C. D. BAKER.

Reverberating Furnace.

No. 52,813. Patented Feb. 27. 1866.

Fig. 1.

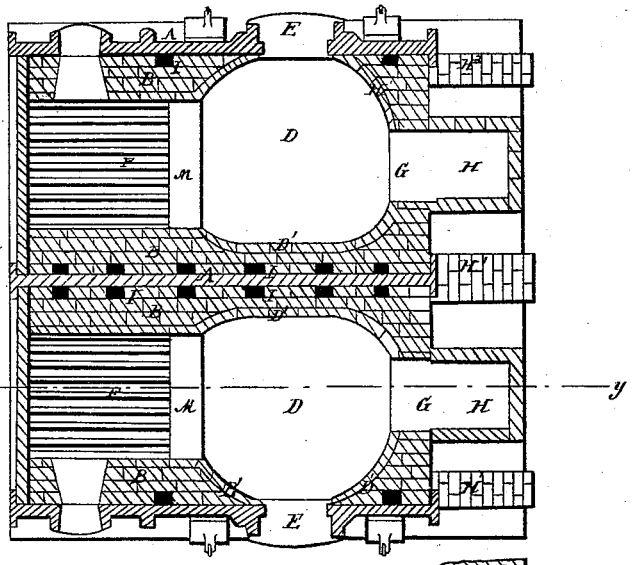


Fig. 2.

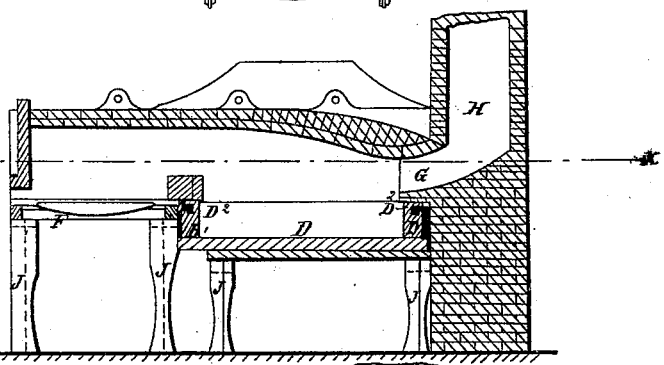
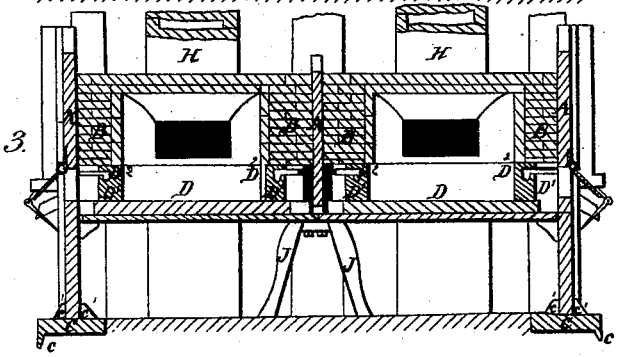


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHRISTOPHER D. BAKER, OF WHEELING, WEST VIRGINIA.

IMPROVED PUDDLING-FURNACE.

Specification forming part of Letters Patent No. **52,813**, dated February 27, 1866.

To all whom it may concern:

Be it known that I, CHRISTOPHER D. BAKER, of Wheeling, in the county of Ohio and State of West Virginia, have invented certain new and useful Improvements in Furnaces for Boiling or Puddling Iron; and I do hereby declare the following to be a full, clear, and exact description of the nature, construction, and operation of the same, reference being had to the accompanying drawings, which are made part of this specification, and in which—

Figure 1 is a horizontal section of two furnaces joined back to back upon my improved plan, the line *x x*, Fig. 2, indicating the plane of section. Fig. 2 is a vertical longitudinal section in the plane of line *y y*, Fig. 1. Fig. 3 is a transverse section of the two furnaces as represented in Fig. 1.

