

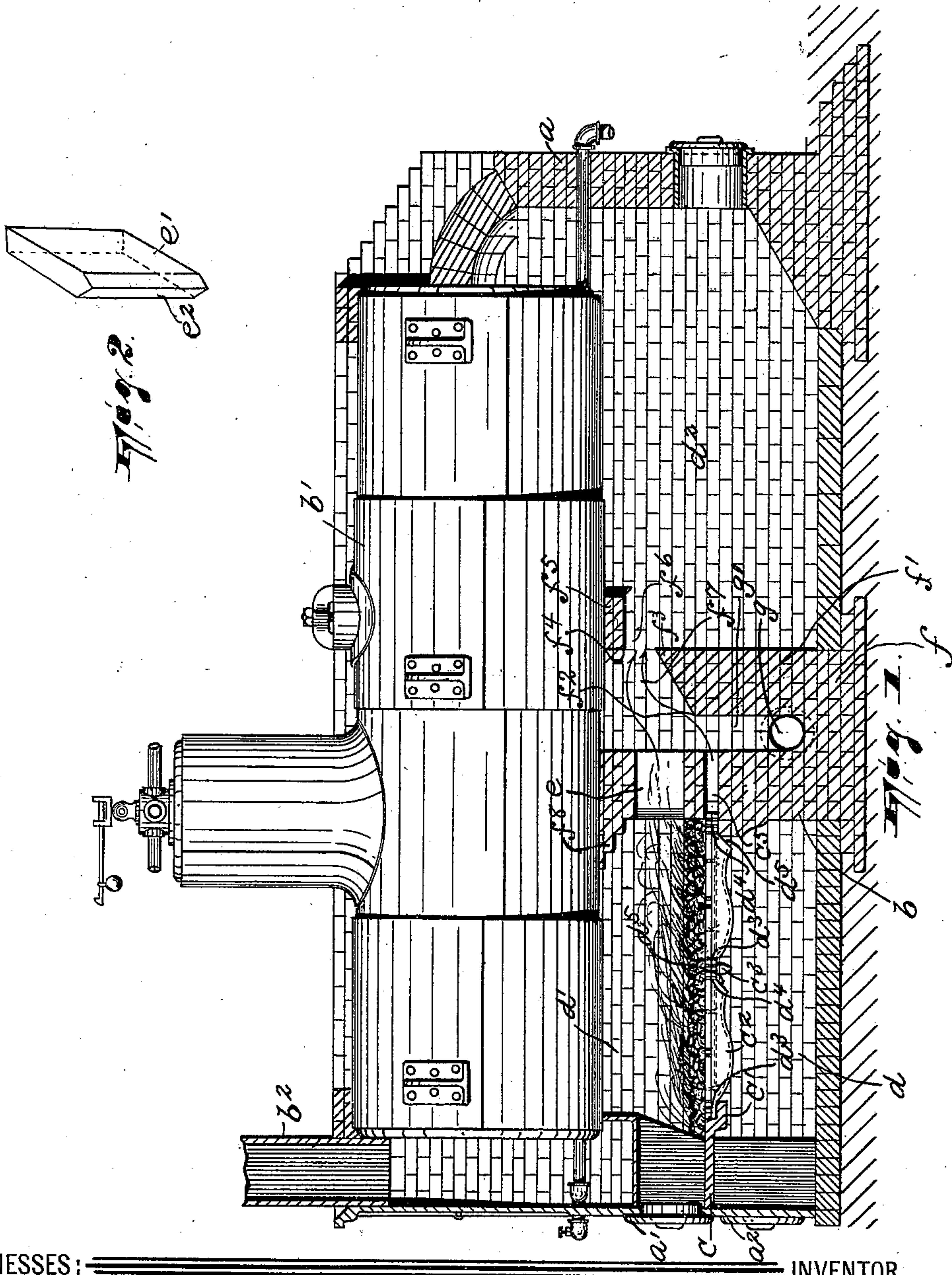
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G. S. LEE.
FURNACE.

(Application filed Oct. 25, 1899.)

(No Model.)



WITNESSES:

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 641,873, dated January 23, 1900.

Original application filed August 29, 1899, Serial No. 728,832. Divided and this application filed October 25, 1899. Serial No 734,709. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. LEE, a citizen of the United States, residing at Hawthorne, in the county of Passaic and State of New Jersey, have invented certain Improvements in Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to an apparatus for promoting combustion; and its object is to provide an apparatus of this nature whereby thorough chemical union of the air and gases will be effected and the production of smoke consequently prevented. The improved apparatus, hereinafter described at length, which I have provided for accomplishing this object is especially adapted as a furnace, particularly of the steam-boiler class, and its construction is such that of two processes of combustion, a primary and a secondary, which are both carried on at the same time in its operation, the secondary combustion results in the perfect consumption of all gases which are evolved in and escape free from the primary combustion. In the construction referred to the combustion-chamber proper of the furnace is divided by a bridge-wall into an initial and a secondary combustion-chamber, which have communication through said bridge-wall for the transmission from the one to the other thereof of the unconsumed gases, and the grate-bars, which are as usual spaced to afford communication between the ash-pit and said initial combustion-chamber, are formed in the shape of hollow flues or conduits that conduct bodies of air from the ash-pit to openings in said bridge-wall that are so disposed as to best effect the commingling of this air with the unconsumed gases passing out of the initial combustion-chamber. Thus by using the grate-bars as flues for leading in the bodies of air which support the secondary combustion the temperature of these bodies of air is appreciably raised, and so their bet-

