

Sheet 1-3 Sheets.

H. G. Brooks,
Steam-Boiler Furnace,

N^o 82,283,

Patented Sep. 22, 1868.

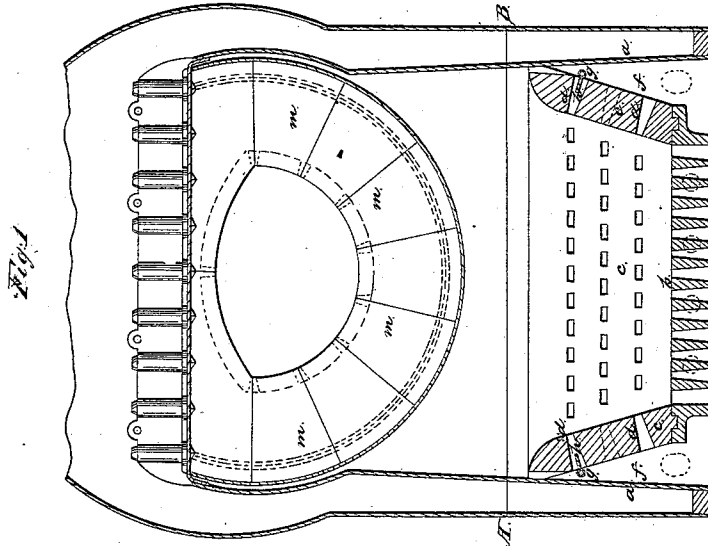
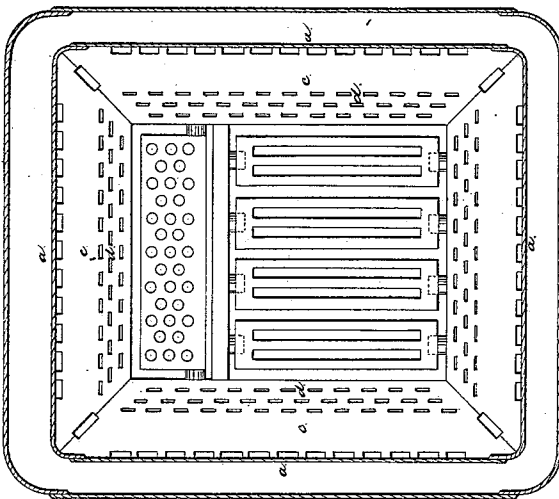


Fig. 2.



Witnesses,
Amos C. Baker
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Inventor,
H. G. Brooks, by
A. Pollok,
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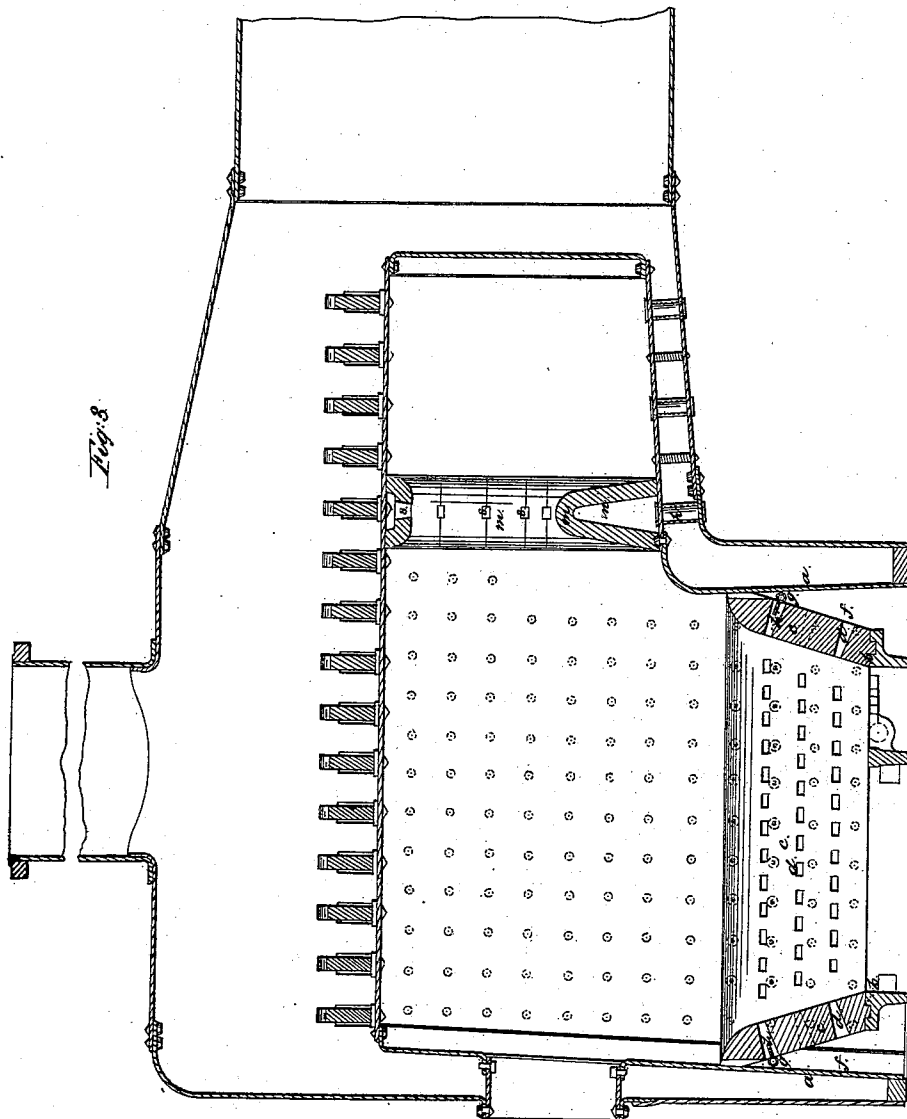
Sheet 2-3 Sheets.

