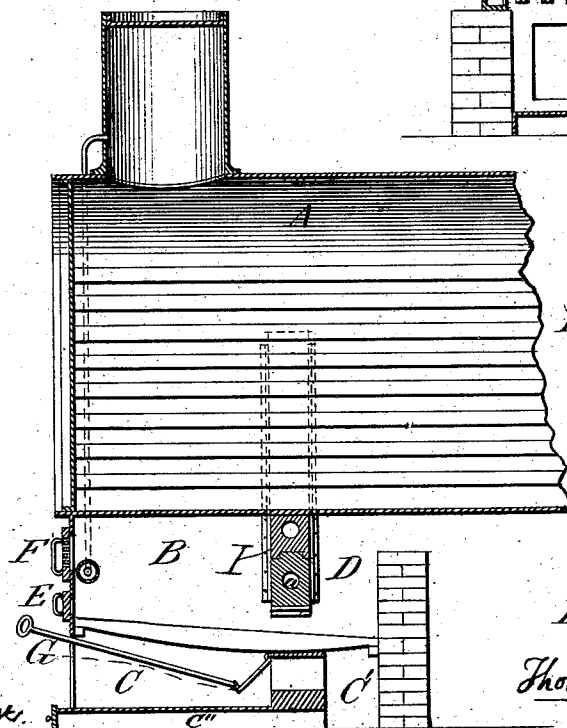
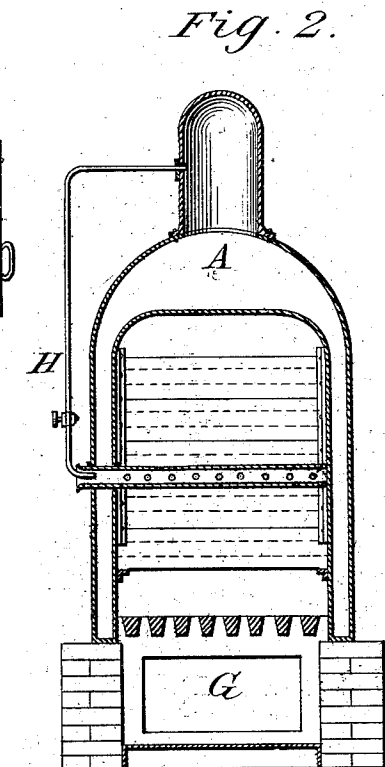
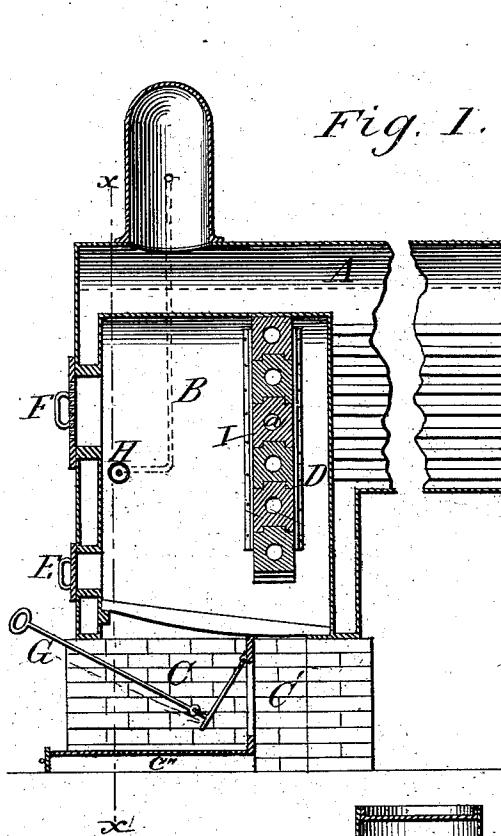


T. M. FELL.
Furnace.

No. 225,357.

Patented Mar. 9, 1880.



Witnesses:
Edwin Swimmer
William W. Dodge.

Inventor:
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UNITED STATES PATENT OFFICE.

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FURNACE.

SPECIFICATION forming part of Letters Patent No. 225,357, dated March 9, 1880.

Application filed January 31, 1880.

To all whom it may concern:

Be it known that I, THOMAS MARA FELL, of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Furnaces; and I do hereby declare that the following is a clear and exact description thereof, which 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 letters of reference marked thereon, which form a part of this specification.

My invention relates to furnaces and fire-boxes for steam-boilers, evaporating-pans, glass-furnaces, brick-kilns, and other purposes, whereby the perfect combustion of the fuel and gases evolved therefrom is assured, by which great economy of fuel is effected and the formation of smoke prevented.

My invention consists in a new and improved partition made of fire-brick or any refractory material capable of withstanding a high degree of temperature, and the slabs are provided with holes centrally located, in which are placed iron pipes, bars, or rods, by which said slabs are strengthened and re-enforced, so as to counteract any tendency toward disintegrating when exposed to a high temperature.

My invention further consists in the construction and arrangement of said partition by which the furnace is divided into a front and rear combustion-chamber, said chambers being provided with means by which an under and over supply of air is furnished.