ter union with the gases of the secondary combustion is secured; and this union is materially enhanced by certain deflecting and dispersing means which I employ in connection with the said construction.

In another and copending application filed by me August 29, 1899, Serial No. 728,832, of which this application is a division, I fully describe, illustrate, and claim a peculiar construction of grate-bar which I prefer to employ in connection with my improved combustion apparatus constituting the subject-matter of this application. I do not therefore herein claim said grate-bar.

My present invention therefore consists in an improved construction of furnace.

The invention is fully illustrated in the accompanying drawings, wherein—

Figure 1 is a sectional view of a furnace of the steam-boiler class constructed after the principles of my invention, and Fig. 2 is a perspective view of one of a series of certain blocks or bricks used in my improved furnace for dispersing the gases that are unconsumed in the initial combustion-chamber.

In said drawings, *a* designates the exterior wall structure of the furnace, the same being of any well-known construction and being provided at its front end with the usual fuel-supply and ash-pit doors *a'* and *a''*, respectively.

b is the bridge-wall, which extends transversely across the furnace, said bridge-wall and another structure hereinafter described dividing the furnace into two compartments. Upon the bridge-wall and otherwise supported in the wall structure of the furnace rests the boiler *b'*, whose flues communicate with the interior of the furnace at their rear ends and with the stack *b''* of the furnace at their other ends.

c is a plate, preferably of metal, that extends horizontally across the front of the furnace between the fuel-supply and ash-pit doors, its inner edge being provided with a flange *c'*, upon which rest the front ends of the grate-bars *c''*, the rear ends of said grate-bars being supported upon a girder *c'''*, extending across the furnace. The front ends of

other grate-bars c^4 , preferably arranged in alinement with the grate-bars c^2 , also rest on the girder c^3 , their rear ends being set in an opening or individual openings c^5 , that are provided in the bridge-wall. The structure comprising the plate c and the series of grate-bars, it will be seen, divides the forward compartment of the two above referred to into the ash-pit d and what I term an "initial" combustion-chamber d' . The other of the two compartments referred to is designated by the reference character d^2 and constitutes a secondary combustion-chamber.

Each grate-bar is constructed hollow and serves as a medium for conducting air from the ash-pit to the secondary combustion-chamber. These grate-bars may be used singly or in plurality in tandem arrangement. Their construction is set forth with sufficient particularity in my above-mentioned copending application, it being only necessary to say that, as indicated by dotted lines in the drawings, a channel is formed in each grate-bar, which is open, as at d^3 and d^4 , at both ends and also, preferably, at a subjacent point d^5 in the bar. The front opening d^3 of the bar may of course be plugged or closed in any desired manner, as by the masonry when setting it in place, if said bar is to be used singly or it happens to be the first or outermost bar in the series.

Above the openings c^5 , in which the rear ends of the grate-bars c^4 rest and with the channels in which they have communication, there is provided in the bridge-wall b an opening e , which extends across the furnace from one side wall to the other thereof. This opening is cut up into a number of smaller openings by a series of vertically-disposed blocks e' , preferably constituting bricks of fire-clay, which have the edges thereof adjacent the initial combustion-chamber beveled off, as at e^2 . The object of providing these blocks e' is to effect a thorough breaking up and dispersing of the gases that are evolved in the primary combustion that is carried on in the initial combustion-chamber d' and which are forced out through the opening e into the secondary combustion-chamber. By beveling the blocks the agitation of these gases will be materially augmented, as will be apparent.

Upon the pier f , which I have formed at the bottom of the furnace and which, extending across the same, constitutes a portion of the bridge-wall b , I erect back of said bridge-wall a deflecting-wall f' , which is slightly spaced from said bridge-wall and has its top surface inclined, so that the lower edge f^2 (which is its front one) thereof is about in a horizontal plane—that is, midway between the openings e and c^5 , respectively. The rear edge f^3 of this wall is approximately as high as the top of the opening e , and in approximate vertical alinement with it is the front lower edge f^4 of a wall f^5 , that spans the furnace-chamber. A narrow opening f^6 is thus formed.