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Witnesses,

Wm. B. McCalister,
Wm. Bowley.

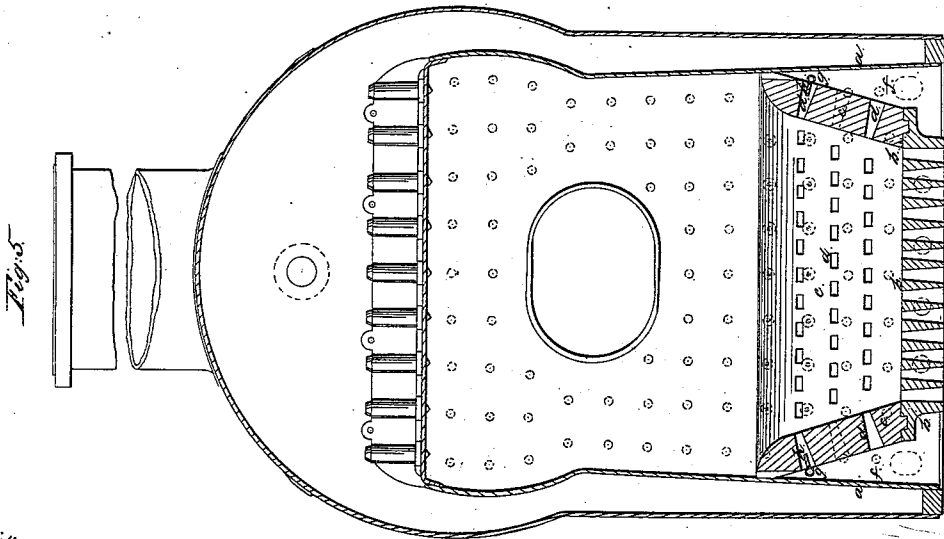
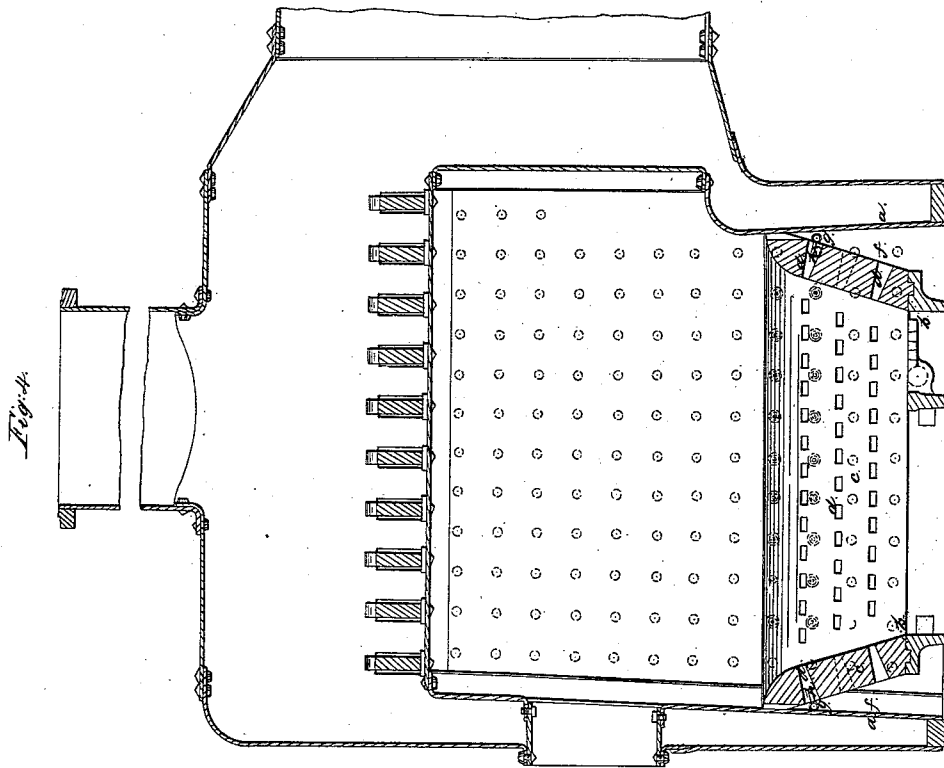
Inventor,
H. G. Brooks,
by A. Pollock
attorney.

