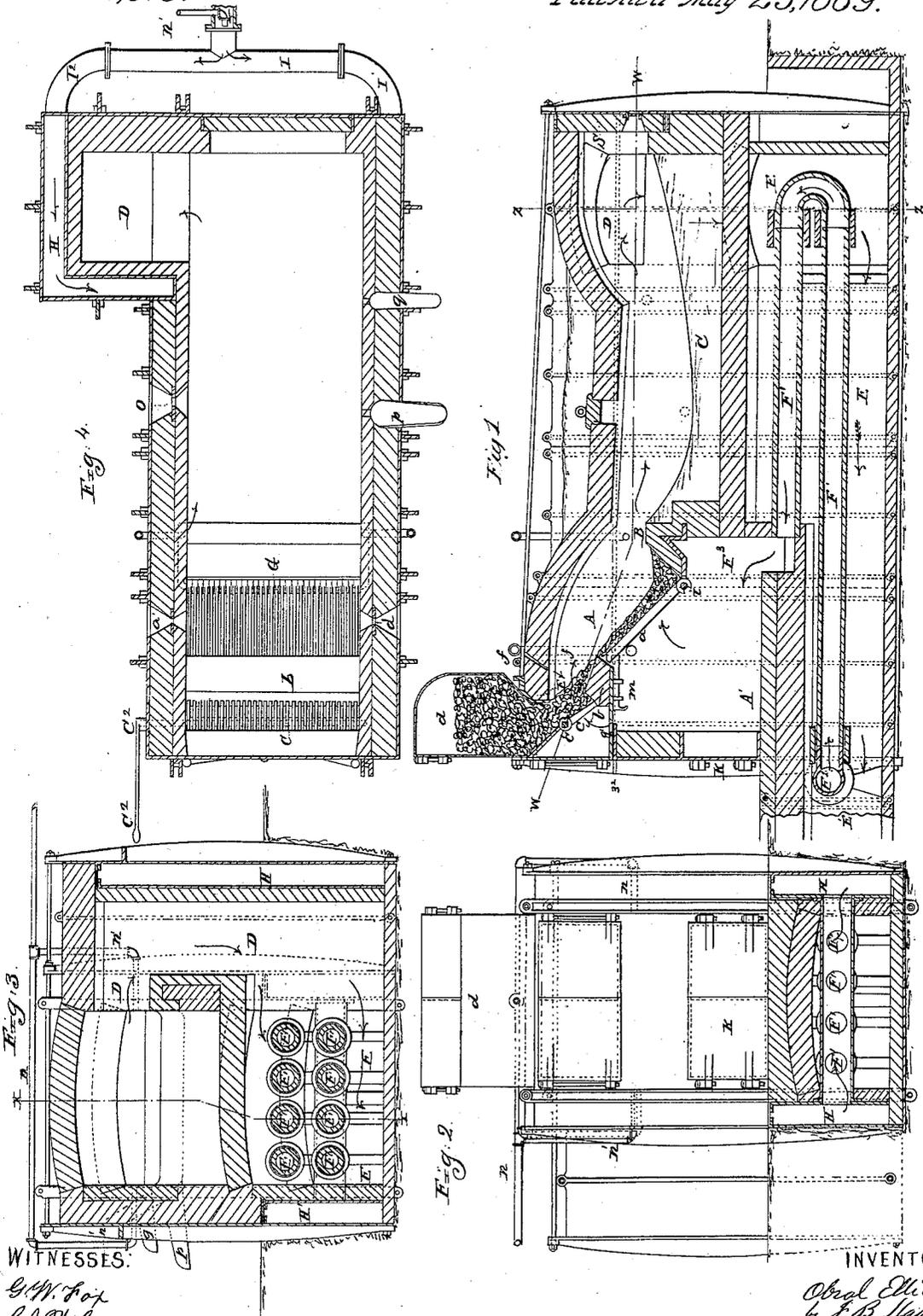


A. Elliot.

Melting Furnace.

No. 90,515.

Patented May 25, 1869.



WITNESSES:

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UNITED STATES PATENT OFFICE.

