(No Model.)

W. H. DE VALIN.

GRATE BAR AND FURNACE.

No. 265,032. Patented Sept. 26, 1882.

Fig. 1.

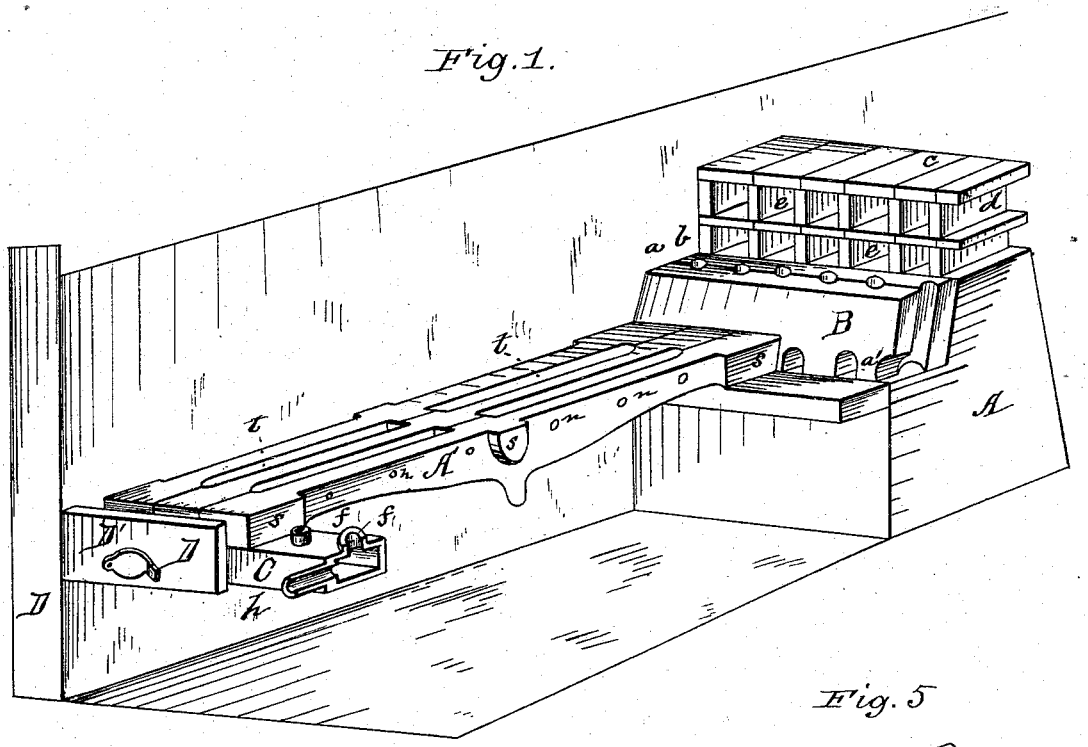


Fig. 2.

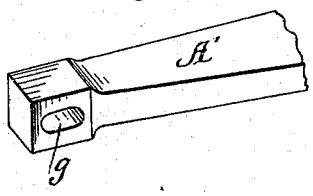


Fig. 4.

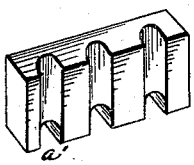


Fig. 5

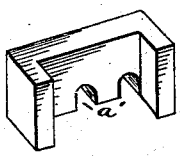
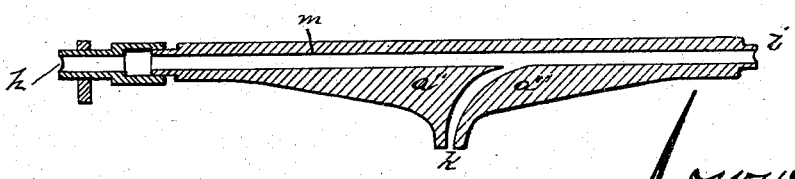


Fig. 3



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UNITED STATES PATENT OFFICE.

WILLIAM H. DE VALIN, OF SAN RAFAEL, CALIFORNIA.

GRATE-BAR AND FURNACE.

SPECIFICATION forming part of Letters Patent No. 265,032, dated September 26, 1882.

Application filed July 22, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. DE VALIN, a citizen of the United States of America, residing at San Rafael, in the county of Marin and State of California, have invented certain new and useful Improvements in Grate-Bars and 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 letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to certain new and useful improvements in hollow grate-bars and furnaces; and it consists in the construction, arrangement, and combination of the parts, as will be hereinafter set forth, and pointed out in the claims.

The object of this invention is to provide a means for distributing air or steam in such manner as will aid in the combustion of the gases produced by the fuel and utilize the same, so as to prevent the waste of these products or gases.

On annexed drawings, Figure 1 is a perspective view of my invention, showing the front and side walls of the furnace removed. Figs. 2 and 4 are detailed perspective views, separate and detached. Fig. 3 is a longitudinal section of the grate-bar and its connection in a modified form. Fig. 5 is a perspective view of the modification of Fig. 4.

On the annexed drawings, A represents the masonry at the rear of the furnace, the front of the furnace, D, being provided with the usual opening, doors, &c.

