United States Patent Office.

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IMPROVEMENT IN CUPOLA-FURNACES.

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

I, JAMES DOUGHERTY, of Philadelphia, county of Philadelphia, State of Pennsylvania, have invented an Improved Cupola-Furnace, of which the following is a specification.

My invention consists of certain improvements in cupola-furnaces, too fully explained hereafter to need preliminary description, and made with the view of attaining general efficiency, both as regards the construction and operation of furnaces of this class.

Description of the Accompanying Drawing.

Figure 1 is a front elevation of my improved cupola-furnace;

Figure 2, a vertical section of the same on the line 1 2, fig. 6;

Figure 3, a vertical section on the line 3 4, fig. 4;

Figure 4, a sectional plan on the line 5 6, fig. 2;

Figure 5, a sectional plan on the line 7 8, fig. 2;

Figure 6, a sectional plan on the line 9 10, fig. 2;

Figure 7, a sectional plan through the upper set of tuyeres;

Figures 8 and 9, diagrams illustrating the peculiar formation of some of the lower tuyeres;

Figure 10, a sectional plan, enlarged, of a portion of the upper tuyeres; and

Figure 11, a plan showing the modification of the upper set of tuyeres.

General Description.

A is the bottom plate of the furnace, and is supported on brackets projecting from columns C, which support a plate, D, the latter forming the base on which the brick chimney E is built.

This arrangement of parts is not peculiar to my improved furnace, but, with the falling doors *a a* hinged to the bottom plate A, is common to other furnaces of this class.

The body of the furnace consists of a circular sheet-iron casing, F, inclosing a fire-brick lining, G, both extending from the bottom plate A to or nearly to the top plate D.

The casing F is slightly larger in diameter above than below, and the interior of the lining G is curved and contracted to the point indicated by the dotted line *b b*, fig. 3, from which point to the bottom plate the interior of the furnace is cylindrical, with the exception of a chamber, *d*, formed a short distance above the bottom plate A, for a purpose explained hereafter.

Between the sheet-iron casing F of the furnace and the contracted portion H of the lining is an annular blast-chamber, I, to which the blast is admitted through a pipe, J, arranged tangentially, or nearly so, as regards the annular chamber, so that the blast has a tendency to pursue the course in this chamber indicated by the arrows in fig. 5.

There are two sets of tuyeres, the lower set being shown in the sectional plan, fig. 5, and the upper set in fig. 7.

Of the lower set there are, in the present instance, four tuyeres *e e*, a rear tuyere, *f*, and front tuyere *h*, all so arranged that their apertures in the lining are at an equal or nearly equal distance apart from each other; but it should be understood that the number of the tuyeres *e* may be increased or diminished in accordance with the dimensions of the furnace.

These tuyeres *e* are arranged nearly tangentially as regards the circumference of the contracted portion of the interior of the lining, as will be observed on referring to fig. 5, this inclination of the tuyeres being the best for the free entrance therein of the blast, as the latter traverses the annular chamber I in the direction of the arrows.

The tuyeres *e e* are of a peculiar shape, best understood by reference to the diagrams, figs. 8 and 9, *x*, fig. 8, representing the form of the outer orifice of the tuyere, and *y* the form of the inner orifice; in other words, the entrance to each tuyere *e* from the blast-chamber is elongated horizontally and its opening into the furnace elongated vertically; hence the bottom of the tuyere is inclined upward from the furnace, thereby preventing the sudden escape of the molten metal into the blast-chamber. This peculiar form of tuyere possesses the further advantage of presenting to the blast a lengthened opening for the free admission of the air, while the blast escaping from the tuyere is discharged to the best advantage, and in a manner by which I have obtained the best results.

The rear tuyere *f* is inclined downward, as shown in fig. 2, so that a portion of the blast may be directed toward the bottom of the furnace.

I have found in practice that, by the use of one downwardly-inclined tuyere, decided advantages are obtained.

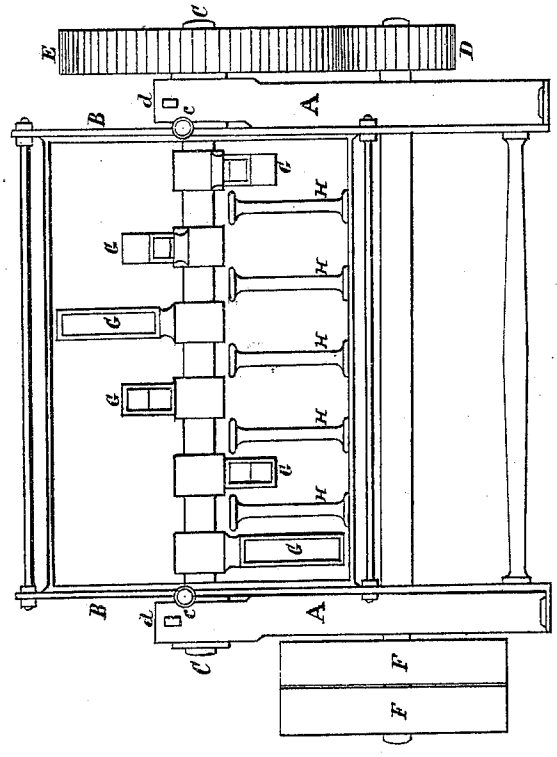
The front tuyere *h* is horizontal, and is slightly lower than the others, and situated immediately above the tapping-opening *i*, fig. 2. In fact, a single brick, prepared for the purpose, separates this tuyere from the tapping-opening.

In the exterior casing F of the furnace, and directly opposite the front tuyere, is an opening, to the front of which is secured a socket, so arranged as to receive a strip of sheet-lead, or any alloy which will melt at or about the degree of heat required to fuse lead, this fusible plate being exposed to the blast, which prevents the heat in the furnace from melting it under ordinary circumstances; but should the molten metal rise in the furnace to such a height as to flow into the front and lowest tuyere *h*, the lead will be melted and permit the molten iron to escape into the tapping-spout *k* in a quantity sufficient to warn the attendant

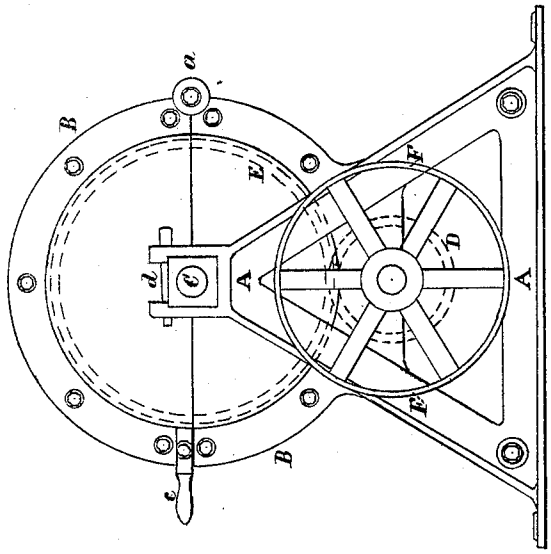
ROBERT DUFF.

Improvement in Machines for Mixing Paste for Confectionery, &c.

No. 114,423. Patented May 2, 1871.



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