiler-flues. To give a high degree of efficiency to the combustion-chamber and to insure circulation of the gases  
35 and heat therein in a manner to effect the combustion of the carbon in the smoke and the unconsumed heavy matters in the products of combustion, we have constructed the  
40 bottom of the combustion-chamber in a peculiar manner. The bottom 17 of the combustion-chamber 9 is of curved form throughout its length, and it extends upwardly in relation to the opposing faces of the front and  
45 rear walls 7 8, the lowest point of this concave bottom 17 being on the plane of the bottom of the ash-pit in the grate-chamber of the furnace. The front part of the concave bottom 17 extends well up toward the rear  
50 surface of the front wall 7, and the rear part of said concave bottom extends in like manner up the front surface of the rear wall 8, whereby these extended concave surfaces of the bottom form deflectors, (indicated at 18  
55 19,) against which may impinge the heavy substances contained in the products of combustion.

As the smoke and products of combustion pass over the front wall 7 from the grate 14  
60 they descend somewhat into the combustion-chamber and strike against the rear deflecting-surface 19, by which the heavy products of combustion are thrown back into the chamber 9, while the heat and lighter gases flow  
65 over the upper edge of the rear wall 8, through

the restricted throat 16, and thence into the boiler-flues, the tailpiece 20 serving to arrest the escape of the heat and gases from the space between the rear extremity of the boiler and the rear wall of the boiler-setting.  
70 The heavy products of combustion deflected by the surface 19 in the combustion-chamber meet with the flame and heat from the grate-chamber, and thus the carbon or soot in the smoke and the unconsumed products of combustion are converted into heat, sufficient oxygen passing through the ash-pit and the grate-chamber to sustain combustion within the combustion-chamber 9 of the furnace.  
75

We construct the top part of the rear wall 8 in the same manner as the top part of the front wall 7, except for the horizontal front ledge that sustains the grate—that is to say, this rear wall 8 has its front part sloped or inclined downwardly and forwardly, as at 21,  
80 leaving a horizontal top edge at 22. This rear wall 8 is utilized to support the pillars 23, one of which is shown in the drawing, for supporting the rear edge of the boiler.  
85

The bottom 17 of the combustion-chamber  
90 may be made of any suitable material; but we prefer to construct it of fireproof material, such as a mixture of yellow clay, flour, alum, stable manure, white glue, salt, and lime. The exposed surfaces of the boiler, the steam-dome, the tailpiece 20, and the steam-pipe are  
95 inclosed within or covered by a suitable fireproof covering, indicated at 25 and consisting of a mixture of the ingredients above referred to.  
100

Our improved construction of the combustion-chamber enables us to attain perfect combustion of the fuel, thus effecting a saving of from twenty-five to fifty per cent. of fuel required to maintain the heat in the boiler, and  
105 we are also enabled to apply uniform heat to the boiler and to secure an increased draft through the boiler and its heating appliances.

We are aware that changes in the form and proportion of parts and in the details of construction may be made by a skilled mechanic without departing from the spirit or sacrificing the advantages of the invention.  
110

Having thus fully described our invention, what we claim as new, and desire to secure  
115 by Letters Patent, is—

The combination with a boiler-setting, a grate, and a boiler, of a front bridge-wall supporting the grate and terminating below the boiler to provide a passage of sufficient area  
120 for the free escape of the products of combustion from the grate-chamber, a rear wall arranged within the setting parallel to the bridge-wall to form the combustion-chamber, said rear wall terminating on a plane above  
125 the front bridge-wall and close to the boiler, and forming with the latter a contracted throat or passage of an area greater than the cross-sectional area of the boiler-tubes, and a curved deflector within the combustion-  
130



chamber and terminating below the upper  
edges of the front and rear walls, whereby the  
rear wall intercepts the products of combus-  
tion as they flow from the combustion-cham-  
ber and the restricted throat or passage avoids  
5 undue checking of the draft, substantially as  
described.

In testimony that we claim the foregoing

as our own we have hereto affixed our signa-  
tures in the presence of two witnesses.

JOHN W. HARMEL.

WILLIAM J. GALLOWAY.

Witnesses:

W. W. SELLERS,

CHAS. B. SMITH.