

(No Model.)

2 Sheets—Sheet 1.

T. McBRIDE, F. B. SMITH & A. J. LENNOX.

CRUCIBLE FURNACE.

No. 323,876.

Patented Aug. 4, 1885.

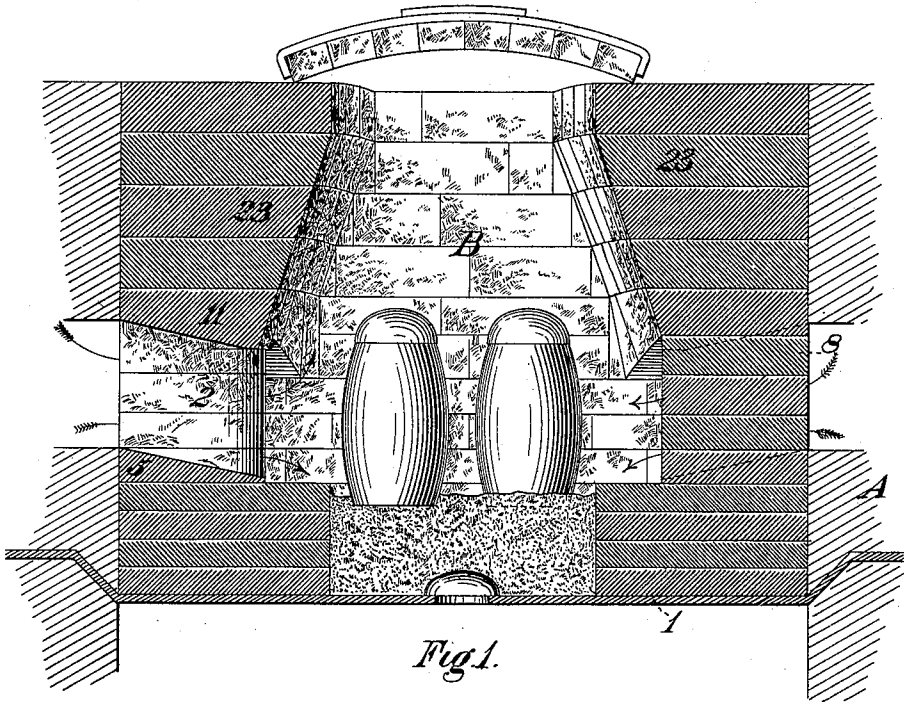


Fig. 1.

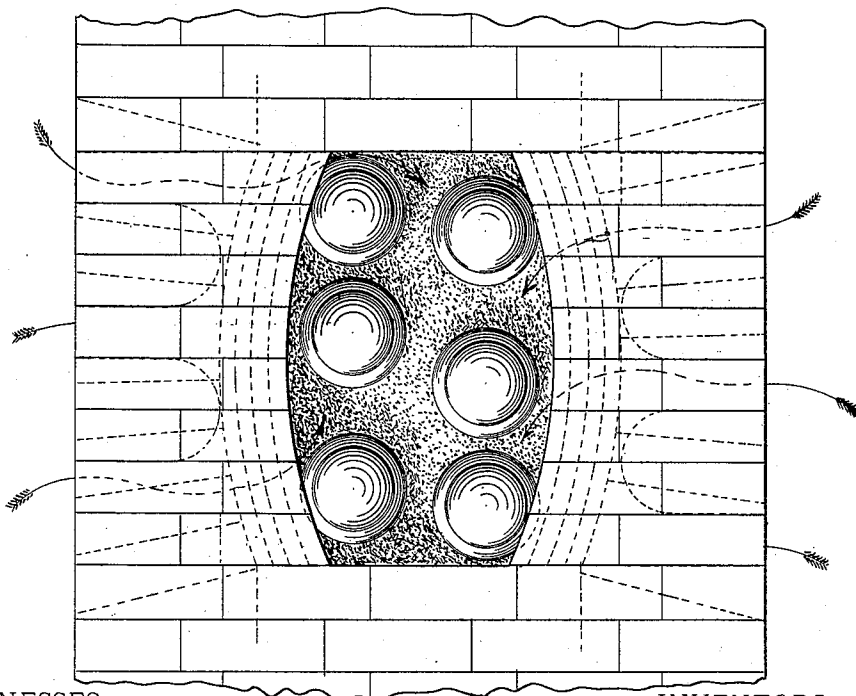


Fig. 2.

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Fig. 3.

