

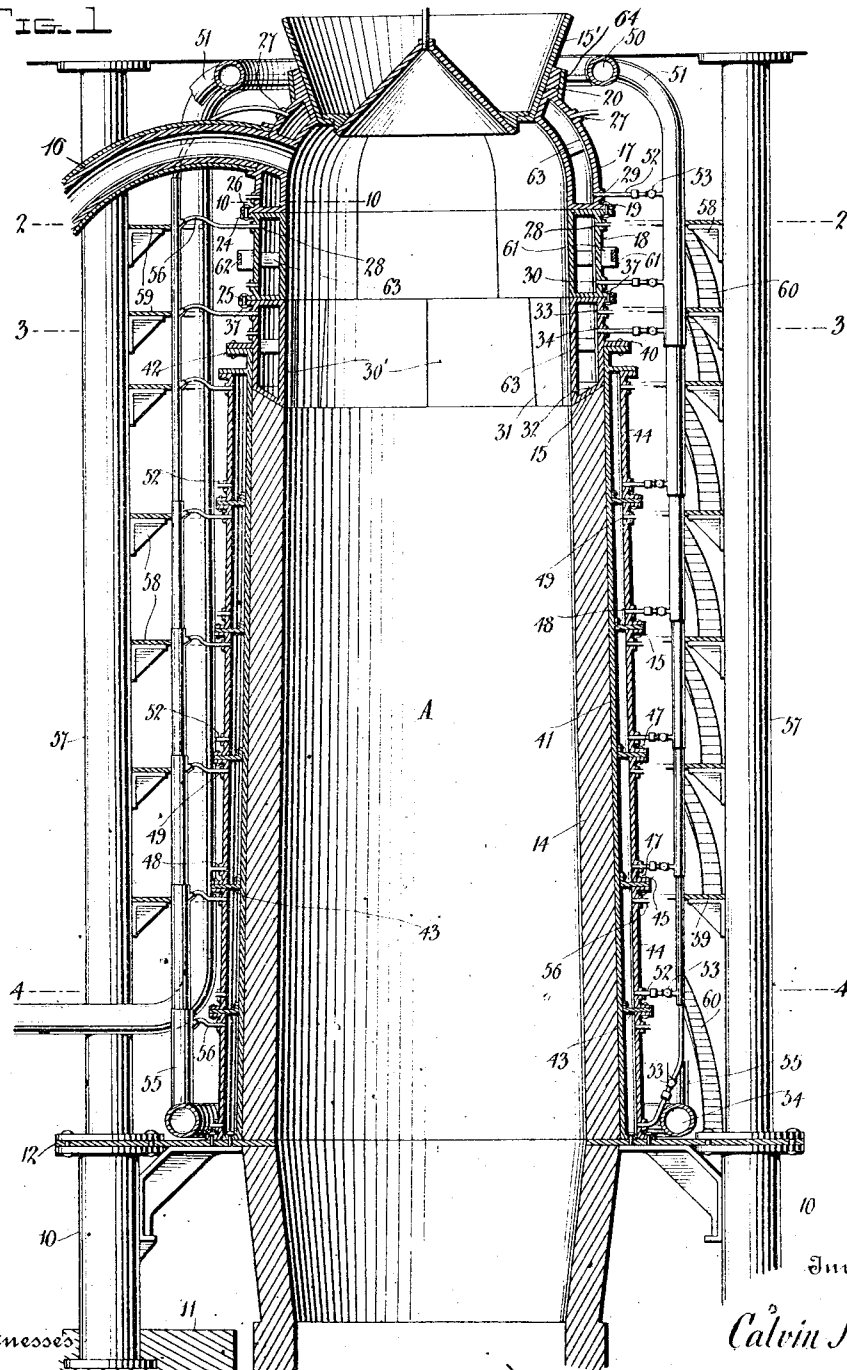
C. HICKS.
BLAST FURNACE.
APPLICATION FILED APR. 15, 1912.

1,039,282.

Patented Sept. 24, 1912.

3 SHEETS—SHEET 1.

FIG. 1



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Henry D. [unclear]

By *Charles Charles*
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3 SHEETS—SHEET 2.

