(No Model.) 2 Sheets—Sheet 1.

D. S. RICHARDSON.

BOILER FURNACE.

No. 529,409. Patented Nov. 20, 1894.

Fig 1.

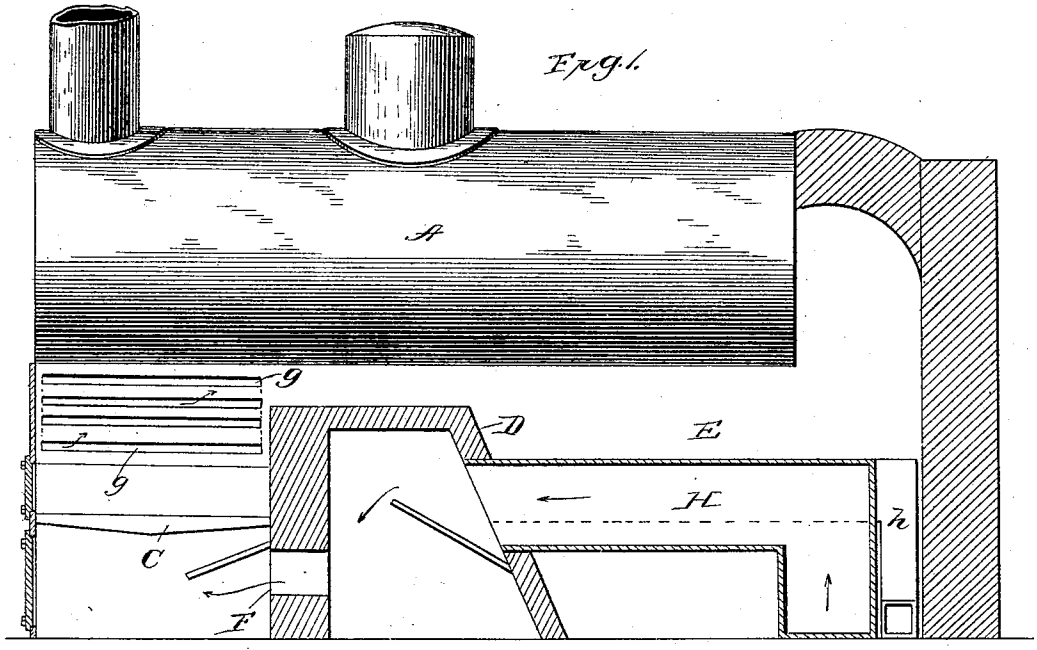
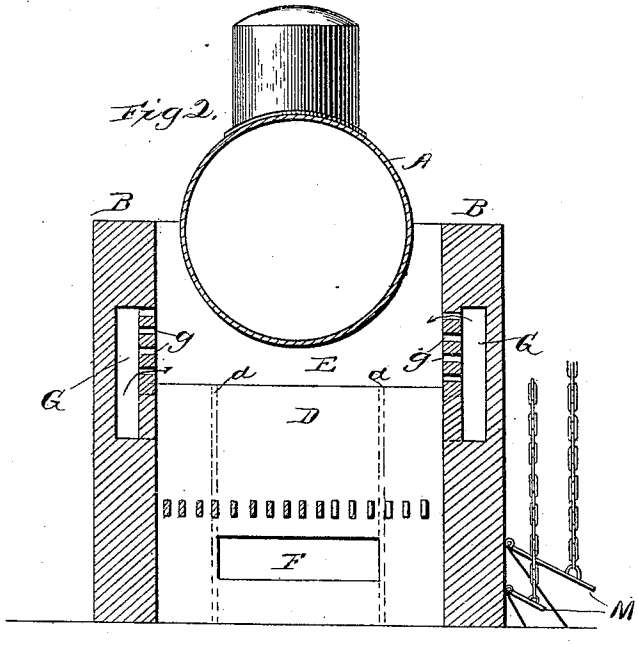


Fig 2.



Witnesses:
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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

