R. K. McMURRAY.

FIRE-BRIDGE FOR STEAM-BOILER FURNACES.

No. 194,780. Patented Sept. 4, 1877.

Fig. 1.

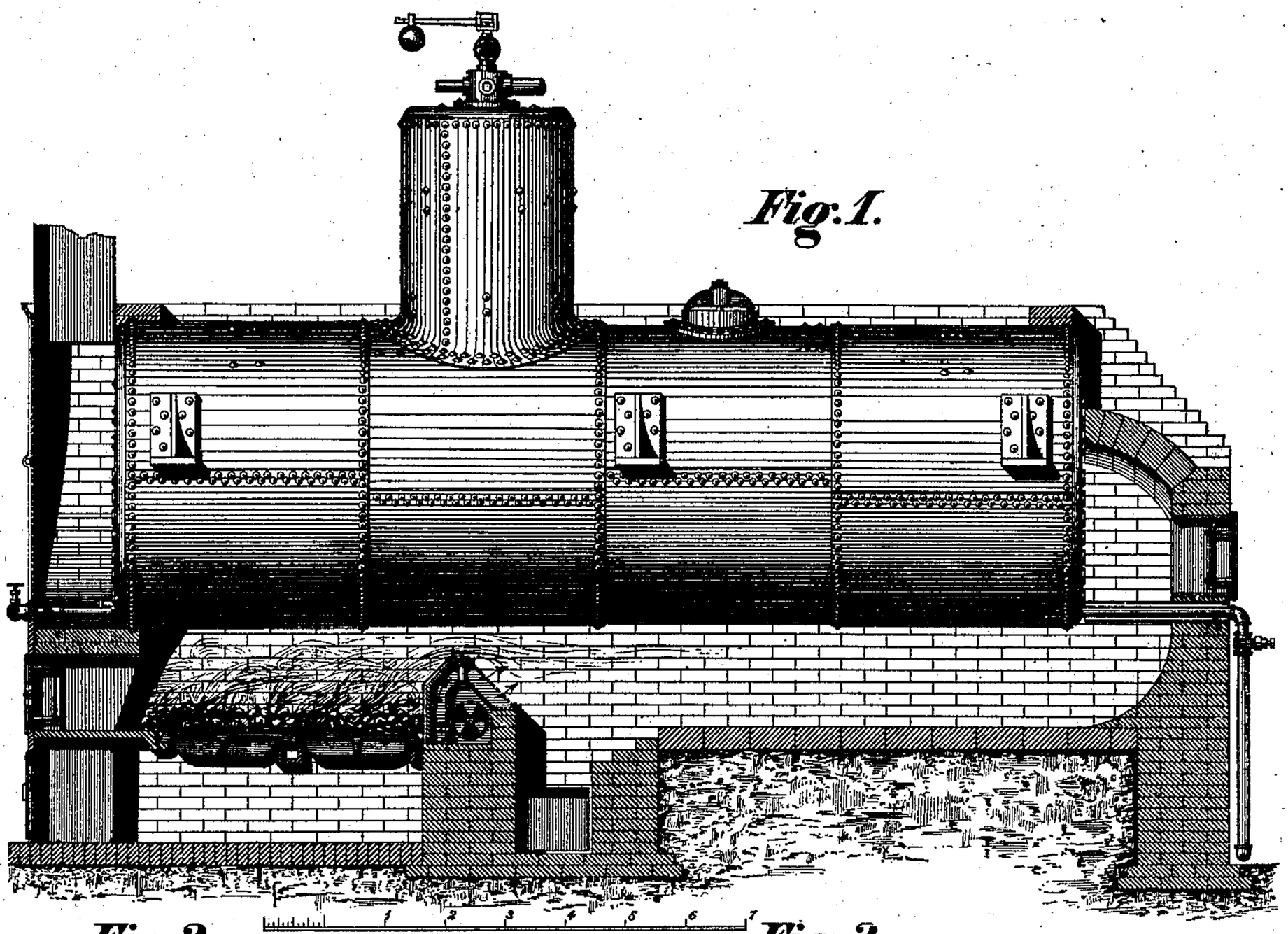


Fig. 2.