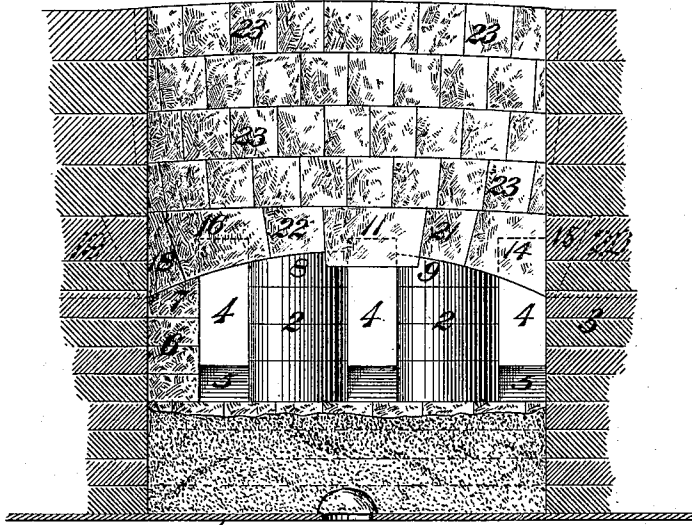
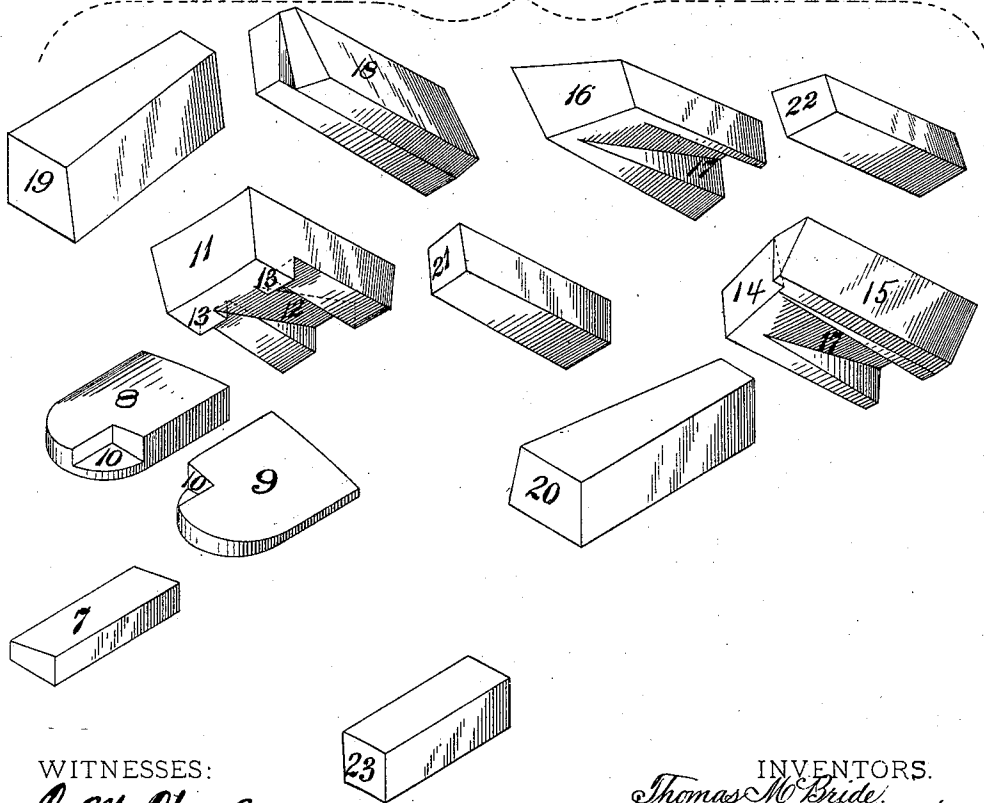


Fig. 4.



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UNITED STATES PATENT OFFICE.

THOMAS McBRIDE, FRANK. B. SMITH, AND ANDREW J. LENNOX, OF ALLEGHENY, PA., ASSIGNORS TO SMITH, SUTTON & CO., OF SAME PLACE.

CRUCIBLE-FURNACE.

SPECIFICATION forming part of Letters Patent No. 323,876, dated August 4, 1885.

Application filed May 4, 1885. (No model.)

To all whom it may concern:

Be it known that we, THOMAS McBRIDE, FRANK. B. SMITH, and ANDREW J. LENNOX, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, citizens of the United States, have invented or discovered certain new and useful Improvements in Crucible-Pot Furnaces, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figure 1 is a transverse sectional elevation of our improved crucible-furnace. Fig. 2 is a top plan view of the same. Fig. 3 is a longitudinal sectional elevation of a portion of the furnace. Fig. 4 includes perspective views of a number of bricks employed in constructing our furnace.

