

Nov. 24, 1925.

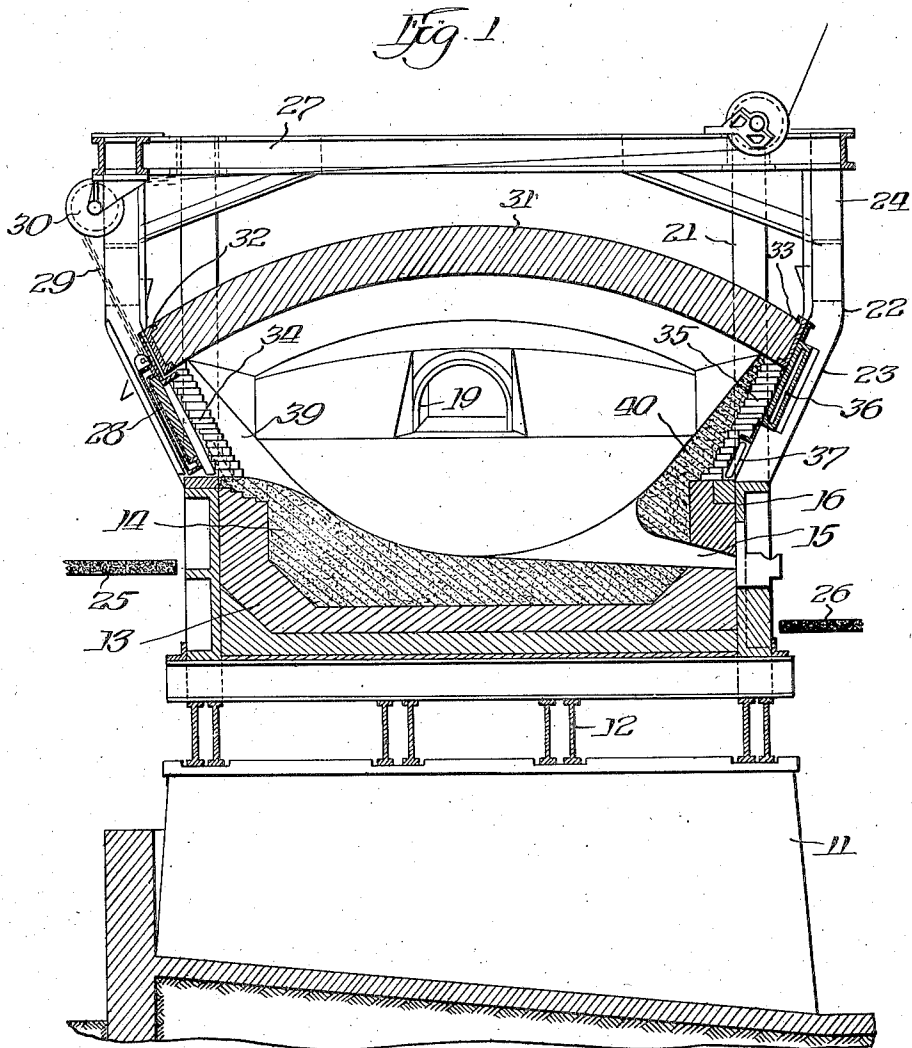
1,563,038

S. NAISMITH

METHOD OF MAINTAINING OPEN HEARTH FURNACE WALLS

Filed Nov. 10, 1924

4 Sheets-Sheet 1



Witness:  
*Geo. C. Brown*

Inventor  
*Samuel Naismith*  
By *A. Anthony Harris*

Nov. 24, 1925.