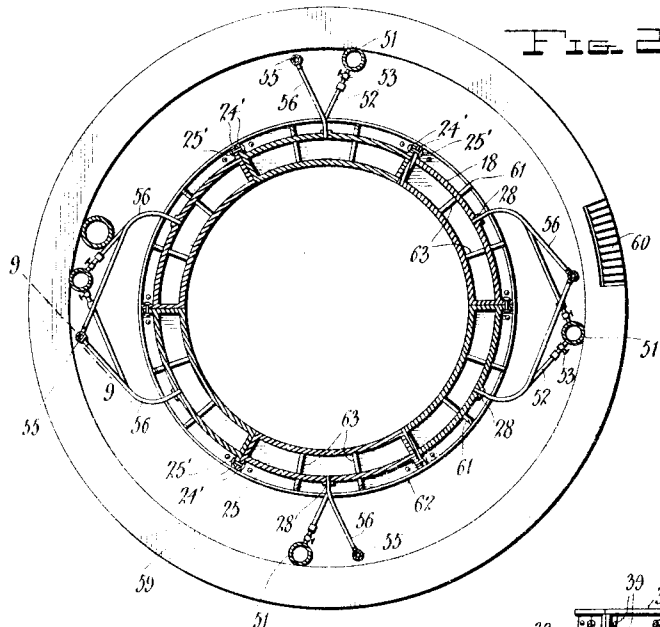


FIG. 2

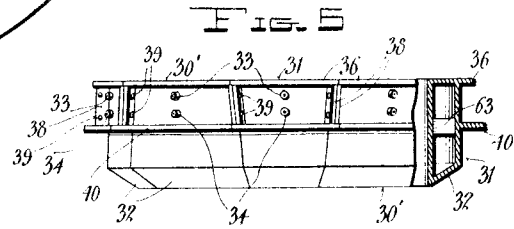


FIG. 5

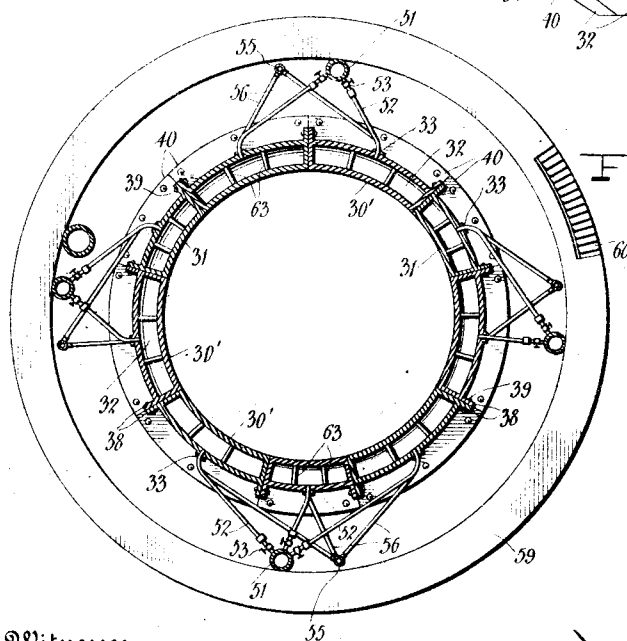


FIG. 3

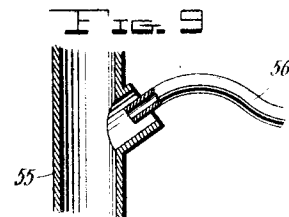


FIG. 6

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3 SHEETS—SHEET 3.

