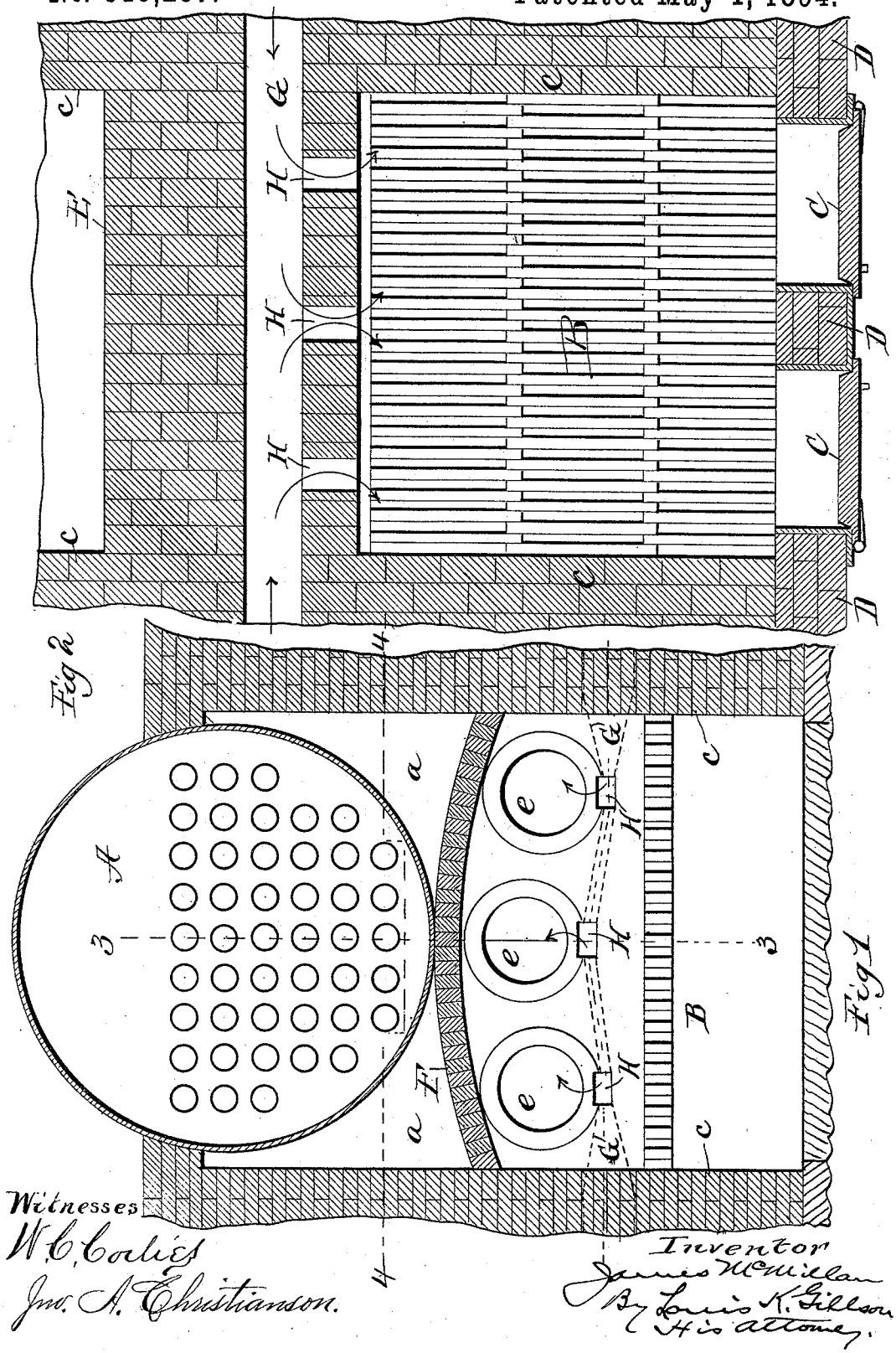
(No Model.) 2 Sheets—Sheet 1.

# J. McMILLAN.

## STEAM BOILER FURNACE.

No. 519,267. Patented May 1, 1894.




THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

(No Model.)

