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J. W. CLEARY & J. A. KAVANAGH.

STEAM BOILER FURNACE.

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Fig. 1.

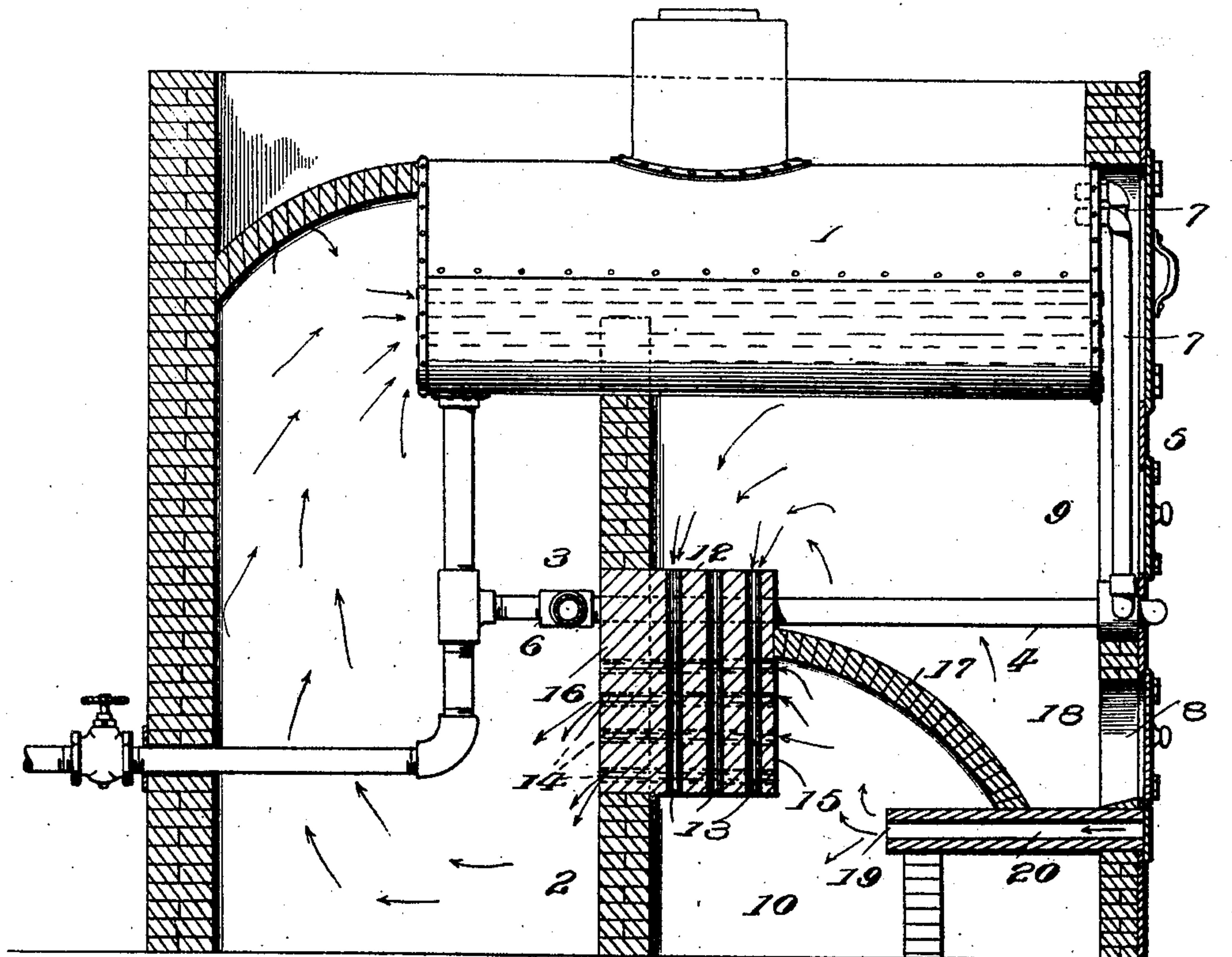
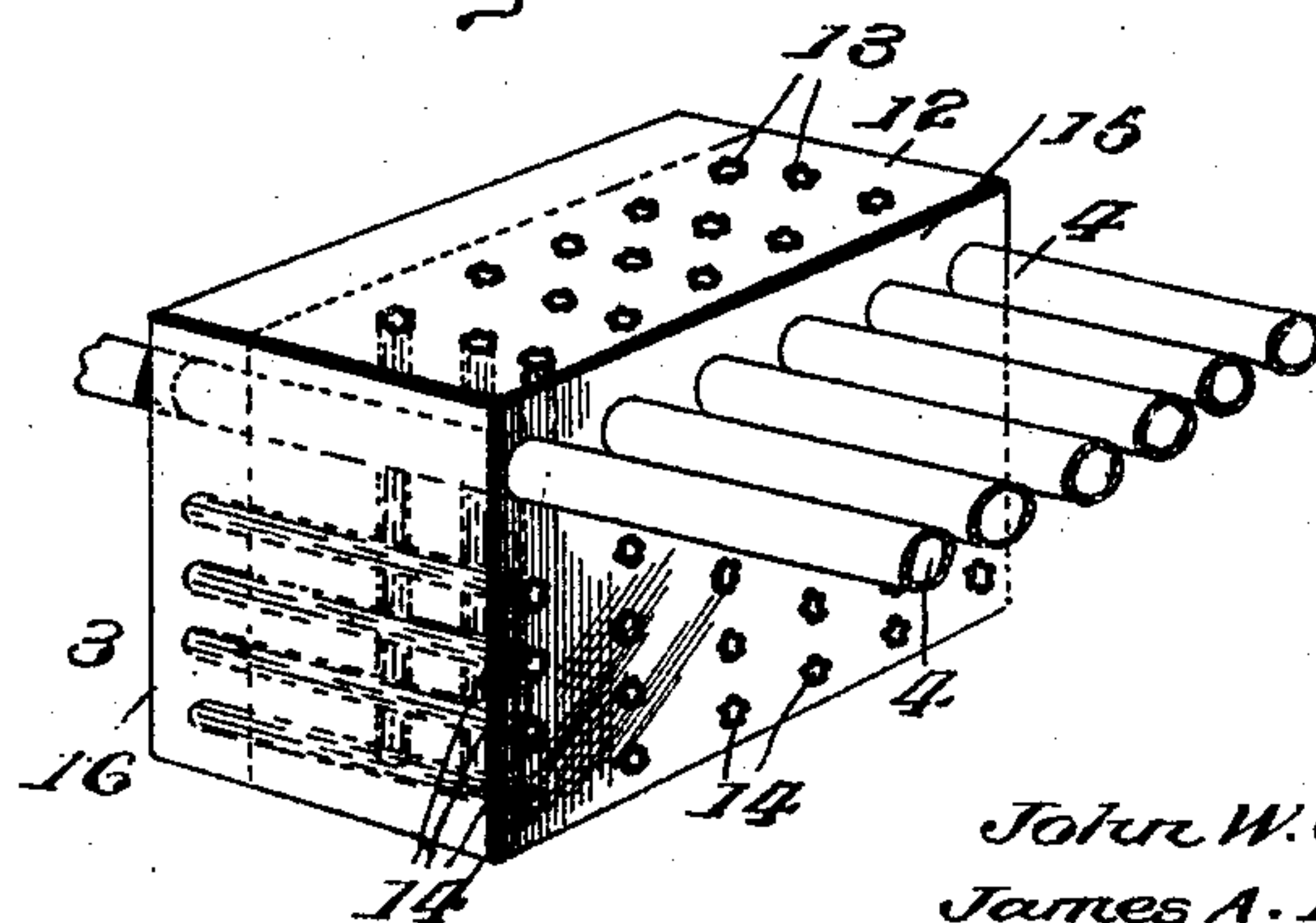