FIG. 4

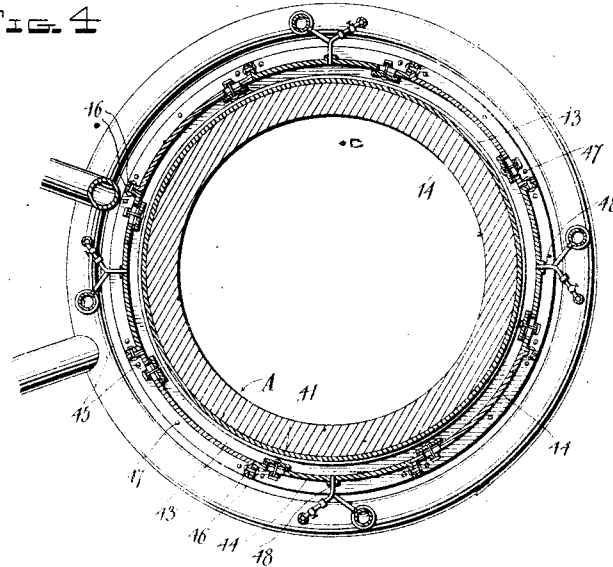


FIG. 5

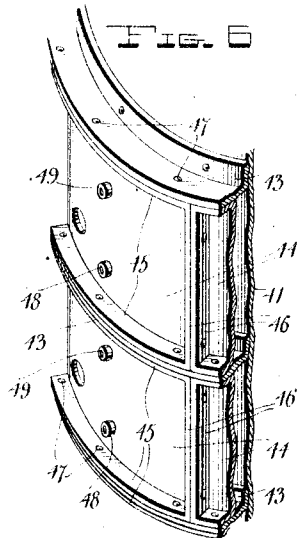


FIG. 7

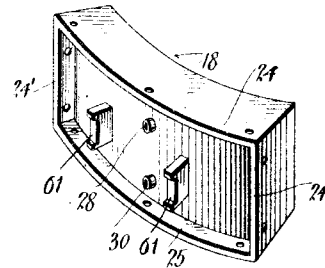


FIG. 8

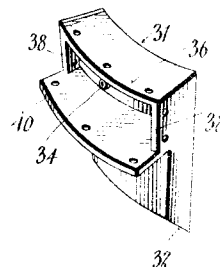
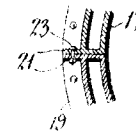


FIG. 10



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BLAST-FURNACE.

1,039,282.

Specification of Letters Patent.

Patented Sept. 24, 1912.

Application filed April 15, 1912. Serial No. 690,878.

To all whom it may concern:

Be it known that I, CALVIN HICKS, a citizen of the United States, residing at Auburn, in the county of Schuylkill, State of Pennsylvania, have invented certain new and useful Improvements in Blast-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to blast furnaces.

The object of the invention resides in the provision of a construction for effecting the cooling of the furnace wall throughout the entire extent of the latter and which will at all times permit the flow of water there-through to be observed by the furnace tender so that he may know that the highest efficiency of the system is being maintained.

A still further object of the invention resides in constructing the upper end of the furnace wall of a plurality of hollow castings in position to receive the impact of stock ore and other products as they are fed to the furnace whereby wear of the furnace wall is prevented.

With the above and other objects in view, the invention consists in the details of construction and in the arrangement and combination of parts to be hereinafter more fully described and particularly pointed out in the appended claims.

In describing the invention in detail, reference will be had to the accompanying drawings wherein like characters of reference denote corresponding parts in the several views, and in which—

Figure 1 is a vertical section of a blast furnace constructed in accordance with the invention, Fig. 2, a section on the line 2—2 of Fig. 1, Fig. 3, a section on the line 3—3 of Fig. 1, Fig. 4, a section on the line 4—4 of Fig. 1, Fig. 5, a view partly in elevation and partly in section of the lower layer of hollow castings which constitutes the top portion of the furnace, Fig. 6, a detail perspective view of one of the members employed in constructing the water jacket of the cooling system which surround the intermediate and lower portions of the wall of the furnace, Fig. 7, a detail perspective view of one of the intermediate layer hollow castings employed in constructing the upper portion of the wall of the furnace, Fig. 8, a detail perspective view of one of the key

lower layer hollow castings employed in constructing the upper portion of the wall of the furnace. Fig. 9, an enlarged section on the line 9—9 of Fig. 2. Fig. 10, a section on the line 10—10 of Fig. 1.

Referring to the drawings, the furnace is shown as supported upon columns 10 which are in turn sustained by a foundation 11. Carried upon the upper ends of the columns 10 is a mantel 12 which supports the upwardly converging wall A of the furnace, the lower portion 14 of which is of the usual fire brick construction and has its upper end beveled inwardly as at 15 to form a seat for the metallic portion of the wall A which is disposed between the upper beveled end 15 and the hopper 15'.