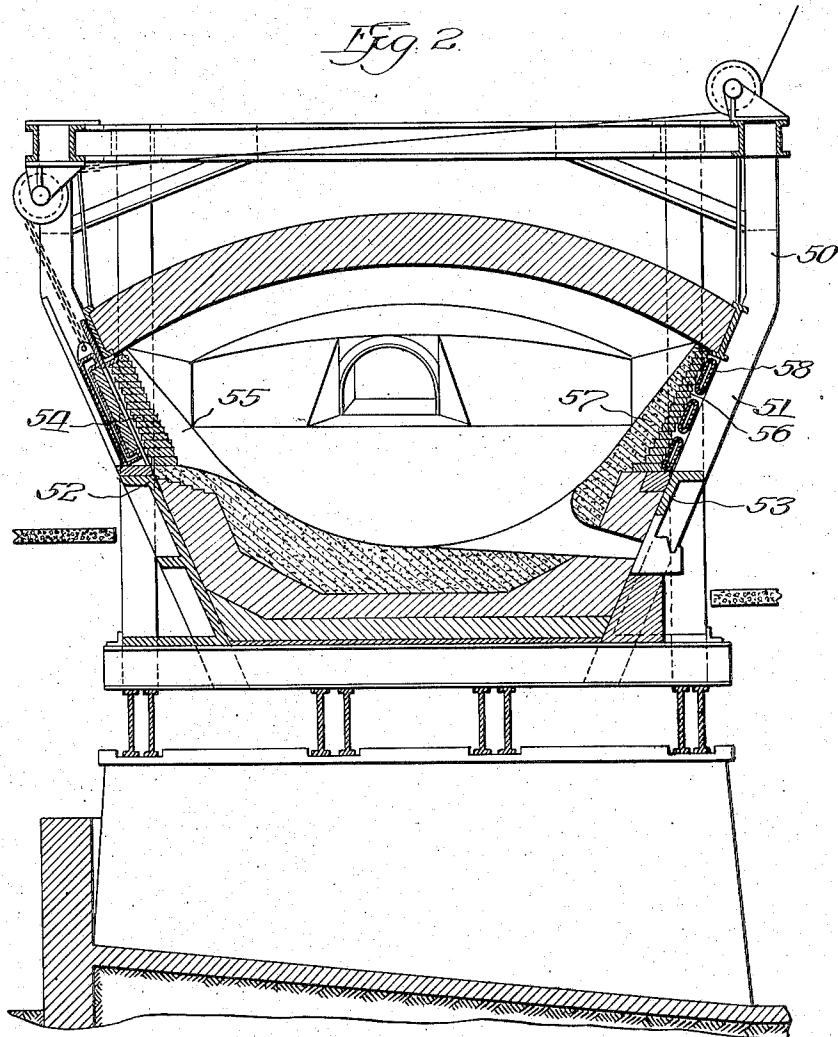
1,563,038

S. NAISMITH

METHOD OF MAINTAINING OPEN HEARTH FURNACE WALLS

Filed Nov. 10, 1924

4 Sheets-Sheet 2



Witness:

*Ed. Andrews*

*Inventor*  
*Samuel Naismith*

*By D. Anthony Usina Atty*

Nov. 24, 1925.