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Witnesses:
to Boiler,
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Inventor,
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Att'y.

United States Patent Office.

H. G. BROOKS, OF NEW YORK, N. Y.

Letters Patent No. 82,283, dated September 22, 1868.

IMPROVEMENT IN STEAM-GENERATORS

The Schedule referred to in these Letters Patent and making part of the same.

TO WHOM IT MAY CONCERN:

Be it known that I, H. G. BROOKS, of New York, in the county and State of New York, have invented certain new and useful Improvements in the Construction of Locomotive and other Boilers; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a transverse vertical section through the fire-box of a locomotive-boiler, made in accordance with my invention.

Figure 2 is a section on the line A B, fig. 1.

Figure 3 is a longitudinal vertical central section of the boiler in fig. 1.

Figures 3 and 5 are, respectively, a longitudinal central section, and a transverse vertical section of a locomotive fire-box, slightly differing in construction from that represented in the preceding figures.

The improvements which are the subject of this patent relate to the means for obtaining more perfect combustion, and insuring thereby greater economy in the consumption of fuel in locomotive and other boilers.

Various devices have heretofore been employed with more or less success to effect the combustion of coal. It is a well-known fact, however, that a large proportion of the combustible gases generated by the combustion of coal passes off unconsumed, and that therefore a great portion of the combustible properties is not utilized. I attribute this want of economy to a failure to supply the requisite quantity of heated atmospheric air to the solid fuel and products of combustion, as well as to a mistaken idea that a very large grate-surface is essential to burn coal successfully in locomotives.

My improvement in this direction may be stated to consist—

First, in the construction of the fire-box for the purpose of contracting the grate-surface of the ordinary coal-burning fire-box, and extending from the outer lines of such contracted surface fire-brick or castings of fire-clay, liberally provided with apertures, for the admission of air at a greater or less angle, the said walls of fire-brick or castings being, at the bottom, from eight to ten inches distant from the side and end walls of the fire-box, and at the top resting against said side and end walls, so as to create a space for the heating of the air before it passes through the brick to mingle with the combustible products.

Second, in the arrangement of arched fire-brick or castings, to contract the mouth of the combustion-chamber, or that part of the fire-box through which the products of combustion pass to the flues, and to confine and heat air received through suitable conduits, and then transmit such highly-heated air through said brick at the point of contraction and concentration of the gaseous elements.

Third, in the combination, with the hollow or perforated fire-brick, placed either in the fire-box or at the mouth or throat of the box, of a water-pipe, connected with the boiler, and supplied with nozzles projecting a short distance into the perforations in the fire-brick. The water ejected through these nozzles or sprayers will be decomposed by impingement against the intensely-heated fire-brick, and the oxygen and hydrogen thus evolved will add greatly to the efficiency and economy of combustion.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which the same is or may be carried into effect by reference to the accompanying drawings.

