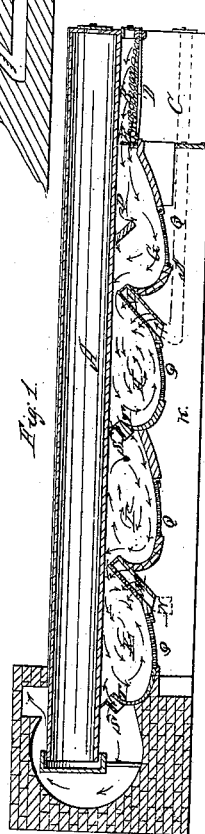
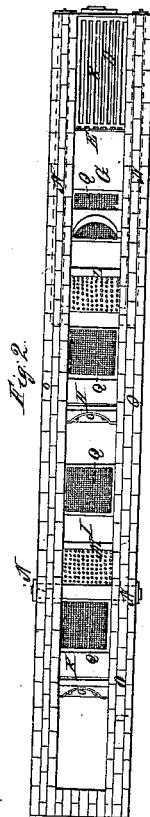
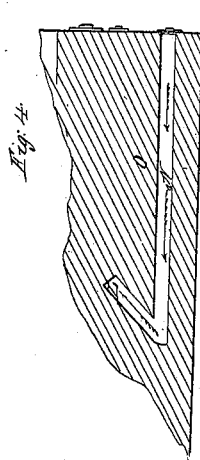
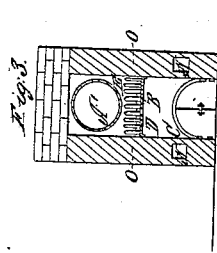


*H. F. Baker.*

*Steam-Boiler Furnace.*

*N<sup>o</sup> 4546.*

*Patented May 30, 1846.*



# UNITED STATES PATENT OFFICE.

HENRY F. BAKER, OF BOSTON, MASSACHUSETTS.

## BOILER-FURNACE.

Specification of Letters Patent No. 4,546, dated May 30, 1846.

*To all whom it may concern:*

Be it known that I, HENRY F. BAKER, of Boston, in the county of Suffolk and State of Massachusetts, have invented a certain new and useful Improvement in Furnaces for Steam-Boilers; and I do hereby declare that the nature of the same or the manner in which it is constructed and operates is fully described and represented in the following specification and accompanying drawings, letters, figures, and references thereof.

The nature of my invention consists in combining with the usual fireplace of a steam boiler, one or more reverberatory chambers or auxiliary fireplaces having air or oxygen ducts, the same being for the purpose of retaining and revolving the volatile products which escape from the burning fuel, and supplying them with a due degree of oxygen, and by so retaining and revolving them, and supplying them with oxygen, obtain a more perfect combustion of them than is generally effected by any of the common modes of erecting furnaces.

Of the aforementioned drawings, Figure 1 denotes a vertical, central and longitudinal section of a cylindrical steam generator or boiler, having my improvements applied to it, Fig. 2 a horizontal section of the furnaces or brick work, taken immediately below the bottom of the boiler. Fig. 3 is a transverse and vertical section taken through the vertical grate bars, at the back part of the main fireplace. Fig. 4 is a vertical and longitudinal section of the brickwork, taken so as to exhibit the air passages which convey air to the distributing chambers, to be hereinafter described.

A, in the drawings, represents a long cylindrical boiler of the kind usually adopted for high pressure steam engines.

B is the fireplace or chamber, for the combustion of the fuel, and its resolution into cinders or ashes. C is the ash pit below the same. The said fireplace B is to be erected beneath the boiler, and, generally speaking, at or near one end thereof, as seen in the drawings.

D is a horizontal grate and E a vertical one placed upon the rear end of the former and extending up or nearly up to the boiler. The object of this latter grate, which should be made large enough to extend entirely across and constitute the rear end of the fireplace B, is to prevent the fuel from fall-

ing into the first reverberatory chamber or fireplace, or that immediately in rear of the said grate.

G, H, I, K, are a series of reverberatory chambers or furnaces, for the retention and burning of the gases and such other volatile products of combustion as escape from the main fireplace B. The said chambers should be arranged beneath the under surface of the boiler and from the main fireplace rearward, and the one in rear of the other, as seen in Fig. 1. The bottom surface of each of the said chambers has an inverted parabolic or curved shape in its longitudinal and vertical section, as seen in Fig. 1, the said shape being for the purpose of deflecting the gases or volatile products received into the chamber, upward against the boiler, and giving to them a revolving motion in the manner denoted by the arrows in Fig. 1.