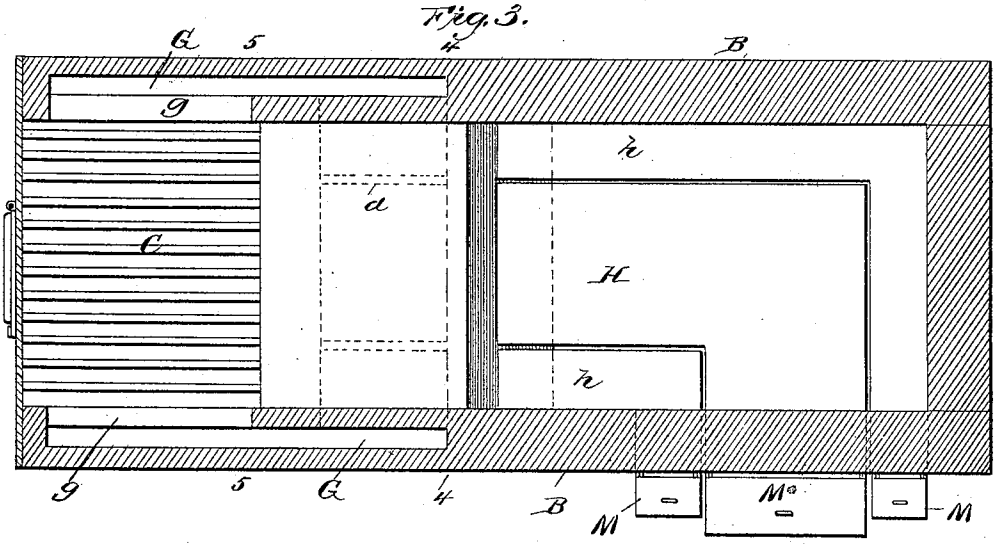


Fig. 4.

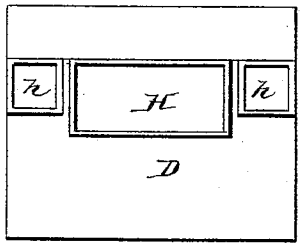
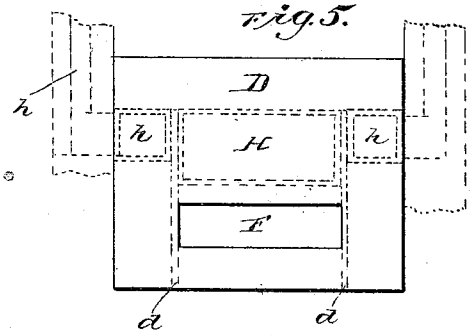


Fig. 5.



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UNITED STATES PATENT OFFICE.

DWIGHT S. RICHARDSON, OF BROOKLYN, NEW YORK.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 529,409, dated November 20, 1894.

Application filed September 5, 1894. Serial No. 522,204. (No model.)

To all whom it may concern:

Be it known that I, DWIGHT S. RICHARDSON, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Boiler-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in furnaces, such as are particularly adapted for steam boiler heating, the objects of the invention being primarily to secure a more complete combustion and utilization of the products of combustion, resulting in a higher efficiency of the boiler for a given expenditure of fuel and in the emission or escape of a less quantity of the heavy products of combustion which form obnoxious smoke.

The invention consists in certain novel details of construction and combinations and arrangements of parts all as will be now described and pointed out particularly in the appended claims.

Referring to the accompanying drawings: Figure 1 is a longitudinal section through a furnace setting showing my present invention. Fig. 2 is a transverse section through the same. Fig. 3 is a horizontal section. Figs. 4 and 5 are sections on the lines 4—4 and 5—5 respectively.

Like letters of reference in the several figures denote the same parts.

One of the main factors in securing a complete and economical combustion of fuel resulting in the liberation of the maximum heat, is the supplying of a proper quantity of air at the right points and at the right temperature. The proper temperature at which the air should be supplied in accordance with the theory upon which my present invention is based is approximately that of combustion or flame (about 800° Fahrenheit) for, when air at this temperature is supplied, its volume is greatly expanded and in condition to at once unite with the products without in the slightest degree deadening the combustion. This hot air should be supplied to the fuel, and also to the gaseous products of combustion given off from the fuel, at a point or points above or beyond the fuel bed, and the quantity supplied at each point in order to secure the best results, must be proportioned and regulated according to the state of the fire, the character of the fuel, &c.

Referring now to the accompanying drawings, it will be seen that I have attained the desired ends by utilizing the bridge wall and the chamber back of the same for heating both the air supply for the ash pit and that for the fire chamber above the bed of fuel, the two supplies being practically independent and independently controlled, whereby the maximum efficiency may be secured with the fire at any stage, and with any kind of fuel.

The letter A in said drawings indicates the boiler which may be of any desired type or style; B, the side walls of the setting; C, the grate; D, the hollow bridge wall, and E the chamber in rear of the bridge wall through which the products of combustion pass around to the flues at the end of the boiler.

The hollow bridge wall, as shown, is quite large, enabling a large body of air to be heated to a very high degree. The interior of the bridge wall is divided into independent compartments by vertical partitions *d* and the central and larger compartment so formed has an exit opening F, leading directly into the ash pit below the grate and is designed to supply air to the under side of the body of fuel, while the side compartments are connected through laterally and forwardly extending ducts G with exit slits or apertures *g* in the fire chamber above the grate. These exit slits or apertures preferably extend from front to rear of the fire chamber and are arranged at alternately different levels. Thus the air projected in through the slits on one side of the fire chamber does not strike that entering from the opposite side, but causes a thorough and complete commingling of the air supply and gaseous products, thereby very greatly promoting combustion.