ABIAL ELLIOT, OF SOUTH WOLFBOROUGH, NEW HAMPSHIRE.

IMPROVEMENT IN THE CONSTRUCTION OF REVERBERATORY AND MELTING FURNACES.

Specification forming part of Letters Patent No. 90,515, dated May 25, 1869.

To all whom it may concern:

Be it known that I, ABIAL ELLIOT, of South Wolfborough, Carroll county, State of New Hampshire, have invented new and useful Improvements in the Construction of a Melting-Furnace, and which I call a "Hot-Air, Double Reverberatory Anthracite Melting-Furnace;" and that the following is a full and exact description of my said improvements, reference being had to the drawings accompanying and making part of this my specification.

Figure I of the drawings represents a vertical longitudinal section of the furnace on line *x x* in Fig. III. Fig. II represents a front elevation, partly in section. Fig. III represents a cross-section of the furnace at the line *z z* in Fig. I. Fig. IV is a horizontal longitudinal section of the furnace on the line *w w* in Fig. I.

In all the figures the same letters represent the same parts.

My invention has reference, primarily, to increasing the ignition of the anthracite fuel used in such furnace, and to intensifying the heat and preserving its very greatly-increased temperature at a uniform degree by the arrangements of the flues and hot-air pipes, so as that the waste heat of the furnace heats to a very high degree the hot-air pipes and the hot blast passing through them; secondly, to the arrangement of the grates in connection both with the melting-chamber and to the reception of the hot blast; thirdly, to the construction of a double or auxiliary grate in connection with the principal grate, where the combustion is completed, for the purpose of properly heating and coking the fuel for its combustion; and, fourthly, to the construction and arrangement of a coal hopper or reservoir adapted to said grates, for the purpose of avoiding the opening of doors, and preventing the admission of cold air into the furnace during the heat or melting of the metal.

The construction of the furnace and the nature and operation of my improvements will now be described.

Fig. I of the drawing exhibits the interior parts of the furnace, in which—

A is the fire-chamber; B, the bridge-wall; C, the hearth, where the metal receives the heat and is melted.

D is a side flue, descending and communicating with the heating-chamber E under the hearth, and where the pipes for heating the blast and conducting it to the fuel are arranged. This heating-chamber E extends under the furnace its whole length, and the heat passes off out of it into the chimney-flue at E'.

The heating-pipes of the blast are shown at F¹ F¹. These are connected together by the horizontal cross-pipe F². This pipe F² extends across the rear of the furnace. It opens at either end into chambers or air-flues H H', Figs. II, III, and IV, on each side of the furnace, and into which side flues the air from the blast is introduced through the pipes I I' I², Fig. III. The several hot-air pipes F F¹ discharge the heated air into the chamber F², leading directly under the principal fire-grate.

A' is the ash-pit, closed by air-tight doors K when the furnace is in operation.

The grate for fuel is a compound grate, composed of two parts—the lower, which is the principal or main grate, and the upper or auxiliary grate.

The main grate *a* is placed at an angle of about forty-five degrees, its lower end reaching to the pit of bridge-wall B, its upper end resting on a bridge-wall, *b*, which bridge-wall *b* is interposed between the two grates.

The auxiliary or feeding grate *c* is also placed about the same angle, and extends from the bridge-wall *b* to the opening in the bottom of hopper or reservoir *d*, in which the fuel is placed, and which holds sufficient to melt the charge.

The bars of grate *c* are all secured on a square transverse bar, *c*¹, on which the grate is made to swing, and is operated by the lever *c*², Fig. III.

The object of the auxiliary grate *c* is twofold, as when the hopper *d* is filled with fuel it descends and fills the grate *c* to the top of bridge-wall *b*. It is there held, and it may be prepared, heated, or coked for burning upon the main grate by permitting the hot blast to ascend through the slot *g*¹ in the plate *g*, the degree of which is regulated by slide *g*²; and, further, the fuel on grate *c*, thus prepared or coked, is moved down upon the main plate *a*, when needed, by operating upward the swinging grate *c* by means of the lever *c*², which is thereby partly pushed over bridge-block *b*, and

distributed over the main grate *a*, thus obviating the necessity of opening a feed or fire door and letting in cold air, which would not only reduce the temperature, but operate injuriously upon the metal being melted.