Fig. 2.



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STEAM-BOILER FURNACE.

No. 795,894.

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To all whom it may concern:

Be it known that we, JOHN W. CLEARY and JAMES A. KAVANAGH, of New York, in the county of Kings and State of New York, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to provide a steam-boiler furnace with improved means for insuring the thorough consumption of the combustible gases and other elements of the fuel to obviate the creation of smoke and superheating the consumed gases and products of combustion to enhance their efficiency in the production of steam.

The invention comprehends the employment of a plurality of series of draft tubes or flues furnishing the passage-way for the products of combustion from the grate to the boiler and which being heated to a high degree will superheat the products and consume their gases and other elements, lengthen the extent of heat-retaining material through which the products pass, thus affording ample opportunity for subjecting the smoke to its action and which are supplied with air additional to that passing through the grate.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of a steam-boiler furnace equipped with our improvements. Fig. 2 is a perspective view of part of the bridge-wall.

Referring to the drawings, 1 designates a tubular boiler, which is or may be of any preferred construction, suitably mounted over a furnace 2.

3 is the bridge-wall, and 4 the grate, the latter being shown of the tubular form, supported by the bridge-wall 3 and outer wall 5 of the furnace and suitably connected with the boiler by circulating-pipes 6 7.

8 is a draft-opening through which air is admitted to the fuel beneath the grate 4.

9 is the fire-box, and 10 the combustion-chamber.

To the extent of the foregoing description the features may be constructed according to any preferred form suitable to return-flue steam-boiler furnaces.

We have shown the initial and secondary draft tubes or flues as formed in the bridge-wall 3. For this purpose the bridge-wall is built with a widened portion 12, terminating at the top approximately on a plane with the grate and at the bottom short of the lower end of the bridge-wall proper sufficiently to provide ample space between itself and the bottom of the combustion-chamber 10. The bridge-wall proper extends to and fits closely around the bottom of the boiler-shell to form a baffle and prevent the escape of the gases direct from the fire-box to the grate.

13 designates a series of tubes leading vertically through the widened portion of the bridge-wall from the top to the bottom thereof, and 14 the horizontal tubes extending transversely through the bridge-wall—that is, from inner face 15 to outer face 16 at right angles to the series of tubes 13. These tubes are preferably cylindrical sections of corrugated copper or other preferred material, accommodated by holes bored through the bridge-wall, which latter is obviously built of refractory material. The tubes are well spaced apart, and those of one series are arranged in the spaces intermediate the tubes of the other series. The products of combustion in passing from the fire-box first through the vertical series of tubes 13 so thoroughly heat such tubes and the bridge-wall that the series of secondary tubes are heated to substantially as high a degree as the initially-heated tubes.

The grate 4 is supported at one end in the widened portion 12 of the bridge-wall. The arch 17 extends from a point in the bridge-wall beneath the grate to near the bottom of the outer wall 5 at a point beneath the draft-opening 8. The arch thus separates the combustion-chamber 10 from the ash-pit 18. Into the combustion-chamber opens an auxiliary air-inlet 19. This is shown in the form of a plate or slab 20, having inlet-apertures extending therethrough, which may be controlled by suitable dampers. Thus the line of direction of the initial draft is through the opening 8, up through the ash-pit and grate, down through the vertical tubes 13 to the combustion-chamber, thence through the horizontal tubes 14, and on to the boiler-tubes and stack. Upon entering the combustion-chamber and

before passing to the horizontal tubes 14 additional air may be introduced through inlet 19 if sufficient combustion has not taken place.

From what has been said it will be seen that smoke and products of combustion leaving the fire-box pass initially through tubes 13, heating the latter to a high degree and likewise the secondary outlet-tubes 14. By reason of the tortuous passage of the gases, &c., through highly-heated passage-ways all smoke is consumed and the gases instead of emerging from the secondary tubes at a lower temperature are superheated. The passage through these tubes is extended by the two series thereof, thus affording opportunity for the carbon and gases to be consumed before reaching the stack, avoiding the escape of smoke, and utilizing the heating capacity of the products of combustion, whether coal or other fuel be employed. The bridge-wall is naturally heated to a high degree, and the products of combustion being divided into several smaller jets or columns in their passage through the tubes of the bridge-wall condensation of the gases is prevented. It will further be noted that the auxiliary air-inlet enables additional air to be supplied to the combustion-chamber for facilitating the objects specified.

We claim as our invention—

1. In a furnace, in combination, a fire-box, a combustion-chamber, a series of passage-ways leading from said fire-box to said combustion-chamber, and a second series of passage-ways leading from said combustion-chamber in such relation to said former series as to be heated by the heat thereof.

2. In a boiler-furnace, in combination, a fire-box, a combustion-chamber beneath said fire-box, a series of vertical tubes leading from said fire-box to said combustion-chamber, and a series of horizontal outlet-tubes leading from said combustion-chamber, said latter tubes being so positioned relatively to the former as to be heated by the heat thereof.

3. In a furnace having a fire-box, a combustion-chamber, and a bridge-wall, a series of tubes in said bridge-wall leading from said fire-box to said combustion-chamber, and a second series of tubes in said bridge-wall leading from said combustion-chamber and arranged intermediate the tubes of said former series.

4. In a furnace having a fire-box, a combustion-chamber, and a bridge-wall formed with a laterally-projecting widened portion, a series of tubes extending entirely through said widened portion and leading from said fire-box to said combustion-chamber, a second series of tubes extending entirely through said bridge-wall and widened portion and leading from said combustion-chamber at right angles to said former series, whereby the products of combustion pass from said fire-box through said former series of tubes into said combustion-chamber, whence by a circular line of direction into said second series of tubes.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

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JAMES A. KAVANAGH.

Witnesses:

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