1,563,038

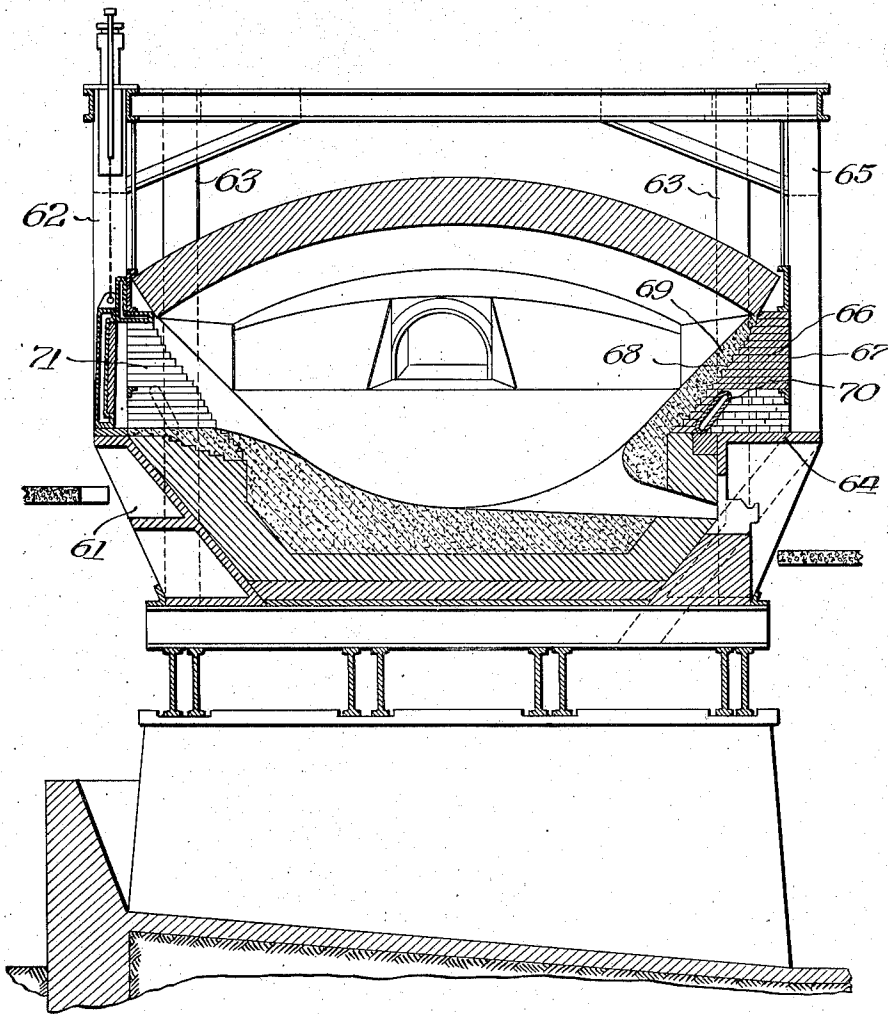
S. NAISMITH

METHOD OF MAINTAINING OPEN HEARTH FURNACE WALLS

Filed Nov. 10, 1924

4 Sheets-Sheet 3

*Fig. 3*



Witness:

*Ed. Johnson*

*Inventor*

*Samuel Naismith*

*By H. Anthony Morris Atty*

Nov. 24, 1925.

