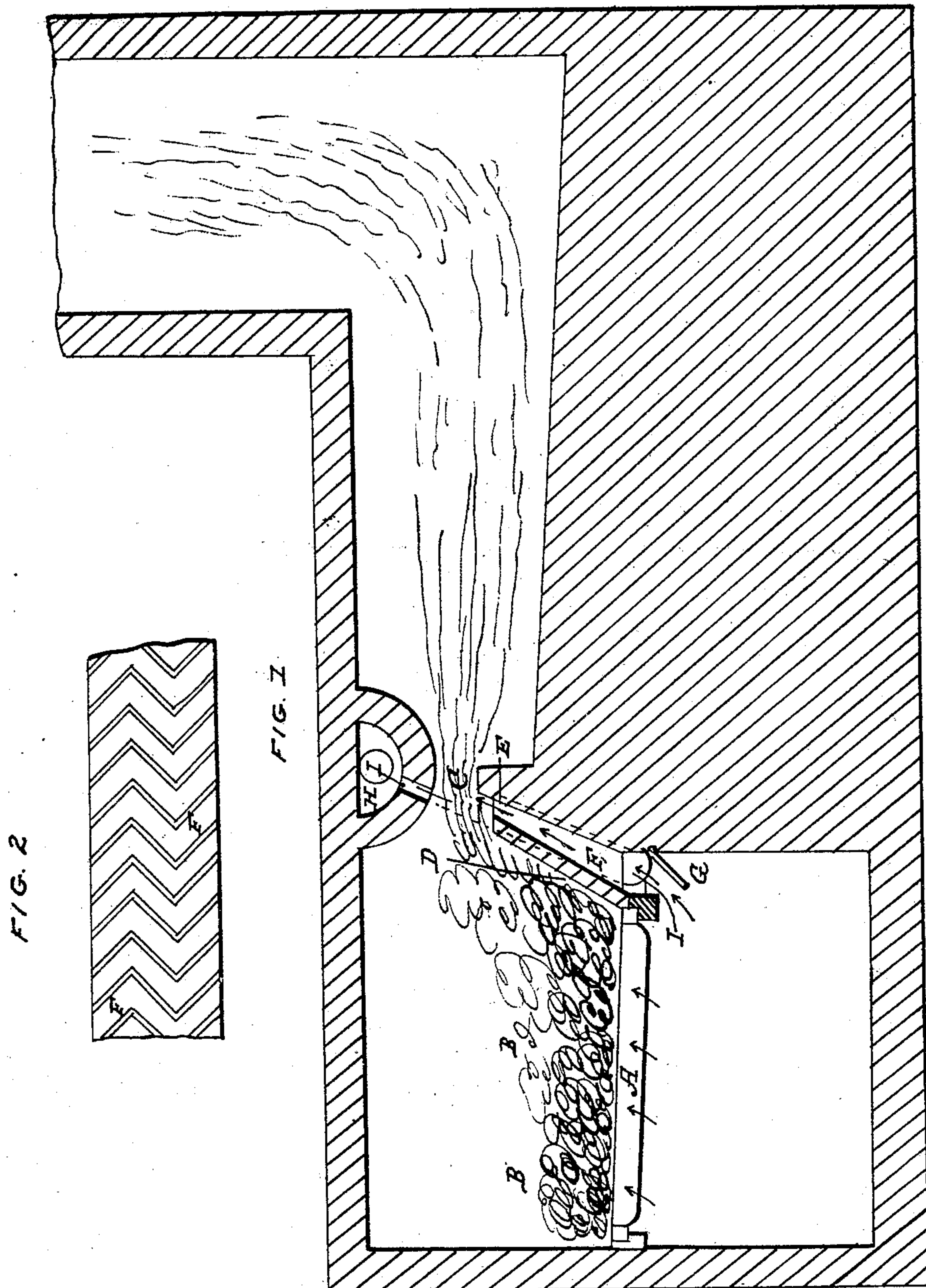


O. F. MAYHEW.

Furnace for Puddling, Heating, &c.

No. 56,429.

Patented July 17, 1866.



WITNESSES:

*J. M. Levette*  
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INVENTOR.

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# UNITED STATES PATENT OFFICE.

OSCAR F. MAYHEW, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO WM. H. WEEKS AND G. M. LEVETTE, OF SAME PLACE.

## IMPROVEMENT IN FURNACES FOR PUDDLING, HEATING, &c.

Specification forming part of Letters Patent No. 56,429, dated July 17, 1866.

*To all whom it may concern:*

Be it known that I, OSCAR F. MAYHEW, of the city of Indianapolis, in the county of Marion and State of Indiana, have invented new and useful Improvements in Smelting, Puddling, Heating, and Boiler Furnaces, for the purpose of effecting a more complete combustion of the carbon and gases eliminated from the burning fuel; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of the same, in which—

Figure 1 is a vertical longitudinal section of a furnace showing my improvements. Fig. 2 is a view of the deflecting air-passages for heating the air before it reaches the flame.

Similar letters of reference indicate corresponding parts in the several figures.

The object of this invention is to effect a more perfect combustion of the carbon and gases eliminated from the burning fuel in smelting, puddling, heating, and boiler furnaces; and to this end it consists in arranging the throat or contracted opening through which the carbon and gases pass away as they are set free low down and in close relation to the incandescent fuel, so that they shall be drawn (or forced in blast-furnaces) through said contracted opening immediately as they are eliminated, being supplied with air just before passing through the opening and while in the condition of hot flame, so that the carbon, gases, and air will be concentrated and intermingled together while heated by the incandescent fuel, thus providing the conditions to effect a more complete combination.