It will be seen that the bridge-wall and the

structure comprised in the deflecting-wall f' and the wall f^5 together separate the furnace-space into two compartments, of which the one comprises the primary combustion-chamber and the ash-pit and the other constitutes the secondary combustion-chamber. Furthermore, the bridge-wall being spaced from the structure comprising the other two walls combines therewith to form what I term a "mixing-chamber" f^7 .

It will be seen that in the operation of the furnace above described the combustion of the fuel that is placed upon the grate-bars is supported by the air which is admitted from the ash-pit between the grate-bars, and simultaneously air enters from the ash-pit the ingress-openings of the channels of the several grate-bars and being conducted back and forth through each grate-bar passes out of its egress-opening and the opening c^5 in the bridge-wall, whereupon it is deflected upwardly by the deflecting-wall f' . Now as the gases that are evolved, but not consumed, in the primary combustion above referred to are driven out of the initial combustion-chamber they are thoroughly broken up and agitated by the beveled blocks e' , and after passing said blocks are commingled in the mixing-chamber f^7 with the rising bodies of air that are discharged by the hollow grate-bars and are passing out of the openings c^5 of the bridge-wall. Thereupon the secondary combustion begins to take place, and it is promoted not only because the deflecting-wall and the wall f^5 , together with the bridge-wall, form a mixing-chamber, as f^7 , from which there is egress for the elements of combustion only through a confined opening, but because in passing through the grate-bars and being thereby brought into close proximity to the combustion that is going on in the initial combustion-chamber the temperature of the fresh bodies of air that are supporting this secondary combustion has been raised, and consequently they quite readily release their oxygen. It should be remarked that in order to best give the gases and other products of combustion that are passing out of the initial combustion-chamber proper direction, so that they will all keep in motion, the bricks of which the bridge-wall is composed should be disposed so as to successively overhang each other, as at f^8 .

So far as the grate-bars are concerned any construction in which the grate-bars are hollow will suffice so long as that by it the temperature of the air as it passes through said grate-bars may be materially raised. I prefer, however, to use that form of grate-bar to which I herein briefly refer and which I particularly describe in my said copending application.

Between the bridge-wall b and the deflecting-wall f' one side wall may have an opening g , whereby refuse that collects there may be removed. The pit g' , formed by the space between these walls, may be as deep as de-

sired, the said opening being arranged preferably at the bottom of it.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a combustion apparatus, the combination, with two compartments and a spaced bridge-wall and a partition structure separating said compartments, said bridge-wall having an opening through it, of a suitable fuel-support disposed in one of said compartments in a plane beneath the top of said opening, and air-conducting means discharging through said bridge-wall and disposed beneath said opening, said partition structure being arranged in effective proximity, and having a contracted opening approximately opposed to said opening in the bridge-wall and the discharge end of said air-conducting means, said last-named opening being disposed in the partition structure appreciably below the top thereof, substantially as described.

2. In a combustion apparatus, the combination, with two compartments and a bridge-wall and a deflector separating said compartments, and said bridge-wall having openings arranged one above the other and affording communication between said compartments, of a series of tubular grate-bars arranged in one of said compartments and communicating with the subjacent openings, said deflecting-wall being arranged in effective proximity to said openings, and another wall disposed above said deflecting-wall and spaced therefrom to form an opening approximately opposite said first-named openings, substantially as described.

3. In a furnace, the combination, with two compartments and a bridge-wall and a deflecting-wall separating said compartments, and said bridge-wall having openings arranged one above the other and affording communication between said compartments, of a series of tubular grate-bars arranged in one of said compartments and communicating with the subjacent openings, spaced dispersing-blocks arranged in the upper openings, and another

wall disposed above said deflecting-wall and spaced therefrom to form an opening approximately opposite said first-named openings, said deflecting-wall being arranged in effective proximity to said openings, substantially as described.

4. In a furnace, the combination, with two compartments, of walls separating said compartments, one of said walls being the bridge-wall and having openings arranged one above the other and the other walls being disposed the one above the other and spaced from said bridge-wall to form a mixing-chamber and also from each other to form a confined opening, a series of tubular grate-bars arranged in one of said compartments and affording communication between the same and the subjacent openings, and beveled and spaced blocks arranged in the upper opening, one of said last-named walls being a deflecting-wall and arranged in effective proximity to said openings, substantially as described.

5. In a furnace, the combination, with two compartments, of walls separating said compartments, one of said walls being the bridge-wall and having openings arranged one above the other and the other walls being disposed one above the other and spaced from said bridge-wall to form a mixing-chamber and also from each other to form a confined opening, a series of tubular grate-bars arranged in one of said compartments and affording communication between the same and the subjacent openings, and beveled and spaced blocks arranged in the upper opening, one of said last-named walls being a deflecting-wall and arranged in effective proximity to said openings, the top of said wall being inclined, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 20th day of October, 1899.

GEORGE S. LEE.

Witnesses:

JOHN W. STEWARD,
ALFRED GARTNER.