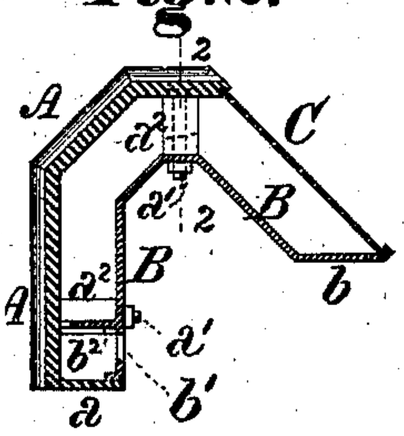


Fig. 3.

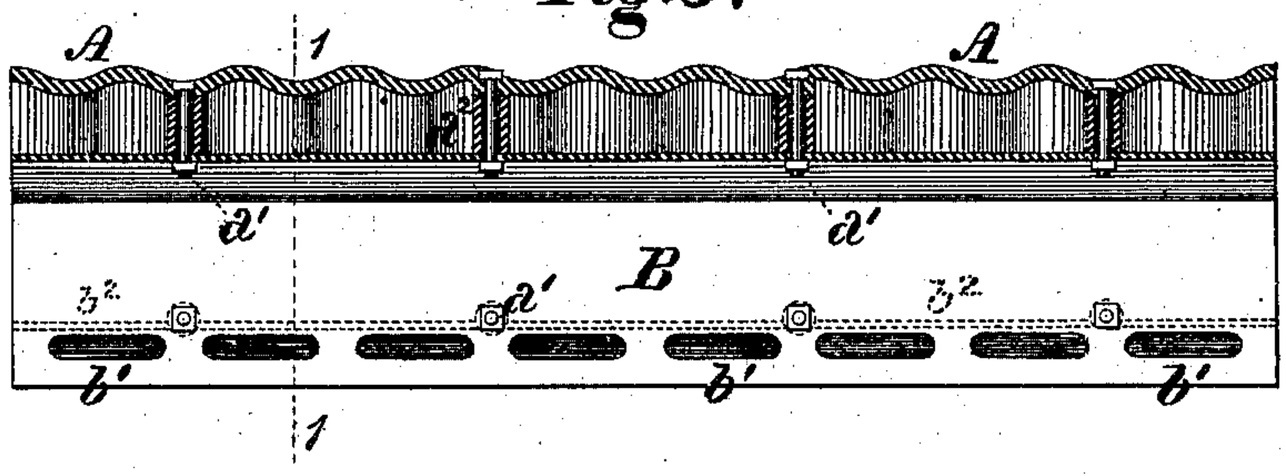


Fig. 4.

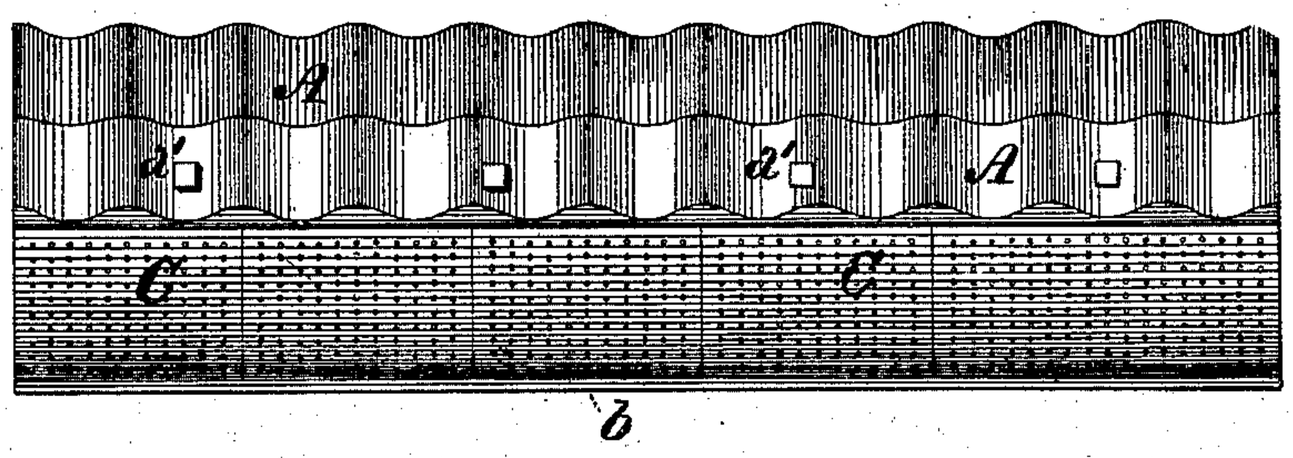
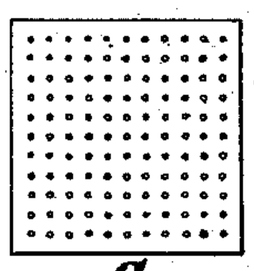


Fig. 5.



