(No Model.)

2 Sheets—Sheet 1.

R. B. AYRES.

FURNACE.

No. 345,611. Patented July 13, 1886.

FIG. I.

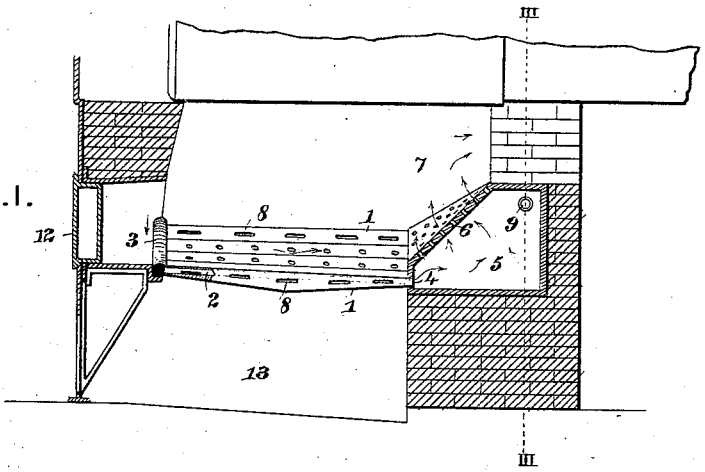


FIG. II.

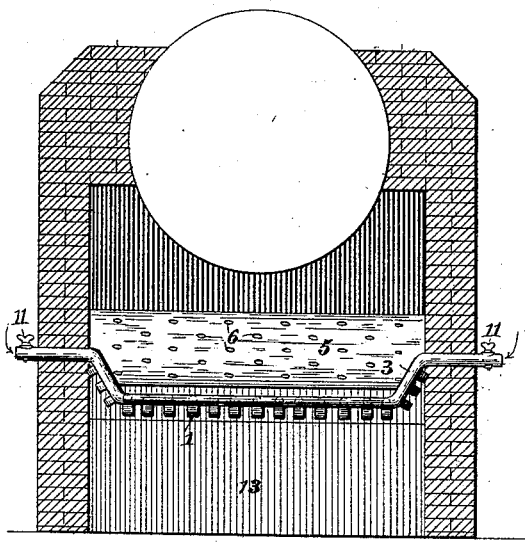
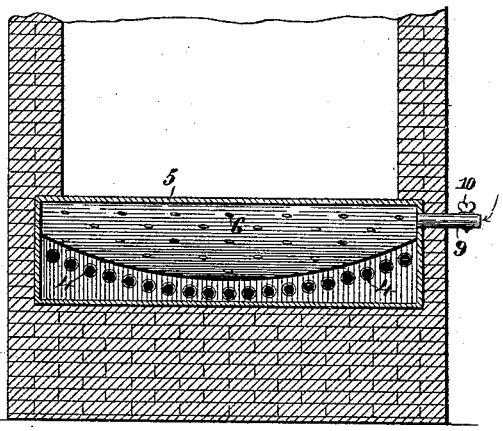


FIG. III.



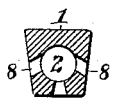


FIG. IV.

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Geo. L. Wheelock

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(No Model.) 2 Sheets—Sheet 2.

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FURNACE.

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FIG. V.

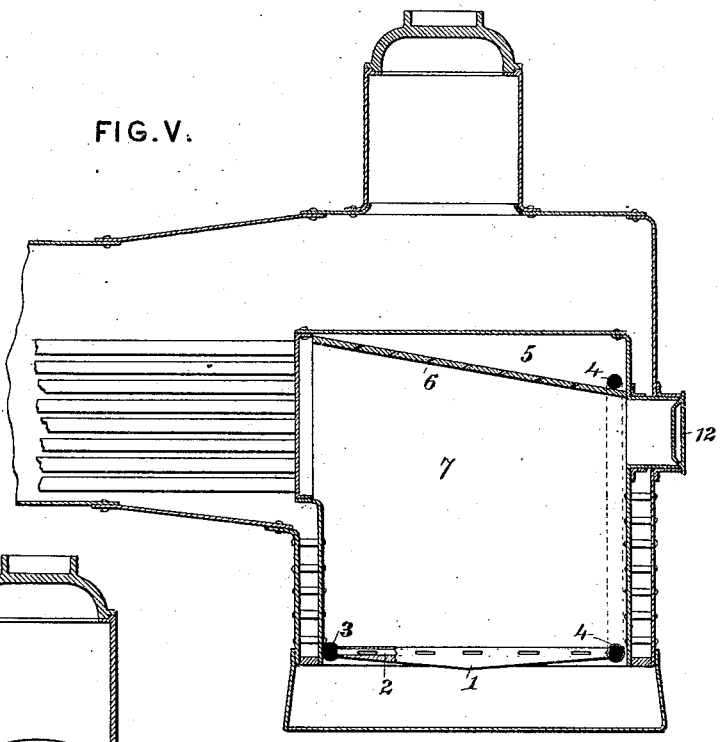
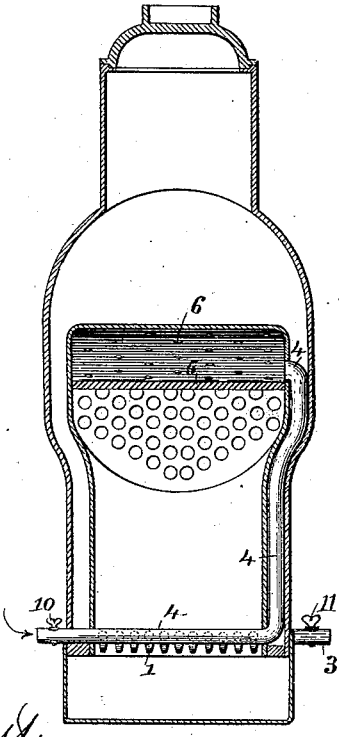


FIG. VI.