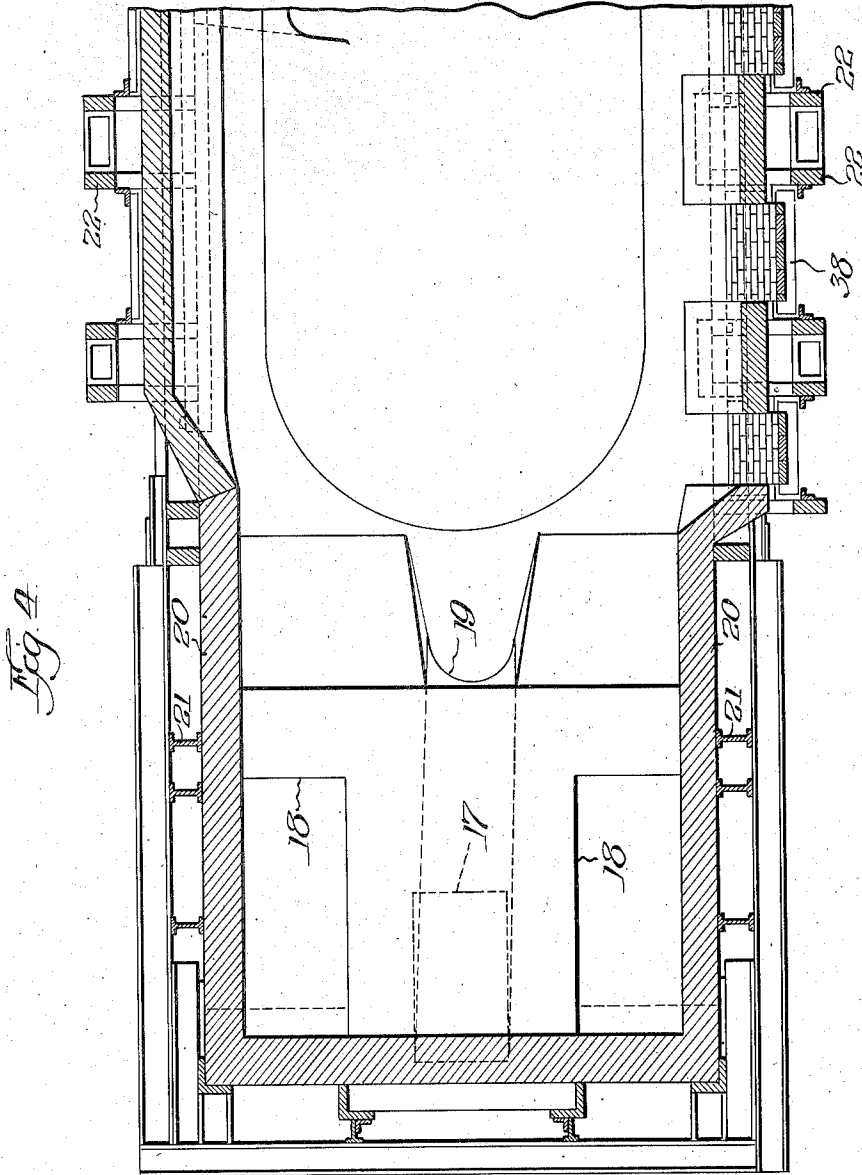
1,563,038

S. NAISMITH

METHOD OF MAINTAINING OPEN HEARTH FURNACE WALLS

Filed Nov. 10, 1924

4 Sheets-Sheet 4



Witness:  
*Ed. C. ...*

Inventor  
Samuel Naismith  
By *S. Anthony ...* Attorney

# UNITED STATES PATENT OFFICE.

SAMUEL NAISMITH, OF CHICAGO, ILLINOIS, ASSIGNOR TO OPEN HEARTH COMBUSTION COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

## METHOD OF MAINTAINING OPEN-HEARTH-FURNACE WALLS.

Application filed November 10, 1924. Serial No. 748,963.

*To all whom it may concern:*

Be it known that I, SAMUEL NAISMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Methods of Maintaining Open-Hearth-Furnace Walls, of which the following is a specification.

This invention relates to a new and improved method of maintaining open hearth furnace walls, and more particularly to a construction of such walls whereby they may be protected by furnace lining material.

Open hearth furnaces as generally constructed comprise vertically extending front and back walls which are made of siliceous brick. These walls are subjected to the very high temperature of the furnace and to the basic conditions of the melting chamber and are comparatively rapidly destroyed. Their replacement requires the shutting down of the furnace with consequent loss in operating time as well as the actual expense of the replacement.

The furnace bottom is lined with refractory materials in loose form such as dolomite. Due to the angle of repose of this loose material, it is not possible to protect the vertically extending walls with it without unduly restricting the hearth area available for the bath. With an ordinary furnace construction the furnace bottom can be built up the height of the back wall only slightly above the door sill elevation.

It is an object of the present invention to provide a means whereby the furnace back or front walls or both may be protected by a layer of lining material.

It is a further object to provide an open hearth construction wherein the front or back walls or both are adapted to retain thereon a layer of refractory material.

It is an additional object to provide a construction of this character which is simple in design and which may be applied to existing installations without material alteration therein.

Other and further objects will appear as the description proceeds.

I have illustrated certain preferred embodiments of my construction in the accompanying drawings in which—

Figure 1 is a vertical section taken through a furnace constructed according to my invention,

Figure 2 is a view similar to Figure 1 but showing a modified form of construction.

Figure 3 is a view similar to Figure 1, showing a further modification and

Figure 4 is a horizontal section of one half of a furnace taken just under the roof in the form of construction shown in Figure 1.

Referring first to the form of construction shown in Figures 1 and 4, the furnace comprises the hearth support 11 from which the furnace is supported upon beams 12. The hearth bottom 13 is formed of basic brick and the furnace bottom proper 14 is formed of dolomite or magnesite. The furnace is shown supplied with the tapping hole 15 and the tapping hole plate 16.

The ends of the furnace may be of any usual form and as shown in Figure 4, the end is provided with the gas uptake 17 and the air uptakes 18. The port 19 discharges into the furnace chamber. The side walls 20 of the ends of the furnace are vertical and are supported by the vertically extending buckstays 21. The wall of the intermediate portion of the furnace, or the front and back walls of the hearth are supported by the buckstays 22. The lower portions of these buckstays extend in the same vertical plane as the lower portions of the buckstays 21. The buckstays 22 are provided with intermediate outwardly and upwardly sloping portions 23 and with vertically extending upper portions 24 which are located in vertical planes outwardly of the buckstays 21. The charging floor has been shown at 25 and the platform in the back of the furnace is shown at 26. The upper ends of the buckstays are joined by usual types of binding channels 27. The furnace doors 28 are operated by mechanism comprising chains 29 and pulleys 30. The arched furnace roof 31 is supported at its sides upon the skewback channels 32 and 33.