The metallic portion of the wall A is formed of a plurality of hollow segmental castings arranged in horizontal layers. In this instance the metallic portion of the wall A is shown as formed of three horizontal layers of castings, the uppermost and intermediate layers being constructed of castings 17 and 18 respectively. One of the castings 17 is provided with a walled aperture there-through into which the downcomer 16 projects and is secured, said downcomer being of a construction common to furnaces of this type. Each casting 17 of the upper layer is formed with a flange 19 at its lower end and has its upper end beveled as at 20, the beveled upper ends of all the castings 17 registering to form a seat for the hopper 15'. The castings 17 are of such shape superficially as to properly complete the upper end of the wall of the furnace. The castings 17 are further provided at each side with outwardly directed flanges 21 and adjacent flanges 21 are suitably connected together by bolts 23.

The castings 18 are each provided at their upper and lower ends with outwardly directed flanges 24 and 25 respectively, the flange 24 of each casting 18 being connected to the flange 19 of the section 17 next above by means of bolts 26. The castings 18 are further provided at each side with flanges 24' and adjacent flanges 24' are connected together by bolts 25'. It will be here noted that the castings 17 and 18 are each provided at their upper ends with discharge openings 27 and 28 respectively and at their lower ends with intake openings 29 and 30 respectively. The lower layer of castings of the upper portion of the wall of the fur-

nace is formed successively large and small as at 30' and 31 respectively. The lower ends of all of these castings 30' and 31 are beveled as at 32 so as to seat snugly upon the beveled upper end 15 of the lower portion 14 of the furnace wall. Each of the castings 30' and 31 is provided in its upper end with a discharge opening 33 and further provided with an intake opening 34 disposed beneath the opening 33 in vertical alinement with the latter. The castings 30' and 31 are each provided at their upper ends with an outwardly directed flange 36 which is secured to the flange 25 of the section 18 next above by means of bolts 37. These castings 30' and 31 are also provided at their sides with outwardly directed flanges 38 and the adjacent flanges 38 of said castings 30' and 31 are connected together by means of bolts 39. The castings 30' and 31 are further provided intermediate their upper and lower ends with outwardly directed horizontal flanges 40 for a purpose that will presently appear. The portion 14 of the furnace wall is surrounded by a shell 41 the upper end of which is provided with an outwardly directed flange 42 upon which rests the flanges 40 of the castings 30' and 31, said flange 42 thus serving to support the castings 17, 18, 30' and 31. The shell 41 of the furnace is provided with a plurality of spaced horizontal projections or flanges 43 and between each adjacent pair of flanges 43 is secured a plurality of plates 44 disposed in spaced relation to the shell 41. Each of the plates 44 is of the necessary arcuate formation and has its sides and ends formed with outwardly extending flanges 45 and 46 respectively provided with bolt receiving apertures whereby said plates may be secured together side by side and each plate positively secured to the flanges 43 by means of bolts 47. As many of the plates 44 as desired are provided with intake and discharge openings 48 and 49 respectively for attachment to suitable intake and discharge elements to supply a current of water in the space between the shell 41 and the plates 44.

Disposed around the furnace at its upper end is a supply main 50 from which depends a plurality of feed pipes 51. A plurality of branch pipes 52 connect the feed pipes 51 with the intake openings of the castings 17, 18, 30' and 31 and with the intake openings of the plates 44 respectively. It will be noted that the feed pipes 51 decrease in diameter downwardly as the number of cooling compartments which it is called upon to supply at a given point decreases. The various branch pipes 52 are controlled by means of valves 53, thus enabling the furnace tender to easily and quickly regulate the flow of water from the feed pipes 51 to the interior of the castings 17, 18, 30' and 31 and the spaces between the shell 41 and plates 44. Surrounding the furnace at its lower end is a discharge main 54 which has extending vertically therefrom a plurality of drain pipes 55. A plurality of branch drain pipes 56 connect the drain pipes 55 with the discharge openings of the castings 17, 18, 30' and 31 and with the discharge openings of the plates 44 respectively. It will be noted that the drain pipes 55 increase in diameter in a downward direction as the number of branch drain pipes discharging therein increases. The openings in the drain pipes 55 which receive the ends of the branch drain pipes 56 are larger in diameter than said branch pipes so as to permit the furnace tender to observe at all times if the water is discharging properly from the various cooling compartments of the system. It will of course be understood that the supply main 50 is suitably connected with a water supply while the discharge main 54 is provided with an outlet whereby the water being fed thereto may be conveniently carried off.

