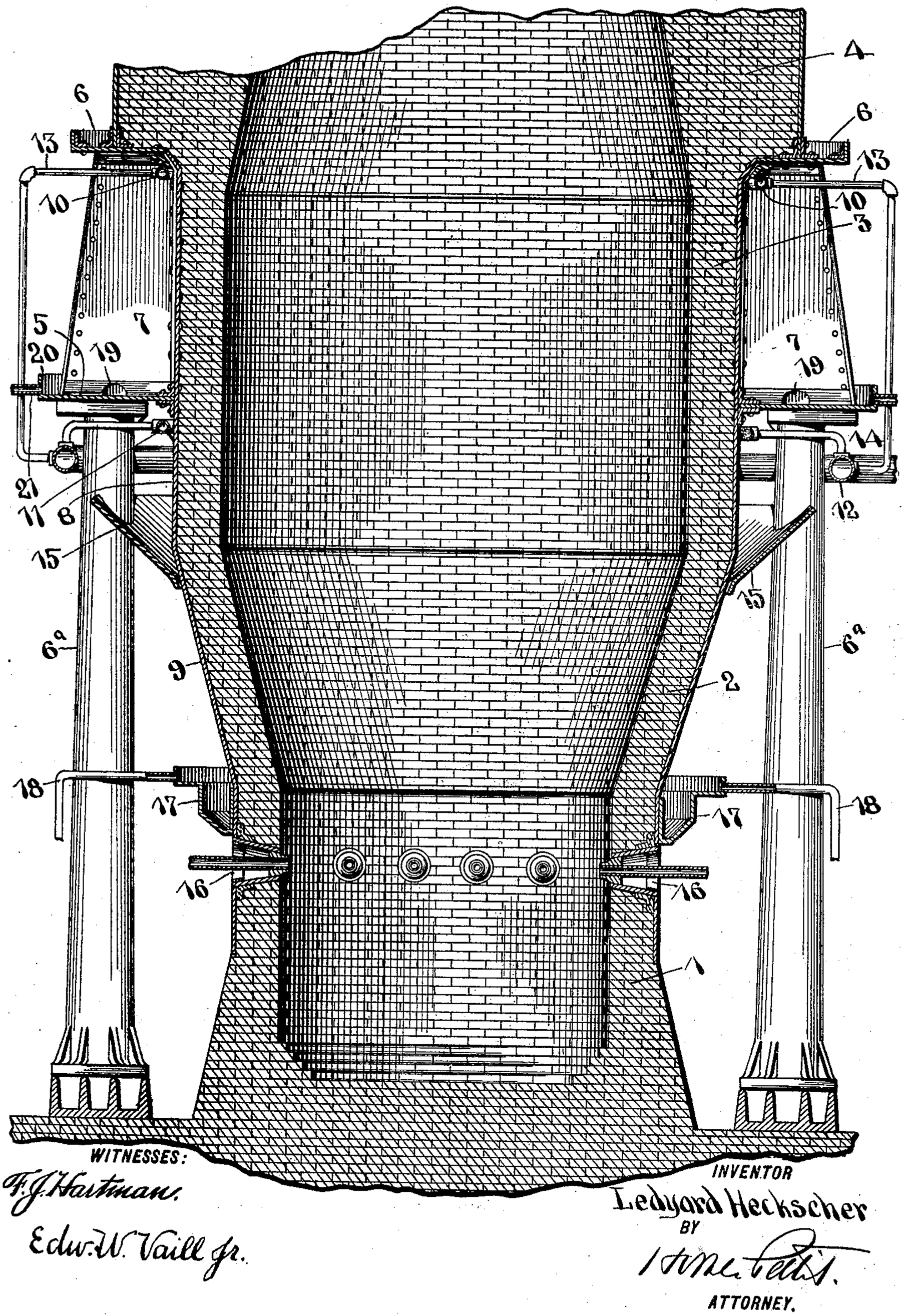
No. 828,310. PATENTED AUG. 14, 1906.

L. HECKSCHER.

BLAST FURNACE.

APPLICATION FILED NOV. 2, 1903.



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BLAST-FURNACE.