The front wall is formed of brick 34, so placed as to carry the wall up at an angle corresponding to the angle of the supporting buckstays. The back wall 35 is similarly sloped and is shown provided with the water cooled support and cooler 36. The wall also contains the back slag line cooler 37. The front wall 34 is provided with water cooled supports and coolers 38.

As clearly shown in Figure 1 the furnace bottom lining of dolomite or magnesite 14 extends upwardly at 39 upon the front wall to the point of junction of the wall and roof; similarly at 40, the lining extends up on the back wall 35. The angle of the front and back walls are such as to insure their retaining their covering of the lining material. The angle of the walls must therefore be not materially less than the angle of repose of the lining material. The angle will vary with the angle of repose of the material used for lining the furnace. Where the material is put on loose the angle will be greater than where the material is put on in plastic condition, as has heretofore been customary in some furnaces. By making the walls upon such an angle they will remain covered without the necessity for such a thickness of lining material at the slag line, as will restrict the normal hearth area.

The form of construction shown in Figure 2 is generally similar to that just described. The hearth buckstays 50 are provided with their entire lower portions 51, extending upon an angle. The front breast plate 52 and the tapping hole plate 53 extend upon a similar angle. There is no diminution of the width of the furnace at the slag line and the bottom of the furnace is of the usual capacity. The sloping front wall 54 is covered by the dolomite, or other lining material 55. The rear wall 56 is similarly covered by layer 57 of the refractory material and the wall is shown as provided with the water cooled supports and coolers 58.

In the form of construction shown in Figure 3 the furnace is provided with the front breast plate 61 extending outwardly upon such an angle that the front hearth buckstays 62 are supported upon the plate 61 and extend in a plate located outwardly from that of the furnace end buckstays 63. The back wall 66 is formed with its outer face 67 extending vertically against the buckstays 65 while its inner face 68 is formed upon such an angle as to support the layer of lining material 69. The back wall 66 is shown provided with the cooler 70. The front wall 71 is shown as constructed in the manner similar to the back wall 66.

In the form of construction shown in Figure 3, the front and back walls are self-

supporting and do not require the water cooled supports and coolers which are necessary in the forms of construction shown in the other figures.

Any of the forms of construction shown permits the front and back walls to be covered by the protective refractory lining. This is accomplished without restricting the hearth area and without the necessity for the modification, or the reconstruction of the greater portion of the furnace structure. While the invention has been shown as applied to both front and back walls, it may be used for only the back wall if desired.

While I have shown certain preferred forms of construction by way of illustration, it is to be understood that I contemplate such changes and modifications as come within the spirit and scope of the appended claims.

I claim:

1. In an open hearth furnace or the like, a back wall inclining upwardly and outwardly throughout its extent at such an angle that the furnace lining material will lie on the wall surface and a furnace lining extending up said inclined wall substantially throughout its extent.

2. In an open hearth furnace, a hearth of normal width, a back wall sloping upwardly and outwardly from the sides of the hearth at such an angle that the bottom lining may extend up the sloping wall to the roof and be retained in position due to the normal angle of repose of the material without restriction of the hearth area.

3. In an open hearth furnace, a hearth and furnace ends of normal width, front and back walls sloping upwardly and outwardly from the sides of the furnace hearth, loose furnace lining material covering said walls, and a roof for the furnace of normal width at the ends and broadened over the hearth to meet the tops of the outwardly sloping walls.

4. In an open hearth furnace or the like, a back wall above the metal line inclining outwardly toward the roof and beyond the normal wall line, the furnace hearth being normal in width, and a covering of refractory material extending up and lying on said sloping wall.

5. In an open hearth furnace or the like, a wall inclining upwardly and outwardly toward the roof at such an angle that the inner wall surface at its highest point is located outwardly beyond the outer face of the wall at the point immediately below the door sill elevation, and a covering of refractory material extending up said wall.

6. In an open hearth furnace or the like, a wall having approximately its lower half extending vertically and its upper portion inclining outwardly at an angle such as to retain a covering of refractory material on

tending up and lying on said inclined portion.

7. In an open hearth furnace or the like, a wall having its upper portion inclined outwardly and upwardly at such an angle as to retain a covering of refractory material, and a roof curved in cross section, the wall

height being minimized by the downward curve of the roof and being less than the height of a vertical wall erected at the same point. 10

Signed at Chicago, Illinois, this 3rd day of November, 1924.

SAMUEL NAISMITH.