WITNESSES

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ROBERT K. McMURRAY, OF WEST NEW BRIGHTON, NEW YORK.

IMPROVEMENT IN FIRE-BRIDGES FOR STEAM-BOILER FURNACES.

Specification forming part of Letters Patent No. **194,780**, dated September 4, 1877; application filed June 11, 1877.

To all whom it may concern:

Be it known that I, ROBERT K. McMURRAY, of West New Brighton, in the county of Richmond and State of New York, have invented certain new and useful Improvements in Fire-Bridges for Steam-Boiler Furnaces, of which the following is a specification:

The object of my invention is to provide effective means for economizing the consumption of fuel in the furnaces of steam-boilers, and for the prevention of smoke by the admission of a proper supply of heated air to the gases evolved by combustion; and, further, to effect a reduction in the time and expense heretofore required for the renewal and repair of bridge-walls employed in boiler-settings.

To these ends my improvements consist in combining, with the furnace and combustion-chamber of a steam-boiler, a hollow metallic fire-bridge, formed of a series of plates united together and resting upon the top of a bridge-wall of the ordinary construction, without being embedded therein, into which hollow bridge fresh air in properly-graduated proportions is introduced, and within which it is heated to a temperature approximating to that of the gases escaping from the furnace, and is thence delivered, in a minutely-divided condition, to said gases as they enter the combustion-chamber.

My improvements further consist in such construction of said fire-bridge as to provide ample resistance against blows or shocks and the effects of expansion and contraction, as well as to render it capable of being readily and quickly removed from its position in the setting, renewed or repaired at a comparatively slight expense, and replaced in position for further operation.

The improvements claimed are hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through the setting of a return tubular stationary boiler with my improvements applied; Fig. 2, a transverse section through the fire-bridge at the line 1 1 of Fig. 3; Fig. 3, a longitudinal section at the line 2 2 of Fig. 2; Fig. 4, a plan or top view of the fire-bridge; and Fig. 5, a plan view of one of the dispersing-plates detached.

To carry out my invention I provide a hollow metallic fire-bridge, preferably composed of cast-iron sections, the width of which fire-bridge is about equal to the thickness of the bridge-wall upon which it is set, and its length slightly greater than the inside width of the furnace and combustion-chamber, so as to project into each of the side walls thereof for a distance of, say, one inch. The fire-bridge consists of three principal members—to wit, a fire-plate, A, a back or base plate, B, and a dispersing-plate, C—which are constructed and connected substantially as follows: The plate A, which I designate as the fire-plate by reason of the fact that it is designed to receive the direct heat of the fire, is corrugated throughout its entire length so as to increase its strength and allow for expansion and contraction under changes of temperature, and its thickness is sufficiently great, say about three-fourths of an inch, to adequately resist blows from a slice-bar, to which, from its position, it is necessarily exposed. It is provided with a light bottom flange, *a*, which rests upon the bridge-wall, and thence rises vertically for about two-thirds of its height, at which point it is inclined at an angle of forty-five degrees, or thereabout, extending to a horizontal top surface, being longitudinally corrugated, as before stated, at all points except upon its bottom flange. The bottom flange might be made separate, if preferred, and fitted between the fire-plate and back plate, or cast upon the back plate; but I deem the arrangement shown more desirable, as affording a more uniform distribution of metal in the several portions of the bridge.

The bottom plate B is a light angular plate, substantially conforming, in the relative position of three of its sides, to the plate A, and, in addition, projecting downwardly from its upper surface in reverse direction to, but at a similar angle with, its rising incline, and terminating in a horizontal flange or foot, *b*. The plates A and B are connected by bolts a^1 passing through thimbles or distance-pieces

a^2, so as to form a hollow case or trough, and a dispersing or diffusing-plate, C, perforated throughout its entire length with numerous small orifices, is inserted in lips or grooves formed in the edges of the top surface of the fire-plate A and the bottom flange *b* of the plate B, respectively. The connecting-bolts a^1 are arranged in two series, one vertical, passing through the upper surfaces of the plates A and B, and the other horizontal, and as near as convenient to their lower edges. A series of air-supply openings, b^1, are formed in the plate B, as near as practicable to its base, above which a horizontal deflecting-flange, b^2, extends along the side of the plate B, adjacent to the plate A, the width of said flange being about one-half inch less than the distance between the two plates, and the edge of the flange being curved correspondingly with the corrugations of the plate A, so as to maintain a uniform width of opening between the flange and fire-plate for the entire length of the bridge. In practice the dispersing-plate may be formed in separate sections, as shown, instead of in a single piece, both for greater convenience in casting and to reduce the expense of renewal in the event of breakage.