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

My said invention consists, first, in constructing the entire furnace above ground and dispensing with a large portion of the brick-work hitherto made use of, by which means the expense of the furnace is reduced and the time required to build it diminished; second, in providing the raised border or chill of the iron-chamber with a channel, passage, or groove for the reception of water or air, which is supplied at intervals in order to preserve the chill from injury in consequence of the intense heat to which it is subjected; third, in constructing a chill of wrought-iron; fourth, in a novel method of arranging the fire-grate relatively to the iron-chamber, which arrangement tends to save fire, reduces the size, and hence lessens the cost of the fire-bridge; fifth, in a method of constructing and arranging the stack and the adjacent end of the furnace, which enables me to dispense with the separate piece containing the inclined throat for conducting the dross from the stack into the furnace, said throat-piece being described in my patent of June 27, 1865; sixth, in constructing the furnace with passages or spaces wherein the surplus air or steam in the interior of the furnace is conducted off and discharged into the external air; seventh, in means for joining or building two furnaces back to back.

In order that others skilled in the art to which my invention appertains may be enabled to fully understand and use the same, I will proceed to describe the construction and operation with reference to the accompanying drawings.

The treatment to which the iron is submitted in furnaces of this class is referred to in my previous patent, hereinbefore alluded to, and is so well understood that it is needless to dwell upon it in this specification.

A A A′ A′ are the metallic binding-plates, and B B the fire-brick portion at the front and back of the furnace.

Heretofore in building these furnaces a pit or foundation was first dug in the earth for the purpose of forming an ash-pit beneath the fire-grate and giving stability to the furnace, a large portion of the fire-brick having been laid under ground.

In building one furnace I employ two metallic supporting plates or bars, similar to those designated by C C, which are laid flat upon the ground in parallel positions. To prevent their being displaced from the positions in which they may be set, they are each formed at the edge with a downwardly-projecting flange, *c*, which flanges take into corresponding grooves, which may be cut in the ground to receive them. The front and back binding-plates A A rest upon these supporting-bars C C, which may be formed with shoulders *c′ c′* to hold the plates against the lateral displacement. I extend the fire-brick from the top of the furnace only as far down as the top of the chill D′ of the iron-chamber D.

In fire-brick furnaces constructed previously to this invention the fire-brick extends from the top to the bottom of the furnace or foundation, and hence from two to three feet below ground.

It will be evident that by this mode of construction two novel and advantageous results are secured, viz: first, a considerable saving of time in building the furnace—*i. e.*, the time required to dig the pit and lay the fire-brick below the iron-chamber; second, a reduction in the actual cost of the furnace by reducing the amount of material.

D is the iron-chamber, to which the iron may be supplied in the customary manner through the door E. On the exterior of the raised border or chill D′ of the iron-chamber D, I make an encircling groove or channel, D^2, to which water may be supplied, at the pleasure

of the attendant, by means of a water-pipe, or in any other desired manner, for the purpose of preserving the said chill from injurious effects by the action of the intense heat to which it is subjected. If preferred, the chill may be cast with a hollow interior, and preserved from the heat by means of air forced through it in any desired way and discharged beneath the fire-chamber. The application of air for this purpose is not attended with expense, for a blast is always used when anthracite coal is employed as fuel, and the same means by which such blast is generated can be made available in supplying the chill with air.

I have succeeded in making a chill of wrought-iron, and have, by practical test, found such a chill to be superior to those made of cast-iron, for the reason that they are better adapted to withstand the heat. The wrought-iron chill can be made by forging or rolling.

By constructing a chill in accordance with the above description I am enabled to entirely dispense with the use of ore, which is generally employed to protect the chill from contact with the melted iron.

F is the fire-grate, which I support on a level with the top of the chill of the iron-chamber.