Small apertures *a' a'* are provided in the side walls of the furnace, and in the fire-room *A*, through which the bed of fuel may be regulated, if found necessary.

The main grate *a* swings on its forward end on pivot-bar *i*, and is held up, each separately or several bars jointly, by bolts *m m*, by the withdrawal of which the bars may be dropped at any parts, and if clinkers or other obstructions have formed they may be removed.

n n are steam-pipes, through which steam is blown over the hearth of the furnace. Steam is also introduced at *n'* with the cold air from the blast.

A suitable pipe, *f*, Fig. I, is provided, by which hot air may be conducted from the hot-air pipes upon the top of the fuel on grate *c* when required.

An opening for stirring the metal when required is made in the side wall at *O*. The tapping-hole for the melted metal is at *p*. A tapping-hole for drawing off the flux, when required, is provided at *q*.

In the upper part of the front of the furnace is a door, *S'*, opening into the heating-chamber, by which the metal is introduced into the furnace.

By this construction and arrangement of the furnace the hot-air pipes and the air from the blast passing through them are enveloped in the heat from the main heating-chamber. The air is prepared for entering the heating-pipes by being warmed before entering them, by passing along the side walls of the furnace, and the heat of the blast is gradually increased as the blast in the air-pipes proceeds against or in an opposite direction to the current of heat from the furnace. The air of the blast thus becomes heated to an extremely high temperature, thus adding to the intensity of the ignition, and consequent heat of the furnace.

A sufficiency of fuel is provided for melting the charge, and the fuel is prepared or coked and pushed down and distributed by and from the auxiliary grate *c* upon the main grate *a*.

The furnace thus constructed produces a more intense heat and more rapid fusion of the metal than any melting-furnace hitherto constructed, and with less danger of the metal being injured by the introduction of the external air during the process, which is of great importance when iron is melted for refining, or if being converted into steel.

The heat to which the hot-blast pipes *F*¹ are subjected is so intense as to require that they be strengthened and braced to prevent warp-

ing and cracking. They may be made of iron; but, as the excessive heat to which they are exposed may have a tendency to warp, corrode, and destroy them, I would recommend that the pipes be made of fire-brick, or some material not readily injured by the heat.

Owing to the intensity and power of the heat produced in this furnace, it is necessary that the parts most exposed to the heat of the interior be composed of the best-known materials for resisting the effects of the heat.

The introduction of jets of steam adds to the intensity of combustion; but I do not claim this as any part of my invention.

I do not claim as my invention the conducting the waste heat of the furnace by a downward flue under the hearth, as this is not new. Nor do I claim any of the parts of the interior heating-chamber or of the shell or walls of the furnace, these parts used by me being common to double reverberatory furnaces, such as are used in large foundries.

I do not wish it understood that my invention applies only to the use of anthracite coal in such furnaces. I have described the furnace as an anthracite-furnace, because I believe that fuel to be decidedly the best; but other kinds of coal may be used.

I claim as my invention, and desire Letters Patent for the features and improvements following, to wit:

1. The manner of arranging the hot-air pipes for heating the blast longitudinally in a chamber under the hearth, so as to receive and in this manner utilize the whole waste heat of the furnace through their entire length, and which chamber forms a part or continuation of the main flue, and entirely incloses the heating-pipes.

2. I claim the construction and arrangement of the two parts *a* and *c*, combined with the coal hopper or reservoir, operating for the purpose and in the manner substantially as described.

3. I claim the construction of the auxiliary grate, arranged and combined with the bridge-wall *b* and the main grate *a*, so as to prepare the fuel, and also push it forward when required, and distribute it upon the main grate, substantially as described.

4. I claim the slotted plate and slide *g g*¹ *g*², by which the separate chamber under grate *c* is provided, and by and through which the admission of the hot air from the blast under grate *c* may be regulated, in the manner and for the purpose substantially as described.

ABIAL ELLIOT. [L. s.]

Witnesses:

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JOHN H. RUST.