In the ordinary mode of building crucible-pot furnaces for melting steel it has been usual to lay the bricks constituting the front of the furnace-chamber with a downward slope toward the inside of the chamber. The action of the heat on the wall of a chamber so built tends to draw the bricks out of position in the direction in which they slope, so that the wall is liable to rapid destruction, especially as when the bricks spring or yield a little out of place the furnace-heat works in back of them and between them and the outer wall of the furnace, and thereby hastens the necessity of rebuilding. It is also true of furnaces of this class that the air and gas intake flues or passages should slope downwardly both at top and bottom, for reasons well understood in the art. The present invention relates to the construction of this front furnace-wall, both in its general features and in the specific features hereinafter pointed out.

Upon a suitable bed-plate, 1, secured as shown in the supporting or shell walls A, are built up the usual piers, 2, and side walls, 3, of the melting-chamber B in the ordinary manner of constructing such parts, thereby forming continuations of the air and gas flues 4. The bottom of that portion of the intake-flues formed by the piers and side walls is formed by a single brick, 5, (see Fig. 1,) of a length and width sufficient to constitute the bottom of each said flue, and having its top surface inwardly inclined in order to impart the desired direction to inflowing currents of gas and air. The tops of the piers 2 and the abutment 6,

projecting from one of the side walls, are formed of single bricks 7, 8, and 9, which slope a little in the direction of the ends of the heating-chamber, the bricks 7 and 8 sloping toward one end and the brick 9 sloping in the opposite direction. (See Fig. 3.) These piers and the abutment are of such a relative height and the sloping surfaces of the bricks have such relationship to each other as to give a slight arch to the course of bricks supported thereon. The inner adjacent corners of the bricks 8 and 9, forming the tops of the piers 2, are provided with notches or recesses 10, and the space between them is bridged across by a specially-shaped brick, 11, designed for that purpose, the lower face of which along its middle part is sloped, as shown at 12, to conform to the slope imparted to bottom of the flue by the wedge-shaped brick 5. The lower inside corners of the brick 11 are provided with lugs or projections 13, adapted to rest and fill the recesses 10 of the bricks 8 and 9, and back of these lugs or projections 13 the lower side of the brick on each side of the slope 12 is cut away and made to conform with and rest upon the adjacent edges of the top bricks, 8 and 9. The depth of the recesses 10 in the bricks 8 and 9 is such as to drop the inner end of the bridge-brick 11 downward below the tops of the piers at the center of the arch sufficiently to bring this central intake-flue to the same height as that of each side flue. The space between the right-hand pier, 2, in Fig. 3, and the side wall, 3, is bridged over by a brick, 14, one edge of which rests upon the pier 2, and the other upon the side wall, 3. The under surface of this brick is beveled or inclined to correspond with the slope or inclination of the arch of the first course of bricks, but the upper surface is practically straight, and that portion of the under surface which rests upon the side wall is made straight to give it a firm bearing upon the side wall. In order that this brick may act as a key or filling piece, that portion, 15, which projects within the side wall is given a wedge shape, as clearly shown by dotted lines in Figs. 3 and 4. The space between the abutment 6 and its adjacent pier 2 is bridged over by a brick, 16, one edge of which rests upon the pier and the other edge upon the abutment. The edges of