Supported upon the mantle 12 in vertical alinement with the columns 10 are columns 57 which rise to the upper end of the furnace. Each of these columns 57 support a plurality of brackets 58 positioned at corresponding points on respective columns 57 and the brackets 58 disposed at corresponding points on the various columns 57 support respectively landings or platforms 59 and these various landings or platforms are connected by suitable stairways 60. By this arrangement of platforms and stairways the furnace tender can easily reach and inspect all of the piping of the cooling system.

The castings 18 are provided intermediate the flanges 24 and 25 with outwardly disposed projections 61 which form a seat for a strengthening band 62 surrounding the castings 18. In addition to the band 62 the various castings 17, 18, 30' and 31 are strengthened by means of integral braces 63 formed in the interior of respective castings.

The operation of the cooling system here in-described will be obvious, it being sufficient to say that during the operation of the system water will discharge from the main 50 into the various supply pipes 51, from whence it will flow through the branch pipes 52 into the lower portion of the castings 17, 18, 30' and 31 and into the lower portion of the space between the shell 41 and plates 44. The water will then discharge from the upper portion of the various castings and from the upper portion of the space between the shell 41 and plates 44 through the branch drain pipes 56 into the drain pipe 55 and thence into the discharge main 54 from where it is carried off through a suitable outlet.

It will be noted that the upper castings 17

are bound against the lower end of the hopper 15' by means of a band 64, said band serving to effectually hold the castings 17 in proper relation and to strengthen the structure generally.

What is claimed is:

1. A blast furnace having the lower portion of its wall formed solid and the upper portion of said wall constructed of a plurality of hollow castings disposed one upon the other, a water jacket surrounding the lower portion of the furnace and formed with a plurality of superimposed independent compartments, a cooling fluid supply main surrounding the upper end of the furnace, connections between said supply main and the lower portions of the interior of the hollow castings and the compartments of said water jacket respectively, a discharge main surrounding the lower portion of the furnace and connections between said discharge main and the upper portions of the interior of the hollow castings and the compartments of said water jacket respectively.
2. A blast furnace having the lower portion of its wall formed solid and the upper portion of said wall constructed of a plurality of hollow castings disposed one upon the other, a water jacket surrounding the lower portion of the furnace and formed with a plurality of superimposed independent compartments, a cooling fluid supply main surrounding the upper end of the furnace, feed pipes depending from said supply main, branch pipes connecting said feed pipes with the lower portion of the interior of said castings and with the lower portion of the compartments of the water jacket, a discharge main surrounding the lower portion of the furnace, drain pipes extending vertically from said discharge main, and branch drain pipes connecting said drain pipes with the upper portion of the interior of the castings and the upper portion of the compartments of the water jacket.
3. A blast furnace having the lower por-

tion of its wall formed solid, and the upper portion of said wall constructed of a plurality of hollow castings disposed one upon the other, a water jacket surrounding the lower portion of the furnace and formed with a plurality of superimposed independent compartments, a cooling fluid supply main surrounding the upper side of the furnace, feed pipes depending from said supply main and decreasing in diameter at spaced points in a downward direction, branch pipes connecting said feed pipes with the lower portion of the interior of said castings and with the lower portions of the compartments of the water jacket, a discharge main surrounding the lower portion of the furnace, drain pipes extending vertically from said discharge main and decreasing in diameter at spaced points in an upward direction, and branch drain pipes connecting said drain pipes with the upper portion of the interior of the castings and the upper portion of the compartments of the water jacket.

4. A blast furnace having the lower portion of its wall formed solid, and the upper portion of said wall constructed of a plurality of hollow castings disposed one upon the other, a water jacket surrounding the lower portion of the furnace and formed with a plurality of superimposed independent compartments, a plurality of columns surrounding said furnace, platforms supported by said columns at spaced points respectively, stairways connecting said platforms, and pipe connections for effecting a current of water through the interior of the castings and the compartments of the water jacket, said pipe connections being accessible from said platforms.

In testimony whereof, I affix my signature, in presence of two witnesses.

CALVIN HICKS.

Witnesses:

WILLIAM SILFF
IRWIN DELONG