2 Sheets—Sheet 2.

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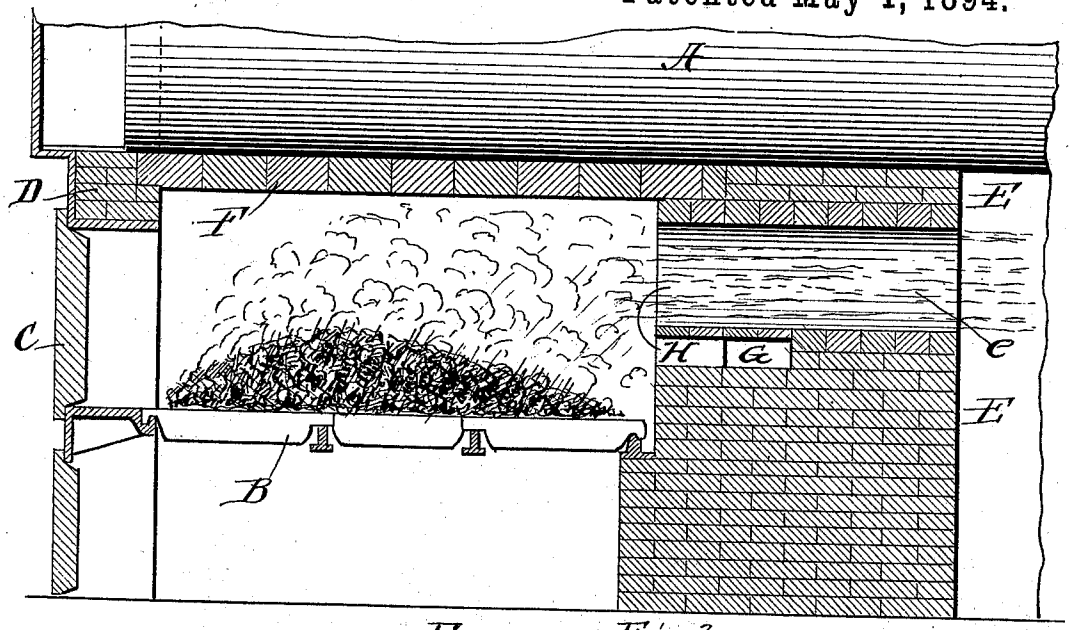



Fig. 3.

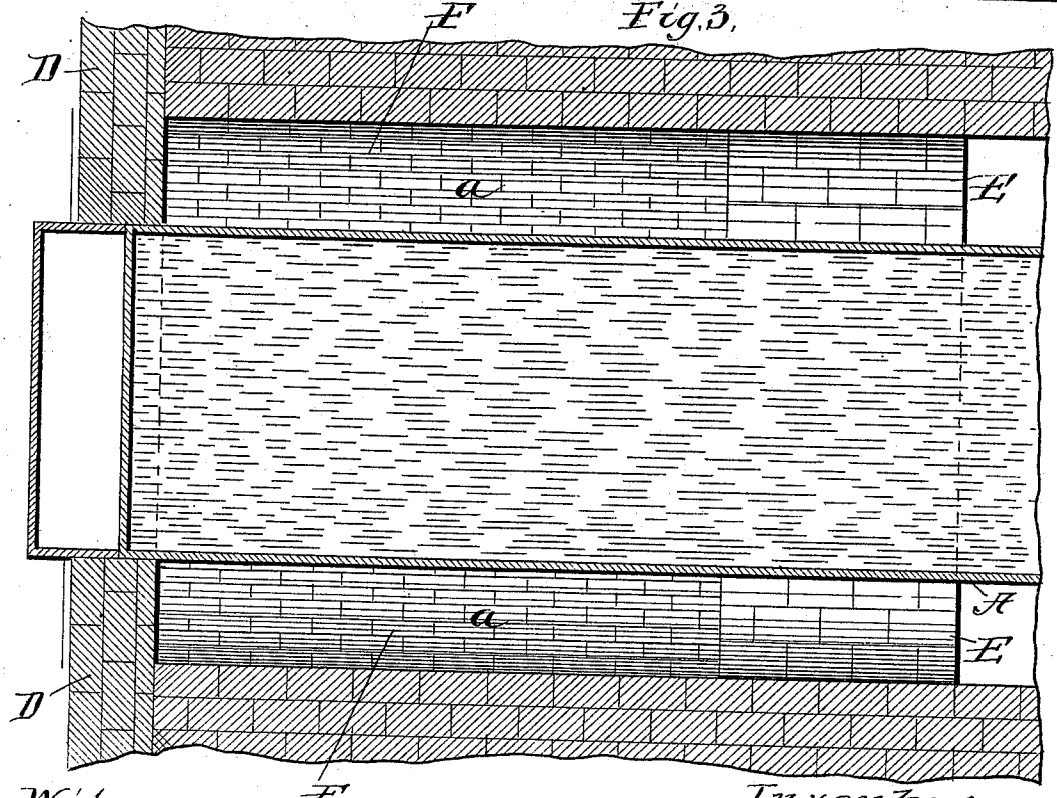



Fig 4

Witnesses
W. C. Coales
Jno. A. Christianson.

Inventor
James McMillan
By Louis K. Gillson
His attorney.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

JAMES McMILLAN, OF CHICAGO, ILLINOIS.

## STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 519,267, dated May 1, 1894.

Application filed January 8, 1894. Serial No. 496,103. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES MCMILLAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to smoke burning steam boiler furnaces.

Its object is to secure the complete combustion of the carbon given off from burning fuel while securing the full benefit of the heat generated by the burning gases.

The invention has for its further object the protection of the boiler by the more equal distribution through it of the heat.

The invention consists of the use of an inclosed fire-box located below the boiler and separated therefrom by a brick arch and discharging the products of combustion into the combustion chamber through flues in a bridge wall of great thickness.

In the accompanying drawings, Figure 1, is a transverse vertical section of the furnace. Fig. 2, is a plan section on the line 2—2 of Fig. 1. Fig. 3, is a vertical longitudinal section on the line 3—3 of Fig. 1. Fig. 4, is a plan section on the line 4—4 of Fig. 1.

In order to secure complete combustion it is necessary that a high temperature of the distilled gases be maintained. This is found exceedingly difficult of accomplishment when the roof or top of the fire-box is the crown sheet of the boiler, as the water is necessarily of lower temperature than the burning gases and as they immediately come in contact with the boiler in the old style of construction, they are chilled to such an extent that their inflammation is checked and a cloud of black smoke can be plainly seen rolling back to the flue. Furthermore it is necessary to provide not merely a supplemental supply of oxygen to complete the combustion of the gases, but means must be supplied not only for preventing the lowering of the temperature by the natural radiation, but for actually raising it and for heating the supplemental air supply. The difficulties enumerated are overcome in my improved furnace and the purposes set forth above are subserved in the manner hereinafter described.

For the purpose of clearness I have shown in the accompanying drawings the major features of an ordinary steam boiler furnace, comprising the boiler, A; the grate bars, B, the furnace front, C, and its side walls, *c*, and the feeding doors, D. The bridge wall, E, is of unusual thickness, being preferably not less than three feet thick. Its center reaches to the boiler and its upper surface is curved in arch form. A solid arch, E, that is an arch without perforations of the same height as the bridge wall covers the entire fire-box extending from side wall to side wall and from the front wall C, to the bridge wall E. The outlet for the products of combustion is through the bridge wall; a multiple number of flues, *e*, of ample capacity being provided for this purpose. A supplemental air supply is provided for by means of ducts G, G, extending through the side-walls, *c*, *c*, and thence through the bridge wall below the apertures *e*, discharge ports into the fire-box being provided, one directly below each of the apertures *e*, as shown at H. By this construction the air is introduced into the furnace already well heated and immediately it mingles with the burning gases as they enter the flues in the bridge wall. The front wall, C, of the furnace is closed tightly around the front end of the boiler, A. Chambers, *a*, *a*, are formed by the construction described upon each side of the boiler and above the arch, F, of the fire-box, these chambers being open at their rearward end and closed at their forward end so that there is no draft through them and the heat from the arch, F, which becomes very intense, is radiated to the boiler. When the furnace is in use the arch, F, quickly becomes heated to a high degree so that the gases distilled from the fuel are not cooled by contact with it, on the contrary its temperature is sufficiently high to stimulate combustion. The same is true of the walls of the apertures, *e*. These apertures, or flues, serve the purpose, in fact, of retorts, and all the conditions essential to perfect combustion are present; namely, combustible gases, an

ample supply of oxygen and high temperature, and there issues from these retorts a perfectly white flame, giving off an invisible vapor. By preventing contact of the vapors resulting from combustion with the comparatively cool surface of the boiler until their combustion has become complete, perfect combustion is made possible; furthermore, the boiler itself is protected from the constant variations of temperature due to the exposure of its surface to the direct action of the flames, the heat from the arch being uniform and the combustion at the rear of the bridge wall being substantially without variation.

I claim as my invention—

1. A steam boiler furnace having its fire-box completely inclosed by masonry, and having discharge flues in tubular form and of such capacity as to secure free draft and insure complete combustion within the flues leading from its fire-box through such masonry, substantially as described and for the purpose specified.

2. In a steam boiler furnace the combination of a grate, side walls, a solid arch covering the fire-box, a bridge wall extending to, and joining the rear end of the arch, and flues, in tubular form leading from the fire-box through the bridge wall and of such capacity as to secure free draft and insure complete combustion within the flues, substantially as described and for the purpose specified.

3. In a steam boiler furnace the combination with a boiler, of a fire-box, an arch, F, covering the fire-box and separating it from the boiler, and a bridge wall extending to the arch and having flue openings, *e*, *e*, leading outwardly from the fire-box, and air ducts leading from without the furnace and opening to the fire-box below the flue openings, *e*, *e*, said bridge wall being of such thickness that the flue openings serve the purpose of retorts, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES McMILLAN.

Witnesses:

JOHN F. MICHALSKI,

LOUIS K. GILLSON.