It also consists in the combination, with the improved partition, of double combustion-chamber, as described, a double ash-pit provided with independent air-supply ducts, by which slow and fast combustion may be controlled in either of the combustion-chambers or both, as may be desired.

It further consists in the combination of the double combustion-chambers and double ash-pits with their independent air-supply ducts of a combined air and steam supply pipe, arranged in such manner that a combined air and steam supply is given to the front combustion-chamber above the fuel or grate in a mechanically-divided state, and air alone is supplied from

below the grate, as hereinafter described; and it further consists in the arrangement of the blast-pipes in such manner that the flame and gases evolved from the fuel in the front or primary combustion-chamber are forced with great rapidity against the partition, by which the air, steam, and gases are made to thoroughly commingle and atomize, by which they are more intimately and chemically united, and in this state are forced through the fuel and under said partition in a state of bright incandescence into the rear combustion-chamber, in which perfect combustion takes place.

A description of parts is as follows: Figure 1 represents a vertical longitudinal sectional elevation as applied to a locomotive-boiler. Fig. 2 is a vertical transverse sectional elevation on the line *xx* of the same, and Fig. 3 a vertical sectional elevation of the parts applied to a common return-flue or tubular boiler.

A is the boiler, with the usual tubes; B, the furnace or fire-box; C, C', and C'', the ash-pits and bottom air-supply.

The interior of the fire-box is divided by the partition I, which thereby forms the back combustion-chamber, D. Said partition reaches down to within a short distance of the grate-bars, and is constructed in portable sections, slabs, or blocks, having the ends made with a projection or joint for cementing. The center is preferred to be filled along its length with the iron re-enforcement in the shape of a tube or hollow casting or pipe, *a*, as being preferable to a solid bar; but either may be used.

E is a door, which may be used for removing clinkers; F, the fire-door, which may have the usual perforations for air, or be made solid.

The ash-pit is divided by an iron or brick partition into a front ash-pit, C, and a back ash-pit, C', G being an air-door with its handle, the bottom supply of air, C'', furnishing the back ash-pit with a separate quantity of air.

H is a steam-pipe, with valve passing down from the steam-space to or near where the top surface of the fuel is ordinarily maintained, which is made to force in a top supply of air by the line of injection-holes, as shown, across

the width of the front, the position of which is clearly seen in Fig. 2, and also the partition is shown by the dotted lines.

The modus of working is as follows: A fire
5 having been made in the front chamber, having air-supply ducts G and C'' closed, a certain amount of bright fuel is pushed back, but which is afterward maintained in the back
10 combustion-chamber by using the fire-bars at a downward angle, as shown, and by proper stoking. After the fuel is well ignited and built up the steam and air are turned on and the bottom supply of air regulated by the air-door G and the damper shown at the mouth
15 of the air-duct C''. Fresh fuel thrown upon this fire is distilled at the surface in the same way as in any ordinary open-top furnace; but instead of being immediately thrown off up the flues as smoke and unburned gas, the com-
20 bustion-gases are fully atomized and converted into a heat-flame before escaping. The hydrogen of the steam is utilized by reason of the oxygen having been separated to form carbonic oxide.

25 The construction and operation of this furnace are applicable for various uses besides the furnaces of steam-boilers, for which purpose, instead of the water-ways surrounding it, the same may be inclosed by brick or other suitable covering.
30

I therefore claim as my invention—

1. In a furnace for steam-boilers, the combination of the slabs or fire-brick provided with holes centrally arranged and iron bars or pipes,
35 said slabs being united together to form a partition in the furnace, substantially as described.

2. The combination of the front and rear combustion-chambers divided by the pendent partition I, constructed as described, the front
40 and rear ash-pits provided with independent

air-ducts, said chambers being supplied with air above and from under their grates, in the manner and for the purpose specified.

3. In a furnace for the combustion of fuel, the combination of the partition I, constructed
45 as shown, double combustion-chambers B and D, as described, a double ash-pit provided with independent air-supply ducts controlled by suitable mechanism, by which slow and fast
50 combustion may be had in either of said combustion-chambers, or both, as may be desired, as herein shown and specified.

4. The combination, with the double combustion-chambers, double ash-pits with independent air-supply ducts, of combined air and
55 steam supply pipes, arranged in such manner that the combined air and steam supply is given to the front combustion-chamber above the grate in a mechanically-divided state, and
60 air alone is supplied from below the grate, as herein described.

5. In a furnace for the perfect combustion of fuel, the combination, with partition I, the front combustion-chamber, B, and the inclined
65 grate, of the combined air and steam pipes in front of the furnace, and arranged in such position as to force with great velocity the flame and gases evolved from the fuel on the grate
70 against said partition, by which they are made to intimately mix, and by the same blast are in this state forced through the fuel and under said partition into incandescence in the
combustion-chamber D, where they are entirely utilized, substantially as described, and
for the purpose set forth.

THOMAS MARA FELL.

Witnesses:

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