Attest:
Geo. T. Smallwood.
Geo. L. Wheelock

Inventor:
Ruben B. Ayres.
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UNITED STATES PATENT OFFICE.

RUBEN B. AYRES, OF ST. LOUIS, MISSOURI.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 345,611, dated July 13, 1886.

Application filed November 14, 1885. Serial No. 182,848. (No model.)

To all whom it may concern:

Be it known that I, RUBEN B. AYRES, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a new and useful Improvement in Steam-Boiler Furnaces, of which the following is a specification.

This invention is adapted to stationary as well as locomotive and other steam boiler-furnaces.

Its objects are to provide for the complete combustion of the smoke and inflammable gases and provide for the perfect and economical combustion of the fuel and the evolution of the greatest amount of heat therefrom, and the most advantageous introduction of air to support combustion; and, further, to effect the heating of the inflowing air and incidentally the cooling and preservation of the grate-bars. To these ends I employ hollow grate-bars supplied with air from the exterior of the furnace, and having slots or other openings to admit the air to the fuel, also communicating with a chamber in the rear, from which the air is delivered in a heated state and in numerous jets to a gas combustion chamber, where the smoke and inflammable gases are all consumed. An independent opening is provided from the exterior to the hot-air chamber in the rear of the furnace and suitable dampers, so that the influx of air can be confined to the hollow grate-bars or to the air-chamber, or it may be admitted through both at once.

In the accompanying drawings, Figure I is a vertical longitudinal section of a boiler illustrating the invention. Fig. II is a transverse section on the line II II, Fig. I. Fig. III is a transverse section on the line III III, Fig. I. Fig. IV is a transverse section of a grate-bar on a larger scale. Fig. V is a longitudinal section illustrating the application of the invention to a locomotive-boiler. Fig. VI is a transverse section on the line VI VI, Fig. V.

The form of the grate-bars 1 in transverse section is best shown in Fig. IV. They are made hollow from end to end, the bore 2 of each bar connecting with a hollow bridge-bar, 3, common to all, through which air is admitted, and connecting through ducts 4 with an air-chamber, 5, having a number of delivery-apertures, 6, through which the air heated in the chamber 5 is admitted to the gas-combustion chamber 7 of the furnace, so as to completely consume the smoke and inflammable gases. The hollow grate-bars 2 are furthermore provided with any desirable number of slots or other openings, 8, to admit air into the fire-chamber. Inlets 9 are provided for the air-chamber 5 at the sides or rear of the furnace, guarded by suitable valves or dampers, 10, which may be closed when it is desired to cut off the ingress of air directly to the chamber 5, and cause it to take its supply wholly through the hollow grate-bars 1. Suitable valves or dampers, 11, are also provided to regulate or cut off the supply of air through the hollow bridge-bar 3 and grate-bars 1. By these means the supply may be admitted to either the air-chamber or the grate-bars at will, or may be admitted through both, or may be cut off entirely, as when the fires are to be banked.

12 represents the feed-door, and 13 the ash-pit.

The general contour and arrangement of the grate and other parts of the furnace may be modified, according to the nature and construction of the furnace. For example, in locomotive-boilers the air-chamber will be in front, as illustrated in Fig. V, instead of at the rear, as in return-flue or other ordinary stationary boiler-furnaces.

The invention is applicable to various other kinds of furnaces without material modification.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a steam-boiler furnace, the combination, with the combustion-chamber, of an air-chamber located in the upper part thereof and communicating therewith, and a pipe extending upward within the water-leg past the fire-box and communicating at its respective ends with said air-chamber and the atmosphere, as set forth.

2. In a steam-boiler furnace, the combination, with the combustion-chamber, of an air-chamber located in the upper part thereof and communicating therewith, and a pipe communicating at its upper and lower ends with said air-chamber and the atmosphere, respectively, and exposed near its lower end to the heat in the furnace, substantially as set forth.

3. The combination, with the hollow grate-

bars 1, of the air-chamber 5, with which they communicate, the air-inlet 9 placing said chamber 5 in direct communication with the atmosphere, and the valve 10 in said inlet, for regulating the induction of cold air to said chamber 5, as set forth.

4. The combination of the hollow grate-bars 1, the air-chamber 5 with which they communicate, the delivery-apertures 6, and the valves or dampers 10 11, for regulating the induction of air through the grate-bars or directly to the air-chamber, or either alone, substantially as set forth.

RUBEN B. AYRES.

Witnesses:
OCTAVIUS KNIGHT,
GEO. L. WHEELOCK.