Heretofore the fire-grate was located about one foot below the top of the chill, and was set back from the chill about eighteen inches, the intermediate space having been built up with fire-brick, which is termed the "fire-bridge;" hence heretofore from seventy-five to eighty fire-brick were used in the construction of the fire-bridge, owing to the relative positions of the chill and grate. As above stated, I raise the grate to about the level of the top of the chill of the fire-chamber, and I also set the grate close up against the chill. Therefore it is manifest that I reduce the bulk of the fire-bridge M both vertically and horizontally, so that while from seventy-five to eighty fire-brick have heretofore been requisite, from ten to fifteen will suffice in my furnace. The function of the fire-bridge is to prevent the coal from getting into the iron-chamber. This method of arranging the fire-grate causes the action of the fire upon the iron to be more direct and effective, which results in a saving of fuel.

G is a throat inclined upward from the iron-chamber and forming a communication between the latter and the stack H. The object of giving an inclination to the throat is fully set forth in my previous patent, hereinbefore referred to. In my plan of constructing the throat, already patented, a separate piece or section of fire-brick has to be made therefor, inasmuch as the stack stood some distance away from the iron-chamber—say about three feet six inches.

In erecting the furnace I set the same close up against the stack and form the inclined throat in the brick-work, which constitutes the stack itself. Thus I obviate the employment of the separate neck or piece, and hence save the expense of the fire-brick of which the same is composed.

I I I represent a series of passages or conductors for carrying off steam and air. Steam is generated in the groove D^2 of the chill of the iron-chamber from the water which is used to cool the said chill. As the steam (or hot air) escapes from the groove D^2 it enters the lower ends of the passages I and is conducted through them to the top of the furnace, where it is discharged. The passages I are made in the brick-work of the front and back of the furnace.

I will now describe my improved method of joining two furnaces back to back in the manner represented in the drawings, the preceding description having reference chiefly to the construction of one furnace.

The front and back walls of the furnace I make of nine-inch brick-work, in conjunction with the binding-plates. By connecting two furnaces in the manner shown clearly in Figs. 1 and 3 I need employ but three binding-plates, A A A, for the two furnaces, the central plate A serving as the back binding-plate for each furnace.

In one separate furnace constructed upon my improved plan both the front and back binding-plates extend down to the ground or to the supporting-bar C, which rests upon the ground; but when the two furnaces are joined together, as represented, the binding-plate A, which serves as the back binding-plate for each, need only extend downward as far as the bottom plate of the iron-chamber, in which case the furnaces are each supported at the back by the legs J J, which may be bolted to the furnace in the manner shown. If preferred, the central binding-plate or back binding-plate for the two furnaces may be entirely dispensed with, and the intermediate brick-work can be joined, so as to be common to both furnaces.

That portion of the stack designated by H is termed the "lining," which is the central part or column of the stack. On each side of the lining, facing the front and back of the furnace, is a side wall, H′, which walls are in fact the main columns of the stack, and quite a large quantity of brick is required to build these walls. To render the erection of one of these walls unnecessary in the construction of the two furnaces, I erect one at a point equidistant between the two linings and one at the opposite side of each lining, as represented.

Having thus described my invention, the following is what I claim as new and desire to secure by Letters Patent:

1. Constructing a puddling-furnace entirely above ground, substantially as described.

2. Surmounting the iron-chamber with fire-brick, substantially as and for the purpose described.

3. Surmounting both the iron-chamber and the fire-chamber with fire-brick, substantially as and for the purpose specified.

4. Providing the raised border or chill of the

iron-chamber with a groove, passage, or channel, to adapt it to be preserved from heat by the application of water or air, as described.

5. Making the raised border or chill of the iron-chamber of wrought-iron, as described.

6. The described method of arranging the fire-grate relatively to the iron-chamber.

7. Setting the stack close up against the furnace, in the manner and for the purpose set forth.

8. The passages or spaces I in the brick-work for conducting off the air and steam which emanate from the groove in the chill, as described.

9. Joining two furnaces back to back in any manner, substantially as described.

10. The combination of three main walls with two stacks, as and for the purpose described.

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