To enable others skilled in the art to make and use my invention, I will proceed to describe it, viz:

A are the grate-bars; B, the fuel; C, the throat; D, a plate in front of the bridge-wall E; F, space between the plate D and bridge-wall E; G, damper to close and regulate the admission of air through the air space or passage F to admit air to the flame. H is an air-duct placed in the crown of the furnace or over the throat C to admit air upon the upper side of the flame as well as below, the air being supplied through the pipe I by blast or draft.

The duct H may be made to admit the air either in a thin sheet or through tubular ducts.

The lower down and nearer to the incandescent fuel the throat C is placed the better, allowing merely space enough between the fuel and throat to supply the requisite quantity of air to provide the combining proportion of oxygen to the flame as it passes through the throat.

The throat or opening C should be proportioned to the draft of the flue or stack, and may be provided with any convenient and suitable means of increasing or diminishing it, the object being to adjust the throat C to the draft, so that the flame will be drawn through the opening with sufficient force to cause it and the air to be concentrated and thoroughly intermingled together, and also to concentrate the heat upon them, the same principle being applicable to blast-furnaces.

Furnaces as usually constructed admit the air entirely through the fuel, the oxygen combining with the carbon and gases in the lower part of the fire-pot and greatly increasing the heat therein and eliminating large quantities of carbon and gases from the fuel above, which are carried off by the draft or driven off by the blast unconsumed, because greatly in excess of the supply of air. The design of this improvement being to supply the fuel only so much air as will keep the fire burning sufficient to eliminate the carbon and gases necessary to produce the required heat, the carbon and gases being supplied with the combining proportion of oxygen (air) as they escape from the fuel, and being concentrated and commingled together at this point, and being highly heated by the incandescent fuel, the conditions of a more perfect combination (combustion) are supplied.

In starting the fire the air-passage F may be closed by the damper G, and the quantity of air admitted to the flame at all times regulated by it.

In furnaces where air is supplied to the flame they either fail in concentrating them or in doing it in such relation to the incandescent fuel as that they are not sufficiently heated to combine.

The air-space F is subdivided by zigzag passages, in order to heat the air more thoroughly before it reaches the flame.

In furnaces where great heat is required a fire-brick wall with openings in the lower part may be used instead of the plate D, the air-



space F being between it and the bridge-wall E.

The operation of the furnace is as follows: The air, being admitted under the grate-bars, as in ordinary furnaces, whether by blast or draft, ascends partly through the fuel and partly through the air-passages F and H. This, of course, lessens the force with which the air would pass into and through the fuel if the whole quantity of air had to pass through it instead of a part passing up by the air-passages F and H. In first starting the fire the damper G is closed, so that all the air may ascend through the fuel until fully ignited. This damper is also used to regulate the quantity of air admitted to the flame, the throat C being situated so that the carbon and gases eliminated from the burning fuel are concentrated and drawn or forced through it immediately as they are set free and while in the condition of hot flame. At this point fresh air is supplied to the flame through air-passages F and H, so as to be concentrated and commingled with it as it is drawn or forced through the throat. The oxygen of the air combines with the carbon and gases of the flame, whereby the heat is greatly increased. The reason for placing the throat C in this relation to the incandescent fuel and supplying air at this point is that the conditions are thereby provided to effect the most complete combination of the oxygen of the air with the carbon and gases of the fuel in a simple and practicable manner, viz: The air is supplied to the carbon and gases just as they leave the fuel and while they are hot and in the best condition to combine with the oxygen of the air, and they are concentrated together at this point in order that they may be more thoroughly intermingled and heated, thus supplying the conditions of complete combustion.

It is well known that contracting the throat of the fire-place is an aid to the better combustion of fuel; but this has always been done at such a distance from the incandescent fuel as that the air admitted only tended to cool down the flame, and at best was quite imperfect.

Air has also been supplied in various ways and conditions with greater or less advan-

tage; but I am not aware that it has ever been attempted to arrange the throat or opening that concentrates the carbon, gases, and air together in such relation to the incandescent fuel as that they were intermingled and concentrated together just as they are set free from the fuel and under the influence of constant combining temperature, the conditions of complete combination being provided with little or no additional expense and in the most simple manner, and it is in this that my invention differs from all others with which I am acquainted. Air admitted to the flame at any considerable distance from the incandescent fuel in quantities sufficient to supply the combining proportion of oxygen cools the flame and prevents combination. It is also essential to perfect combustion that room be provided for the expansion and perfect mobility of the flame after it passes the throat, for if it be cramped it will be condensed and the combination checked to a greater or less extent.

I do not make any claim to any of the parts herein shown and described separately and in themselves considered, nor to the admission of air to the flame; but

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

1. The construction and arrangement of the throat or opening C and air-passages F and H, when placed in such relation to the incandescent fuel as to operate in the manner and for the purpose substantially as set forth.

2. The damper G, in combination with the air-passage F and throat C, when arranged as and for the purpose substantially as set forth.

3. The zigzag divisions of the air-passage F, in combination with the throat C, when arranged as and for the purpose substantially as set forth.

4. The upper air-passage, H, in combination with the throat C, when arranged as and for the purpose substantially as set forth.

OSCAR F. MAYHEW.

Witnesses:

G. M. LEVETTE,  
WM. H. WEEKS.