Between any two of the reverberatory chambers to which it may be desirable to apply it, I arrange an air distributor or shallow box L, or M, made of plate iron or other proper material. The top plate of the said box should be shaped so as to correspond with the curve or desired form of the bottom of the chamber H or I immediately in rear of it, and the said top plate should be perforated with a great many fine orifices or holes, in order that there may be a general diffusion of air or oxygen passing through it and into the chamber to which it is applied. Each of the said boxes L, M is to have a suitable passage N leading from it, through the brickwork O, in any convenient direction, the said passage being made to terminate in the external atmosphere, in such manner as to allow air to pass into and through it and into the air distributing chamber or duct, with which it communicates.

Between the vertical grate E and the box L is an inclined partition P made of a material suitable to withstand heat. It is arranged in the position and extends downward from beneath the boiler, as seen in the drawings. The object of the said partition is to receive the main body of smoke and volatile products as they rush from the fireplace, and deflect them upward against the boiler, and thereby cause them to sweep downward and along the bottom or the curved surface of the first chamber G. There is a small grate Q adapted to the bottom of each of the reverberatory chambers.

The said grate allows the fine dust and cinders or ashes, which are indestructible by the heat generated in the chamber, to fall from the chamber into an arch or pit R which extends entirely beneath all the chambers as seen in the drawings.

The grates are not essential to the correct operation of the chambers, and when used, the arch way or pit R may be closed at both ends, in order to prevent the admission of too great a quantity of air into the chambers. If said grates are made easily removable, they will admit of access being had at any time to their respective chambers, for the purpose of cleaning or repairing them.

From the rear chamber K, a smoke passage or flue is carried around the rear end of the boiler, and from thence in any convenient manner into the chimney. Between the rear and front parts of any two consecutive chambers, to which it may be desirable to apply it, I place what may be termed a separator of the volatile products. It consists of a bent plate *s* extending transversely across the rear part of the front one of the said two chambers, and with respect to the plate T, of the back chamber, as seen in the drawings. The said plates S and T form together a throat or passage for the volatile products passing into the chamber I, to rush through. A series of any number of holes may be made through the plate S. Through the said holes the smoke and unconsumed volatile products will rush in so many divisions or streams. The plate S may or may not extend up to the boiler. I do not deem the said plate as constituting any part of my main invention, but only as an accessory which may be often advantageously employed.

As the smoke, gases, or other volatile products of combustion pass from the fireplace into the reverberating chamber G, they are retarded and revolved therein and thrown upward against the boiler, in consequence of the peculiar shape of the bottom of the said chamber. A portion of them will be burnt in the chamber, and the remainder or surplus will pass over the top of the box L, or between it and the boiler, and will commingle with the atmospheric air which rushes through the upper plate of the air box L. The said air will supply the said surplus with the quantity of oxygen necessary to its whole or partial combustion,

and owing to the peculiar inclined position of the perforated plate of the air box, the air rushing through it will impel the combustible and burning volatile gases and other products in numerous jets or streams upward against the part of the boiler which is over the said plate. These streams or jets of flame in striking against the boiler, are, to a great extent, deflected by it against the rear curved part of the chamber and by it, reverberated or turned downward, and coursed back or toward the perforated plate of the air box. Thus a rotation or revolution of the gases or volatile matters is kept up in the chambers.

Such portions of the gases &c. as are not consumed, pass into the next and succeeding chambers, until, by being so revolved and supplied with fresh air, they become nearly if not entirely burnt up. By my improvement, I am enabled to effect a very important saving of fuel, as most of the gases which are generally lost pass off, through the chimney, are by the said improvement, consumed under the boiler, and made to serve the purpose of heating it.

What I claim and desire to secure by Letters Patent, is—

One or more reverberating chambers (made and arranged as above set forth) in combination with the fireplace and boiler, the same being made to revolve and retain the volatile products underneath the boiler, long enough to be consumed thereunder, as above explained, and I also claim, the manner of arranging the air distributing boxes with respect to the bottom of the boiler, in combination with the curved deflecting bottoms of their respective chambers, in order that the flame produced by combustion of the volatile gases or other matters passing over the perforated plates of said air boxes may be blown in jets against the bottom of the boiler, as set forth; the said mode of arranging the said air boxes consisting in giving each of them an inclined position, substantially as represented in the drawings and as above specified.

In testimony whereof, I have hereto set my signature, this fourteenth day of February, A. D. 1846.

HENRY F. BAKER.

Witnesses:

R. H. EDDY,  
GEO. H. BAILEY.