

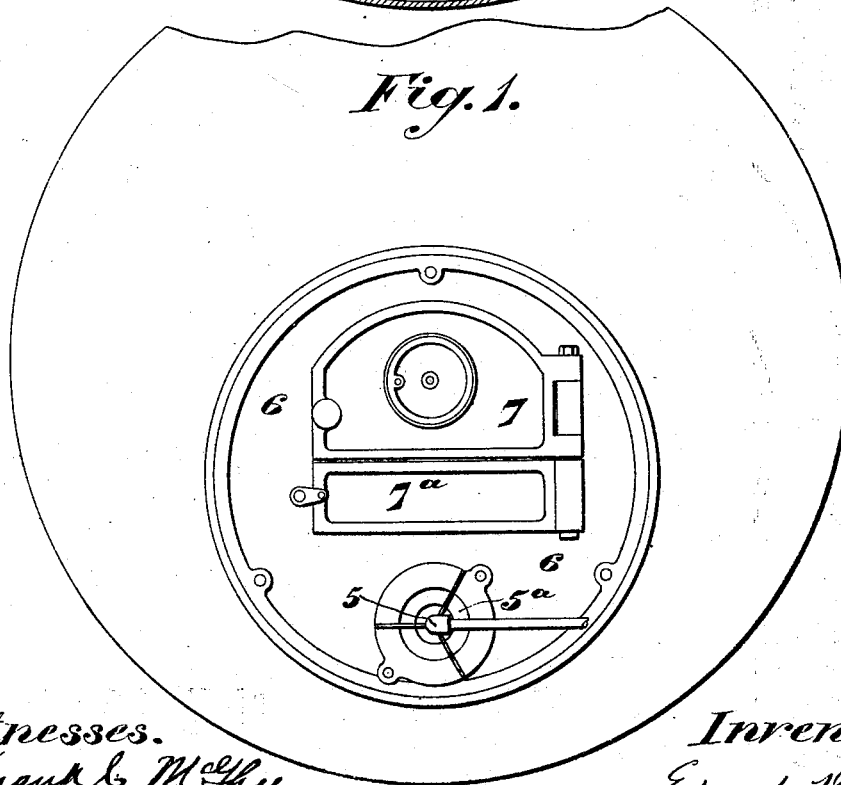
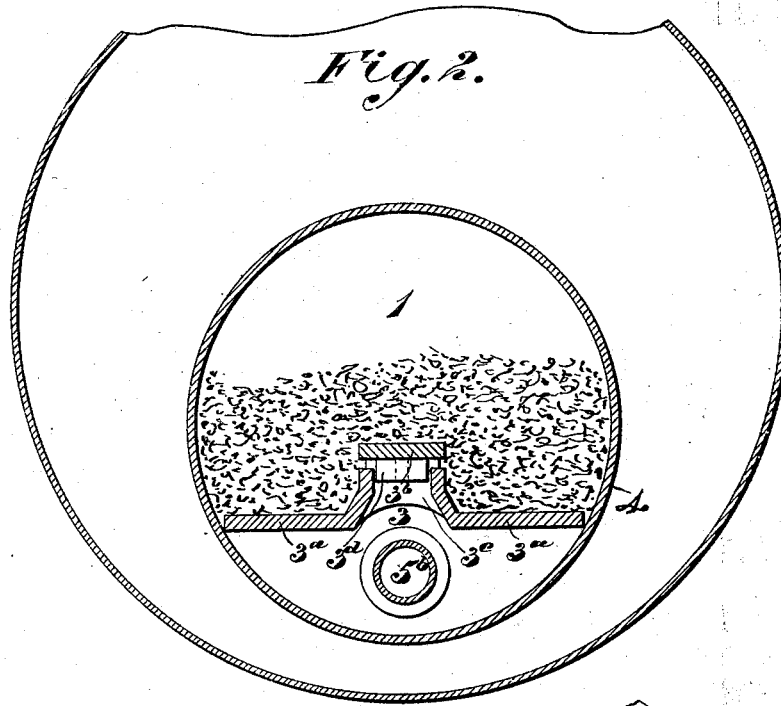
(No Model.)

3 Sheets—Sheet 1.

E. BROOK.
BOILER FURNACE.

No. 553,227.

Patented Jan. 21, 1896.



Witnesses.

Frank & McElhy
Harris & Bates

Inventor.

Edward Brook

(No Model.)

3 Sheets—Sheet 2.

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Fig. 3.

