A. HAMAR.

Furnace for Making Iron.

No. 77,730. Patented May 12, 1868.

Fig. 1.

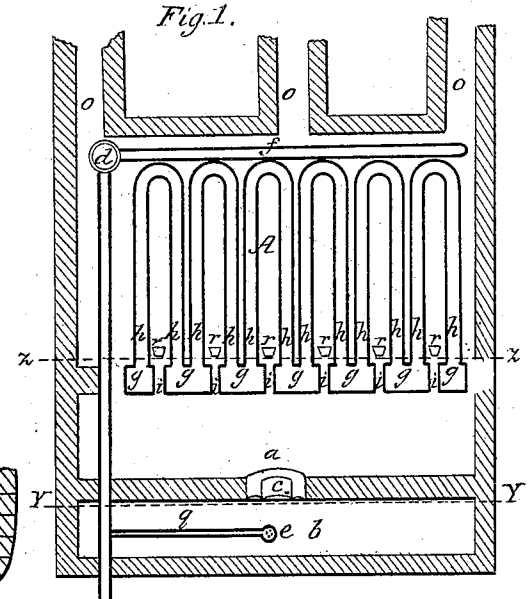


Fig. 3.

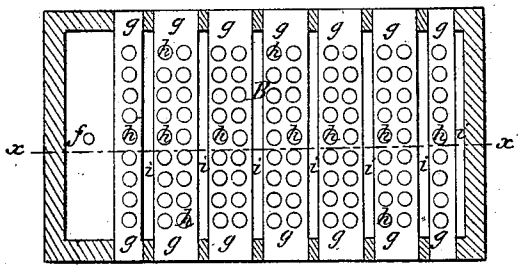


Fig. 4.

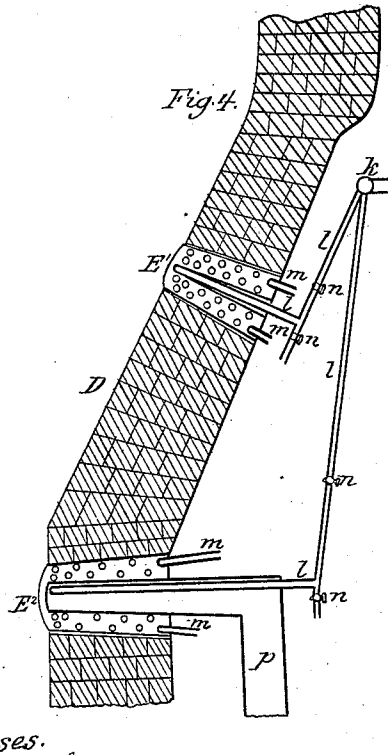
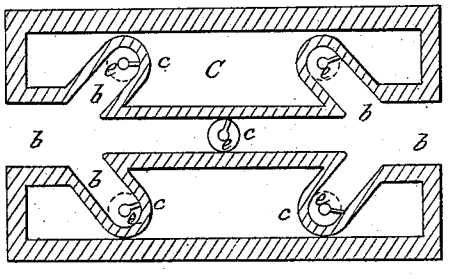


Fig. 2.



Witnesses.
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Wm D. Baldwin.

United States Patent Office.

ALEXANDER HAMAR, OF NEW YORK, N. Y.

Letters Patent No. 77,730, *dated May* 12, 1868

IMPROVEMENT IN IRON-FURNACES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, ALEXANDER HAMAR, of the city, county, and State of New York, have invented certain new and useful Improvements in Iron-Furnaces, of which the following is a full, clear, and exact description.

The first part of my invention relates to that class of hot-blast furnaces, in which a portion of the escaping gases is conducted into a combustion-chamber or oven containing the air-heating apparatus, and used to heat the air-pipes; and the object of my improvement is to attain the highest practicable degree of heat. To this end, the first part of the invention herein claimed consists in a novel method of injecting steam, superheated steam, or hydrogen into the combustion-chamber of the air-heating oven of a blast-furnace to mingle with the gases escaping from the furnace, and thereby producing intense heat.

The next part of my invention relates to the construction of the oven; and its object is to secure the air-heating apparatus firmly, while presenting the greatest practicable amount of heating-surface, and to render the pipes readily accessible for repairs; and this part of my invention consists in a novel method of arranging the entire air-heating apparatus of a blast-furnace in a large combustion-chamber, and supporting them on arches at proper intervals, so as not to interfere with the draught.

The next part of my invention relates also to the heating-apparatus, and its object is to diffuse the heat among the pipes, instead of allowing it to escape between them; to which end my improvement consists in a novel method of combining, with the air-heating pipes, deflectors, arranged in the flue-spaces between the pipes, so as to deflect the heat, and cause it to pass among the tubes.