a a are the side and end walls of a locomotive fire-box, at the bottom of which is located the grate *b*. As hereinbefore indicated, I contract the grate-surface so that its outer lines shall be a suitable distance, say from eight to ten inches, from the side and end walls *a*, as indicated fully in the drawings. From the outer edges of the grate extend upwards the fire-brick or castings, of fire-clay *c*, made especially for this purpose, which slant or are inclined, so that their upper ends shall rest against the side and end walls of the box. In these fire-brick or castings are formed perforations or openings *d*, of a conical form, or contracted at their inner ends, and inclined upward at a greater or less angle, as may be desired. There is thus formed between the fire-brick and the walls of the box, a space or chamber, *f*, which communicates freely with the ash-pan below, so that air taken in at the usual openings in the ash-pan will not only pass through the openings in the contracted

grate-surface, but will also enter the space *f*, and, by contact with the intensely-heated fire-brick, become sufficiently elevated in temperature to be immediately available for mixture with the gases evolved from the burning fuel in the box, the air passing, for this purpose, through the openings *d*, and impinging both against the solid fuel and the gaseous products of combustion. The fuel, in short, burns in a sort of pot, whose bottom is formed of iron grates, and sides and ends of perforated fire-brick, and in this manner the combustion of the fuel can be increased with great facility, simplicity, and economy.

In order to consume as far as possible all the products of combustion, I sometimes employ a pipe, *g*, connected with the boiler, and traversing the space *f*, and provided with nozzles or sprayers *h*, at suitable distances apart, which, as shown in fig. 1, project a short distance into the perforations *d* in the fire-brick. The water ejected in a finely-divided state from the nozzles under the boiler-pressure, will be immediately decomposed into its constituent gaseous element by contact with the intensely-heated fire-brick in its passage through them, and the oxygen and nitrogen thus evolved will, by mixture with the gaseous productions in the fire-pot, add greatly to the efficiency and economy of combustion.

Such of the products of combustion as remain unconsumed pass off through the mouth of the fire-chamber into the boiler-flues. In order to effect the combustion of these products, and to intensify the heat, I place in the mouth or upper part of the combustion-chamber fire-brick, or castings of fire-clay *m*, in the manner shown in fig. 3, the brick being hollow or of an arched form, so as to enclose a space or chamber, *n*, which is supplied with air through hollow stay-bolts *p*, or other suitable conduits. The air, which is highly heated immediately by contact with the brick, is transmitted through perforations *s* in the inner faces of the brick, and mixes, just at the point of contraction and concentration, with the yet unconsumed gaseous products, causing the almost complete if not entire combustion of all the combustible gases, and intensifying the heat to a great degree.

This feature of my invention is most important and valuable, and can be employed either alone or in conjunction with the others.

If desired, a pipe, *g*, and nozzles *h* may be arranged with the chamber *p* and perforations *s*, in the manner and for the purposes hereinbefore set forth.

I am aware that fire-brick have been used in fire-boxes for the purpose of promoting combustion, but so far they have failed to give satisfactory results, for the reason that the use of fire-brick without the presence of other elements does not answer the requirement for the perfect combustion of either the hydrocarbons of bituminous coal or the carbonic oxides of anthracite.

The conditions of combustion require a fixed, highly-elevated temperature, which alone can be gained by the use of castings from fire-clay, or from some other material equally capable of absorbing and retaining a temperature of the requisite quality; and, in connection with such absorbed fixed temperature for contact and deflection, a device which shall confine and elevate the temperature of a sufficient quantity of atmospheric air, and supply it in a highly-heated state to the solid fuel and combustible gases evolved from such fuel. These results are realized by my invention, comprising, as it does, devices for both retaining the required temperature, and supplying the requisite quantity of heated air to the combustible gases, which would otherwise pass off unconsumed.

Having now described my invention, and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is—

1. The arrangement, in the fire-box of a locomotive or other boiler, of perforated fire-brick walls, extending upwards divergently from the contracted grate-surface to the walls of the fire-box, substantially as set forth.

2. The arrangement, in the upper part or mouth of the combustion-chamber or fire-box, of arched or hollow perforated fire-brick, or castings of fire-clay, communicating with air-conduits in the manner described, so that the atmospheric air received through such conduits may be highly heated within said brick or castings, and then discharged from the same into the combustion-chamber at the point of contraction and concentration of the combustible gases evolved from the fuel in the fire-box.

3. The combination, with the perforated fire-brick, of a water-supply pipe, communicating with the boiler, and provided with a series of nozzles or sprayers, arranged partly within the perforations in the fire-brick, substantially as set forth.

In testimony whereof, I have signed my name to this specification before two subscribing witnesses.

H. G. BROOKS.

Witnesses:

M. L. HINMAN,

JNO. W. ROMAINE.