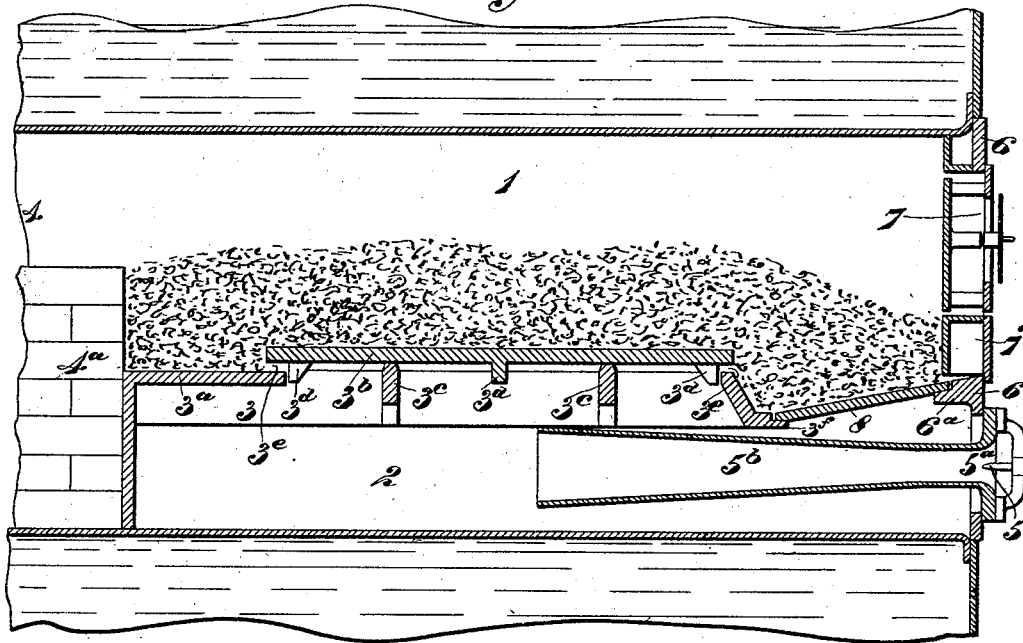
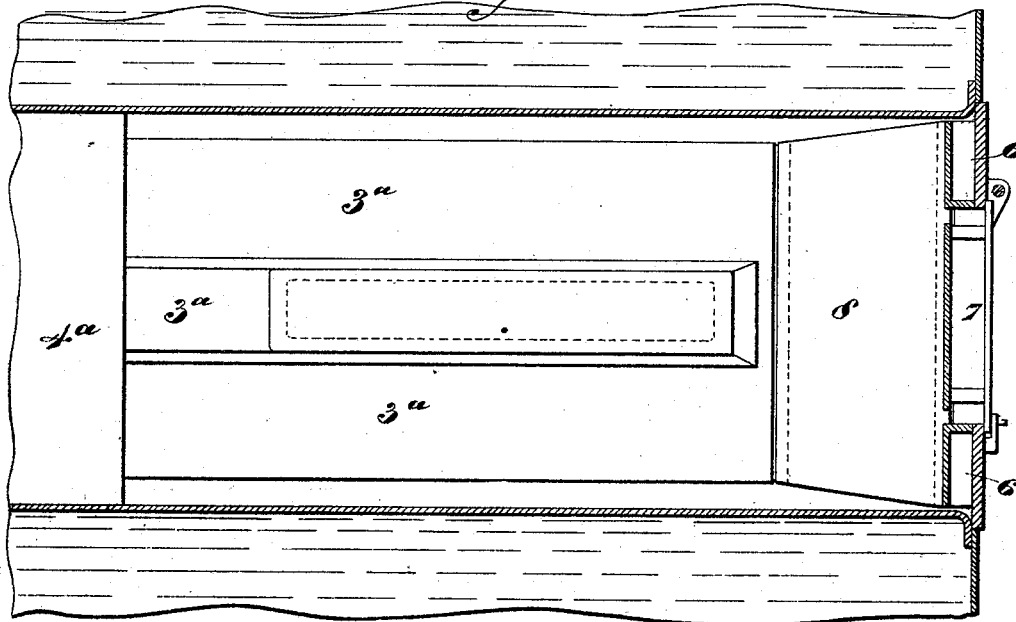


Fig. 4.



Witnesses.

Frank B. McKee
Norris Sykes

Inventor
Edward Brook

(No Model.)

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Fig. 5.

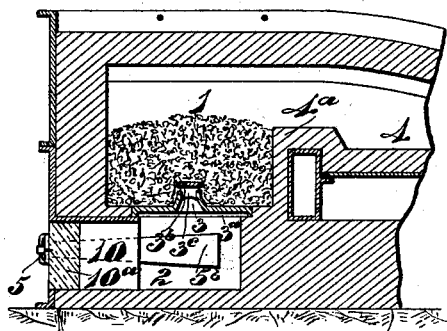


Fig. 6.