the brick differ in thickness by an amount equal or nearly equal to the slope of the arch through its width, or to the shape of the bricks 7 and 8, forming the tops of the abutments and piers, as shown in Fig. 3. Along the middle of the lower face of each of the bricks 14 and 16 a sloping groove, 17, is cut, corresponding to the slope of the top faces of the bricks 5, forming the bottoms of the flues. Alongside of the brick 16 is placed a brick, 18, resting partly on the inclined brick 7 of the abutment and partly on the bricks of the side wall, its under face being correspondingly shaped to fit these different surfaces. The outer edges of the bricks 14 and 18 are beveled downwardly and inwardly, so as to admit of the insertion outside of correspondingly-beveled key-bricks, 19 and 20, which tend to hold this layer or course of brick securely in place, and all in a horizontal position, except as they are arched, and also to aid in sustaining the arch. Filling-bricks 21 and 22, of suitable shape, are inserted over the middle of each pier, this completing the first course. The bricks of this first course are so constructed that their upper surface will form a slight arch, as clearly shown in Fig. 3, but the spring of this arch is very much less than that formed by the under surfaces of said bricks. The object of so arching this top surface is to permit of slightly arching the subsequent courses of bricks, thereby partially relieving the first course of the weight of such subsequent courses. This first course is horizontal, or nearly so, toward the furnace, and is slightly arched in the direction of the length of the furnace or transverse of the bricks on its top surface; and by the term "horizontal," as regards the arrangement of the first course of brick, I mean that the main longitudinal lines of the bricks composing this course are practically horizontal; but as the effect of the heat of the furnace-chamber is to draw the bricks inwardly, I make them all, except the keying-bricks, at ends of the course, wider at their base ends than at their inner or furnace-chamber ends, so as to give an arch in a horizontal plane, (see Figs. 1 and 2,) and thereby render the structure more durable. The remaining courses or layers of brick are made of bricks 23, each as long as the wall is thick, and the brick of each course being a little longer than those of the preceding or next lower course, and having their inner ends beveled, so as to give in some degree the desired shape to the inside of the furnace. These bricks, like those of the first course or layer, have their outer ends a little broader at its base than at the inner or furnace-chamber end, so as to give an arch in a horizontal plane. Each end of each layer or course terminates in a key-brick, which, like the key-bricks of the first layer, come into the division or bridge-walls, or in the plane thereof, so as to be out of the destructive effects of the intense heat in the melting-chamber.

It is a characteristic feature of the furnace above described that each brick composing the sides of the chamber lies in a horizontal plane in place of being inclined inwardly as in the old form of furnace, and that the bricks which are directly exposed to the effects of the heat are all larger in a horizontal plane at their base or outer ends than at their inner-furnace or chamber ends, so as to prevent as far as possible the inwardly-drawing effects of the heat. The vertical arch given to the first layer of brick is preferably carried up through all the bricks above, though in a less degree, so that in effect while all the bricks in the direction of their length or cross-wise of the wall are laid horizontally and are therefore in the position of greatest stability, they are also so constructed and laid that the wall is doubly arched—that is, each layer is arched in a horizontal plane as against the inwardly-drawing effect of the heat, and are also arched slightly in a vertical plane, by which the better to resist any and all downward strains.

In constructing the furnace, the abutment 6, on one side of the furnace, will project from the division-wall at one end of the furnace, and on the other side will project from the division-wall at the opposite end of the furnace, and the piers will be correspondingly located. By this arrangement the abutment and piers on one side of the chamber will be located opposite the flues entering the opposite side of the furnace, thereby insuring a circulation of the air and gas in the chamber.

We claim herein as our invention—

1. In a melting-furnace, having overhanging side walls, the arch forming the bottom or foundation of such wall and the top of the intake-flues composed of a series of brick arranged in horizontal planes, substantially as set forth.

2. A melting-furnace having the arch forming the top of its intake-flues composed of a series of brick arranged in horizontal planes, said brick having their base or outer ends broader than their inner or furnace-chamber ends, whereby an arch in a horizontal plane is formed by said series of brick, substantially as set forth.

3. A melting-furnace having the top of each of its intake-flues formed of a single brick, said brick a member of the arch spanning all the flues on one side of the furnace, substantially as set forth.

4. In a melting-furnace, the arch forming the top of its intake-flues, composed of a series of brick arranged in horizontal lines, in combination with the supporting-piers, the top of each pier being formed of a single brick having its top surface shaped to correspond with the under surface of the arch, and lying in a horizontal plane, substantially as set forth.

5. In a melting-furnace having the top of its flues formed of a series of brick, the bricks 8 and 9 forming the tops of the piers on each

side of the central flue, and having notches or recesses at their inner corner, in combination with the brick 11, provided with the lugs or projections 13, adapted to fit within said
5 recesses, substantially as set forth.

6. In a melting-furnace having the top of its flues formed of a series of brick, the combination of the bricks 8 and 9, forming the
10 tops of the piers, and the brick 11, said bricks being so constructed that the inner end of the brick 11 is dropped down sufficiently to bring the top of the central to the same height as the side flues, substantially as set forth.

7. In a melting-furnace, a series of brick
15 constituting the top layer or finishing course so shaped and arranged as to form an arch in

both a horizontal and vertical plane, substantially as set forth.

8. In a melting-furnace, a series of brick forming the wall above the intake-flues, being
20 suitably constructed and arranged to form an arch in a horizontal plane, in combination with key-bricks forming the division-walls of the furnace, substantially as set forth.

In testimony whereof we have hereunto set
25 our hands.

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