B represents the back of the furnace, which is composed of two plates, *a* and *b*, of refractory material, provided with grooves or passages, as shown. The front plate, as shown in Fig. 4, is provided with horizontal grooves *a'* and *a'* in its lower end. These plates, when placed upon masonry-work, form horizontal and vertical air-passages, as shown in Fig. 1. Instead of using two plates to form these air-passages, I may, if desirable, use a single plate, in which case it will be constructed substantially as shown in Fig. 5, which plate is provided with side projecting walls and grooves in its lower portion.

On top of the masonry-work A at the rear of the furnace are placed bricks and tiles *c* and *d*. These bricks and tiles are laid vertically and horizontally, so as to form passages *e*.

Near the front of the furnace, and attached to the sides of the same, is a hollow cross-bar, C, or grate-support, which is placed so as to leave a space between it and the front of the furnace. The top of this cross-bar, C, is provided with flanged openings *f*, which openings connect with the hollow space in the cross-bar C. These openings *f f* correspond in number with the grate-bars employed, which grate-bars are provided with openings *g*, which fit over the flanged perforations. From the front portion of the cross-bar C, extending to the front of the furnace, D, are pipes *h*, which are provided with suitable dampers, D', which dampers are attached to the front of the furnace.

The grate-bars A' of the furnace, upon which the fuel rests, are made hollow, so as to provide air-passages, as will be hereinafter set forth. One end of these grate-bars is provided with oblong openings or slots *g*, as shown in Fig. 2, which slots extend upward and connect with the hollow space in the bars A'. The opposite ends of the grate-bars are provided with cylindrical projections *i*, as shown in Fig. 3, and they are provided with a large portion, *a''*, located near the center of the grate-bars, which enlarged portion extends below the bottom of the grate-bars, and is provided with air-passages *k*, which air-passages extend upwardly from the bottom to the enlarged portion of the grate-bar into the longitudinal air-passage *m*. The grate-bars are also provided with side perforations, *n*, which extend from a space formed between the bars to the air-passage *m*, formed in said bars. The grate-bars are placed in position by inserting their rear ends into the openings formed in the brick B, and by placing the slots *g* at the front end of the grate-bars over the flanged perforations in the hollow cross-bars. The flange on the end of the grate-bars at *i* prevents the ashes entering the air-passages, and the slotted opening *g* at the other end allows the grate-bars to expand and contract freely without displacing the parts.

In Fig. 3, I have shown the modification by use of which the hollow cross-bar C may be dispensed with. In this modification the grate-bars are formed alike at both ends, and the

front end rests within the circular socket or pipe, which is suitably supported within a furnace. This connecting pipe or socket extends to the front of the furnace. The grate-bars are enlarged or furnished at their end and at their central portion with bosses *s*, which keep the bars separated and form the usual draft-openings.

By the construction hereinbefore described I provide a continuous channel from the front of the furnace to the pipe *h*, cross-bar C, grate-bars A′, channel *m* and *k*, and thence through passages between the bricks *a* and *b* to the proper outlet *e*.

The grate-bars A′ may be placed in position alternately with their ends reversed, in which case the flange *f* is removed, the flat end of the grate-bar covering the opening, the opening *g* in the grate-bar being closed by resting on the rear support.

If desirable, steam may be let in through the pipes *h*, which becomes superheated in the hot bars, a portion of the superheated steam escaping through openings *n n* in the side of the bars A′, which superheated steam passes up through the incandescent fuel, thus increasing the supply of combustible gas. A supply of air may also be let into the grate-bars through pipes *h*, which become heated before coming in contact with the fuel. By the means hereinbefore described a quantity of air is supplied, directly or indirectly, to the bars, and is heated while passing therethrough, and is carried through the passages in the block B in a highly heated state, and issues therefrom to meet the flames of combustion of the fuel and the unconsumed products, and pass with said products through the passages *e*, which serve at this point to completely consume the products arising from the first imperfect combustion of the fuel upon the grate. Thus is secured a large percentage of the loss hitherto sustained in burning ordinary fuel, and a high heat is obtained, which can be conveyed in the usual manner for any practical purpose—such as the production of steam, the heating of buildings, the smelting of ores, or the manufacture of gas—the hot air being distributed to all parts of the furnace, insuring perfect combustion.

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

1. In a furnace, the combination of the hollow grate-bars A′, hollow grate-support C, and back B, having openings *a′* and passages *e*, substantially as described and shown.

2. The hollow grate-bar A′, provided with air-passages *m* and *k*, slot *g*, and projection *i*, substantially as shown.

3. In combination with the hollow grate-bar A′, the supporting-bar C, provided with flanged openings *f*, and pipes *h*, which extend to the front of the furnace and are closed by dampers, substantially as shown, and for the purpose set forth.

4. The combination of the bricks B, having air-passages, and the bricks *c d*, arranged to form passages *e*, communicating indirectly with the passages in the grate-bars and directly with the fire-box, whereby air is introduced into the grate-bars while heated therein, and is intermingled at the bricks and in the passages therethrough with the products produced by the partial combustion of the fuel upon the grate, substantially as shown and described.

5. The combination of the facing D, provided with dampers D′, the hollow grate-bar-supporting beam C, the hollow grate-bars A′, the hollow backing B, and channels *e*, combined in the order herein shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM H. DE VALIN.

Witnesses:
U. M. GORDON,
AI BARNEY.