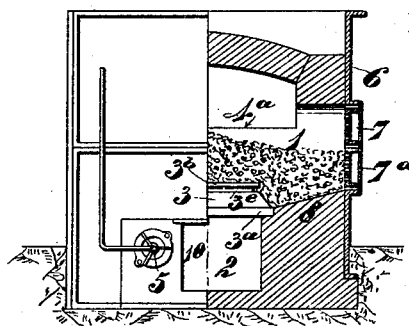
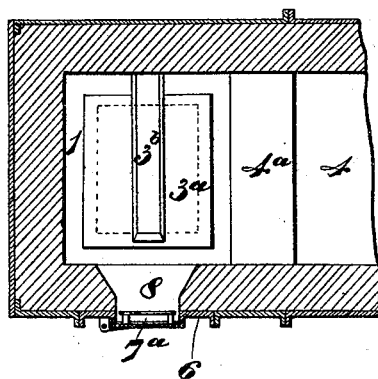


Fig. 7.



Witnesses.

Frank C. McGhee
Harris Sykes

Inventor.

Edward Brook

UNITED STATES PATENT OFFICE.

EDWARD BROOK, OF HUDDERSFIELD, ENGLAND.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 553,227, dated January 21, 1896.

Application filed May 20, 1895. Serial No. 549,855. (No model.) Patented in England February 26, 1894, No. 4,088.

To all whom it may concern:

Be it known that I, EDWARD BROOK, a subject of the Queen of Great Britain and Ireland, residing at Huddersfield, in the county of York, England, have invented Improvements in and Pertaining to Steam-Generator and other Furnaces, (for which I have obtained Letters Patent in Great Britain, dated February 26, 1894, No. 4,088,) of which the following is a specification.

This invention has reference to furnaces of the kind in which there is no fire-grate and no ash-pit, but in which there is in the lower part of the furnace a blast-chamber into which air is induced by a steam-jet apparatus, the construction being such that the fuel rests upon the roof of the blast-chamber, the cross-section of which is such as to provide at the respective sides longitudinal spaces for the collection of ashes and clinker below the level of the openings through which air is supplied from the blast-chamber to the fuel.

The objects of my present invention, which, though designed mainly for furnaces of internally-fired steam-generators, is also applicable to heating, puddling, chemical and other analogous furnaces, are not only the utilization of fuel (especially that of a comparatively cheap and small kind) to the best advantage, but also the provision of simple means for the easy and efficient working of the furnace. For these purposes my improved furnace comprises the following features: (a) a combustion-chamber or space immediately below which is a blast-chamber above and at the sides whereof the fuel rests, this blast-chamber having openings in the upper part of its sides; or, as I prefer, these openings may be produced by making the blast-chamber with a loose top capable of removal for the purpose of renewals, and which is supported and held in position by projections, so as to leave what may be practically described as one continuous opening for the distribution among the fuel of air and steam from the blast-chamber; (b) a steam-jet apparatus placed externally or projecting into and largely contained within the blast-chamber for supplying thereto and thence to the fuel air and steam under pressure; (c) a metal plate or closure provided with a fire-door at its upper part, so that a thick fire

may be maintained, and with, immediately below the fire-door, a supplementary door adapted to give access to and facilitate the removal from the furnace of ashes and clinker which collect and rest upon and at the sides of the walls or cover of the blast-chamber, the construction and arrangement being such that the said two doors close one large opening without any cross-bar between them; and (d) immediately within the furnace-front a "dead-plate" over which ashes and clinker can be removed, and which is preferably placed at an angle forming an inclined plane between the bottom of the doorway and a part of the floor or hearth-plate on which fuel rests and ashes and clinker collect, below the openings through which air passes from the blast-chamber to the fuel. It will usually be convenient to make the dead-plate in two or more parts for convenience of fixing or removal, and the front plate of the furnace is or may be furnished on its inner face with a projecting lip to support one edge of the dead-plate, the other edge resting upon the hearth-plate or wing-plates.

The combined arrangement above described, with large or deep doorway, double doors, and dead-plate, as set forth, will enable the ashes and clinker which collect low down to be easily and rapidly removed, and will constitute a great practical advantage, adding materially to the easy and satisfactory working of the furnace.

In the accompanying illustrative drawings, Figure 1 is a front elevation, Fig. 2 a cross-section, Fig. 3 a longitudinal vertical section, and Fig. 4 a horizontal section, showing an internally-fired steam-boiler constructed according to this invention. Fig. 5 is a longitudinal vertical section, Fig. 6 a half cross-section and a half end elevation, and Fig. 7 a horizontal section, of so much of a reverberatory furnace, as used for puddling or heating iron, as is necessary to illustrate the application thereto of my invention.