My invention further consists in a novel method of combining, in an air-heating oven for a blast-furnace, a mixing-chamber, a combustion-chamber, and the air-heating pipes.

The next part of my invention relates to the steam-apparatus, and its object is to inject the steam into the oven, heated to the highest attainable degree; and my invention for doing this consists in a novel method of arranging the coil of steam-pipes in the combustion-chamber and above the air-pipes, so as to superheat the steam by the waste heat escaping from the chamber after heating the air-pipes.

My invention further consists in a novel method of enclosing the steam-jet pipe in the hot-blast pipe, in order to maintain as high a temperature as possible.

The next part of my invention relates to the furnace, and consists in a novel method of introducing the blast into the furnace at two different levels.

The accompanying drawings show all my improvements as embodied in one apparatus, and represent so much of a blast-furnace and its appendages as is necessary to illustrate my invention.

Figure 1 represents a vertical longitudinal section through the oven or heating-apparatus, at the line *x x* of fig. 3.

Figure 2 represents a horizontal section through the same at the line *y y* of fig. 1.

Figure 3 represents a similar section at the line *z z*, fig. 1.

Figure 4 represents a portion of the furnace-wall in section, showing the arrangement of the tuyeres and blast-pipes.

As the products of combustion escape from the furnace, a portion of them is conducted, in any proper, well-known way, into a mixing-chamber, *b*, under the oven A, and mixed with steam, superheated steam, or hydrogen, escaping through jets or scatterers *e*, which increases their heating-power. The gases then escape through openings *c* into the combustion-chamber *a*, and pass up through openings *i* between the bed-pipes *g* of the hot-air pipes *h*. The wedge-shaped deflectors *r* deflect the hot gases against the pipes *h*, instead of allowing them to pass directly up between them, and by this means materially augment the heating-power of the pipes. The gases finally escape through the flues *o*, first, however, heating a coil of pipes, *f*, containing steam or hydrogen, supplied from a suitable boiler or generator, and superheating it. In order to expose a large heating-surface to the gases, I construct the bed-pipes *g* in rectangular form, and support them only at their ends. If of great length, however, an intermediate arch or two may also be used.

The steam-pipe *f*, after coiling backwards and forwards over the hot-air pipes, connects with a reservoir, *d*, containing charcoal and iron filings to generate hydrogen. I call it hydrogen, as the steam is heated to nearly 1,500° before entering the oven or furnace, and is, consequently, nearly pure hydrogen. A portion of this hydrogen escapes into the mixing-chamber *b* through the pipe *q*, and jets *e*, as before explained, while the remainder is conducted around the furnace by a pipe, *k*, from which branch-pipes *l* lead to the tuyeres. These pipes are all provided with suitable cocks or regulating-valves *n*.

The air enters the oven at g^1, passes through the pipes *g h* in the usual way, and escapes at g^2 into a pipe leading to the blast-pipe *p*. In the drawings, for the sake of illustration, I have shown the steam-pipes as leading direct from the oven to the tuyeres; but in practice I prefer to enclose them in the hot-blast pipe, and thus maintain the steam or hydrogen at a high temperature.

In old-fashioned furnaces, to which my invention could not be fully applied, I have found it advantageous to introduce a steam-jet directly from the boiler into the oven or furnace.

The furnace may be furnished with water-tuyeres *m*, of approved construction, if desired. I have in practice found it highly advantageous to employ two rows of tuyeres at different levels, one set to act upon the upper portion of the charge as it descends into the boshes; the other to act upon the fused materials near the hearth.

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

1. The method, herein described, of injecting steam, superheated steam, or hydrogen into the oven, to mingle with the gases, and increase their heating-effect on the hot-blast pipes.

2. The arrangement, in a large combustion-chamber, of the hot-air pipes, as and for the purpose described.

3. The combination, substantially as set forth, of the hot-air pipes with the interposed deflectors *r*, for the purpose described.

4. The combination, substantially as set forth, of the mixing-chamber, the combustion-chamber, and the hot-air pipes.

5. The arrangement, as set forth, of the superheating-pipes *f* in the combustion-chamber and above the air-pipes, for the purpose specified.

6. The arrangement of the steam-pipe within the hot-blast pipe, to maintain the steam at a high temperature.

7. The arrangement of the steam and blast-pipes in sets, at different levels, for the purpose specified.

In testimony whereof, I have hereunto subscribed my name.

A. HAMAR.

Witnesses:

R. T. STEWART,

TH. PRATT POTTS.