In the application of my improved fire-bridge to a boiler-setting it is placed upon an ordinary brick bridge-wall, without being embedded therein, the lower edge of the fire-plate A being slightly below the level of the grate-bars, and its ends are closed by the side walls of the setting or by metal plates fitted therein, the latter plan being preferable; as in such case, by the removal of the plate at either end, the fire-bridge may be removed, whenever desired, by drawing it out longitudinally through the opening in the side wall, without disturbing any of the brick-work of the setting, and it can be replaced in a similar manner. If, however, its ends be closed by the side walls, it is only necessary, for the purpose of removal, to take out a sufficient number of bricks at one end to form an opening large enough for its withdrawal, and this can be done in a very short time, and without the necessity of awaiting the cooling down of the furnace and combustion-chamber. This capability of ready removal and replacement for renewal or repair constitutes an important feature of my improvements as compared with the ordinary brick bridge-walls, or with devices embedded therein or in the setting. A register or valve of any suitable construction is to be inserted in the wall or plate at one or both ends of the bridge, to enable the supply of air to be accurately regulated thereto, as circumstances may require, and, in some instances, I propose to supply the air by a pipe or pipes passing through the furnace or combustion-chamber, so that it may be admitted to the fire-bridge in a heated state.

In the operation of the bridge the fresh air, which is admitted thereto at one or both ends beneath the back plate, enters the space between the back plate and fire-plate through the supply-openings b^1, and is deflected by the flange b^2 against the heated surface of the fire-plate, and passes upward along the space between the two plates. In its traverse therein it is heated by its impingement upon the entire inner surface of the hot fire-plate, and is introduced in a minutely-divided condition into the combustion-chamber at a temperature closely approximating that of the gases escaping from the furnace, with which it mingles immediately upon their passage over the top of the bridge, thoroughly oxidizing the inflowing carbonic oxide, and effecting a complete combustion, with a corresponding economy of fuel and prevention of smoke. Its advantage, moreover, in durability over the ordinary fire-brick bridge will be apparent to the practical steam-engineer, inasmuch as the fire-plate only is exposed to the direct action of the fire, and, from its material and form of construction, is possessed of greater power of resistance to the destructive influences brought upon it.

In the event of repair, the entire bridge can be removed, a new plate be inserted, and the bridge replaced in position with much less labor and expense, and with far greater expedition, than is practicable in the case of a brick bridge-wall.

I am aware that hollow fire-bridges having an internal air passage or passages and a series of openings or perforations for the supply of air to a combustion-chamber have been heretofore known; and I do not, therefore, broadly claim such device, either *per se* or in combination.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, in a steam-boiler setting, of a furnace, a combustion-chamber communicating therewith, an intermediate bridge-wall, and a series of plates connected together to form a hollow metallic fire-bridge, which rests on, without being embedded in, the bridge-wall, and is removable therefrom through an opening in the side wall of the setting, substantially as set forth.

2. The combination, in a fire-bridge for steam-boiler furnaces, of a corrugated fire-plate, a back plate connected thereto, and provided with a series of air-supply openings, and a perforated diffusing-plate, substantially as set forth.

3. The combination, in a fire-bridge for steam-boiler furnaces, of a fire-plate, a back plate, interposed distance-pieces, and connecting-bolts, substantially as set forth.

4. The combination, with the fire-plate, of a back plate having a series of air-supply openings near its bottom, and a longitudinal deflecting-flange projecting into the space between the fire-plate and back plate above the air-supply openings, and of less width at all

points than the distance between said plates, substantially as set forth.

5. The combination, substantially as set forth, of a fire-plate, a back plate, and a diffusing-plate, connected together and forming a hollow metallic fire-bridge, which is beveled or inclined in opposite directions toward its top, and is provided with a lower series of air-supply openings and an upper series of air-discharge openings.

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