Referring to Figs. 1 to 4, inclusive, 1 is a combustion-chamber, and 2 a blast-chamber, arranged one above the other and separated by a hearth-plate which consists of a tuyere or channel 3 having wings 3^a which rest upon the lower portion of the furnace-tube 4 and against the fire-bridge 4^a, and upon which

and the top of the channel the solid fuel to be burned rests. The top 3^b of the channel 3 is preferably made loose, as shown, and is supported by projecting cross-pieces 3^c of the channel 3 and kept in position by projections 3^d on its under side in such a manner as to leave an opening 3^e all round for the distribution of the blast among the fuel. By thus making the top 3^b loose it can be easily removed for the purpose of renewal or for obtaining access to the blast-chamber 2.

The steam-jet apparatus for supplying air and steam to the blast-chamber 2, and thence through the opening 3^e in the channel 3 to the fuel, comprises a steam-nozzle 5 and a main tube having a conical or bell-mouthed inlet 5^a and a diverging outlet 5^b. This apparatus may be arranged to project into and be largely contained within the blast-chamber 2, as shown, or it may be fixed externally to the blast-chamber.

6 is the metal plate or closure which forms the front plate of the furnace. It is provided with a hinged fire-door 7 at its upper part and with a supplementary hinged door 7^a immediately below, the upper door serving, when opened, for charging coal and breaking up the fire and the lower one for cleaning out ashes and clinker. The two doors close one large opening that is without any cross-bar, and through which large pieces of clinker can be easily removed from the combustion-chamber 1. 8 is a dead-plate arranged in an inclined position with one edge resting on a lip 6^a projecting from the front plate 6 and with its opposite edge resting on a lip 3^f of the hearth plate or channel 3.

It will be seen that the construction of furnace described enables a thick fire to be maintained without having the doors 7 and 7^a abnormally large or deep, and at the same time gives room for attaching the steam-jet apparatus to the front of the furnace. The dead-plate 8, though shown as a single plate, may be made in two or more pieces for convenience of lifting in and out.

In Figs. 5, 6, and 7 the same reference-figures are used as in the foregoing description to indicate similar parts, 1 being the combustion-chamber for containing the fuel; 2, the blast-chamber below the same; 3, the tuyere or channel with wings 3^a supported by girders, steps or recesses in the walls of the blast-chamber; 3^b, the loose top or cover for the same. 5 5^a 5^b is the steam-jet apparatus for supplying air and steam to the fire, 7 and 7^a the main and supplemental fire-doors hinged one above the other to the front plate 6 of the furnace, and 8 the dead-plate, which in this case is preferably formed in brickwork, as shown, but is made to slope upward from the level of the hearth-plate 3^a to the bottom of the doorway for the purpose of reducing the

size of the doors. 10 is an opening for gaining access to the blast-chamber 2 whenever required, the said opening at other times being closed by a door or by a wall 10^a, as shown in Fig. 5, which also serves to carry the steam-jet apparatus, of which there may be two sets.

In the case of reverberatory furnaces, the upper door, 7, may be arranged to lift or slide vertically instead of being hinged to swing horizontally, as shown in Figs. 6 and 7.

What I claim is—

1. A steam generator or other furnace having a combustion chamber separated from a blast chamber below by a wall or division forming a solid hearth having a raised portion provided with an air opening or openings at its upper part and the cross section of which is such as to provide at the respective sides of said raised portion, longitudinal spaces or recesses for the collection of ashes and clinker below the level of said opening or openings, a furnace front provided with a fire door at its upper part, and with, immediately below the said fire door, a supplementary door adapted to give access to the bottom of the said longitudinal spaces, said doors closing one large opening in the furnace front without any cross bar between them, and steam jet apparatus for supplying air to said blast chamber and thence to the fire, substantially as herein described for the purposes specified.

2. In an internally fired steam generator or other furnace, the combination of a metal tuyere or channel provided with lateral wings or side plates and arranged within the boiler-tube or flue or other furnace so as to form a solid hearth between a blast chamber below and a combustion chamber above, said tuyere or channel extending above said lateral wings or side plates and having a loose top or cover arranged to form with the upper part of said tuyere or channel an opening or openings located above said wings or plates, and steam jet apparatus adapted to supply air to said blast chamber, substantially as herein described for the purpose specified.

3. A furnace comprising combustion and blast chambers 1 and 2, a channel 3 having a loose top 3^b and side wings 3^a and arranged between said chambers, a furnace front having a single opening provided with doors 7, 7^a, an inclined dead plate 8 between said door 7^a and channel 3, and steam jet apparatus comprising the steam nozzle 5 and the main tube 5^a, 5^b extending into said blast chamber, substantially as herein described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD BROOK.

Witnesses:

FRANK C. MCGHEE,
NORRIS SYKES.