For supplying air to the bridge wall, I preferably extend ducts or conduits H *h* back from the bridge wall through the chamber in rear thereof and turn the rear ends of the conduits or ducts down to approximately the level of the ash pit in order to secure a natural draft when the fire is started and to pre-

vent the backward movement of the gaseous products. These fresh air supply ducts it will be noted are in position to receive the downwardly radiant heat from the products of combustion passing beneath the boiler and hence the air in its forward passage to the bridge wall is heated to a greater or less extent, and when it enters the bridge wall will not cool the same sufficiently to injure either the structure itself or cause a retardation of the combustion.

As a convenient means for regulating the quantity of air passing through the several ducts I have shown a series of ordinary draft doors M located at the entrance openings to the ducts, although it will be understood that I do not wish to be confined to such devices as any regular mechanism may be employed, and the air may be brought in a duct or ducts from a distance if so desired, the parts illustrated being simply those parts immediately connected with the invention. So too, it is obvious that the form of the bridge wall and grate may be changed to suit the particular style of the setting or the ideas of the builder without departing from my invention, it only being essential that independent hot air supplies brought forward through the compartments in the bridge wall to the ash pit and fire chamber respectively, should be provided.

What I claim as my invention is—

1. In a boiler furnace, the combination with the grate separating the fire chamber and ash pit, of the hollow bridge wall in rear of the grate having independent internal compartments, air supply passages leading to said compartments from the external air, an air exit from one of said compartments into the ash pit and exit ducts leading from the compartments not open to the ash pit, and discharging into the fire chamber above the grate; substantially as described.

2. In a boiler furnace, the combination with the grate separating the fire chamber and ash pit, of the hollow bridge wall in rear of the grate having an air exit into the ash pit, of a fresh air duct extending forward from the rear of the furnace setting and opening into the bridge wall, and fresh air ducts independent of said first mentioned duct extending forward of the bridge wall and opening into the fire chamber above the grate; substantially as described.

3. In a boiler furnace, the combination with the grate separating the fire chamber and ash pit and the hollow bridge wall having independent internal compartments and an air exit from one of said compartments into the ash pit, of independent fresh air ducts extending forward from the rear of the furnace setting and opening into the respective compartments in the bridge wall, and ducts leading from the compartments not open to the ash pit, forward and discharging into the fire chamber above the grate with dampers for controlling the supply of air above and below the grate respectively; substantially as described.

4. In a boiler furnace, the combination with the grate, and hollow bridge wall in rear of the same having an air exit opening into the ash pit below the grate, of a series of independent fresh air ducts passing through the combustion chamber in rear of the hollow bridge wall, said ducts supplying air respectively to the hollow bridge wall and to the fire chamber above the grate and means for independently controlling the passage of air through the ducts; substantially as described.

5. In a boiler furnace, the combination with the grate and hollow bridge wall in rear of the same having the independent internal compartments with an opening from the central compartment into the ash pit below the grate, of ducts extending from the end compartments forward above the level of the grate and having exit openings into the fire chamber, the series of independent fresh air supply ducts passing forward through the chamber in rear of the bridge wall and opening into the compartments respectively and dampers for independently controlling the flow of air through the ducts; substantially as described.

6. In a boiler furnace, the combination with the grate, hollow bridge wall in rear of the same and a fresh air duct opening into said bridge wall, of hot air ducts leading from the bridge wall along each side of the fire chamber above the grate, said ducts having exit openings into the said fire chamber arranged alternately at different levels; substantially as described.

7. In a boiler furnace, the combination with the grate, and the hollow bridge wall in rear of the same separated into independent compartments and having a hot air exit opening leading from the center compartment into the ash pit below the grate, of ducts leading from the end compartments within the walls of the setting forward and discharging into the fire chamber above the grate and independently controlled air supply ducts leading to the compartments in the hollow wall respectively; substantially as described.

8. In a boiler furnace, the combination with the grate and the hollow bridge wall in rear of the same separated into independent compartments and having a hot air exit from the center compartment into the ash pit below the grate, of ducts leading from the end compartments laterally into the setting wall and forward with exit openings into the fire chamber above the grate, and independently controlled fresh air ducts leading forward through the chamber in rear of the bridge wall and opening into the bridge wall compartments respectively; substantially as described.

DWIGHT S. RICHARDSON.

Witnesses:
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L. RICHARDSON.