No. 828,310. Specification of Letters Patent. Patented Aug. 14, 1906.

Application filed November 2, 1903. Serial No. 179,475.

To all whom it may concern:

Be it known that I, LEDYARD HECKSCHER, a citizen of the United States, and a resident of Radnor, State of Pennsylvania, have invented certain new and useful Improvements in Blast-Furnaces, of which the following is a full, clear, and complete disclosure.

My invention more particularly relates to means for cooling the walls of blast-furnaces, whereby a greater portion of the walls of the furnace are cooled than heretofore made possible, while at the same time the advantages of the present construction of blast-furnaces which is commonly employed are maintained.

Briefly, my invention resides in means for the utilization of what is known as "outside cooling" for the protection of the brickwork of the walls of a blast-furnace both above and below the mantle in such a manner that the entire upright part of the furnace is cooled in addition to bosh, thus particularly obviating the dangers due to coils in the "cooling-plates" now generally embedded in the brickwork of blast-furnaces.

For a full, clear, and exact description of my invention reference may be had to the following specification and to the accompanying drawing, forming part thereof, in which the figure there shown represents a longitudinal vertical section showing a blast-furnace having my improvements embodied therein.

Referring to the drawing, the numeral 1 indicates the crucible or hearth of the furnace; 2, the bosh portion thereof; 3, the vertical or upright portion thereof, and 4 the portion which contains the stock or ore to be reduced. These parts are those common to blast-furnaces; but the same may be varied according to individual choice and design—such as, for instance, the bosh and upright portions 2 and 3 may be formed by one interior curved surface, which curved surface is sometimes termed the "bosh" for its whole distance.

5 indicates the mantle, which is supported upon suitable columns 6^a in the usual manner. This mantle comprises an annular plate which completely surrounds the furnace, and in the construction now generally adopted the brickwork of the upper portion of the furnace commences at and rests upon this plate or mantle.

My construction makes use of the mantle; but instead of having the brickwork of the upper portion of the furnace rest directly upon said mantle I provide a second or false mantle, as indicated at 6. This mantle 6 is connected with and supported by the first mantle 5 by means of vertical radial plates 7, which are placed at suitable intervals to support the weight of the superstructure of the furnace.

The external shell or plate 8, covering the vertical portion of the furnace and termed the "mantle-jacket," extends from the upper or false mantle 6 downwardly to the bosh and there connects with a similar covering or plate which incloses the bosh, as indicated at 9.

It will be seen that by the use of the construction above described the mantle is located in its usual position in relation to the walls of the furnace, thereby giving its maximum effect as to the strength, but at the same time allows the walls of the vertical portion of the furnace to be easily accessible for the purpose of the application of the cooling means.

The cooling means consists of two circular pipes 10 and 11, which have small perforations in their lower portions, so that jets of water will be directed inwardly and downwardly against the shell 8 of the furnace, so as to flow over the plates 8 and 9. These circular pipes are connected to a main supply-pipe 12 by means of the auxiliary pipes 13 and 14, respectively. Below the lower circular pipe 11 is placed a funnel-shaped guard or deflector 15, which allows sufficient space between itself and the exterior shell 9 to permit the water to cover the bosh portion of the furnace. Just below the bosh of the furnace and sufficiently far above the twyer-coolers 16 to allow the same to be removed I provide an annular trough 17, which has a water-tight connection with the exterior shell 9 and is connected by a suitable drain-pipe 18 with the sewer or other means for conducting away the waste.

The plates 7 are provided with openings 19 in their lower portions to make connections between the compartments or recesses formed by said plates to allow a free circulation of the cooling liquid in the "mantle-trough," which trough is formed by a flange 20, which is connected with a suitable overflow or waste pipe 21.

When my improved cooling means is in operation, water flows in jets from the pipe 10 against the plate or shell 8, over which it passes in a downward direction until the

mantle 5 is reached. The water thereupon circulates in mantle-trough and passes away through the overflow 21. In a similar manner water is projected from the pipe 11 against the shell 8 at a point just below the mantle and flows over the surface of said shell 8 and the shell 9 until the trough 17 is reached, from which it flows off through the waste-pipe 18. The guard or shield 15 prevents the water from spattering or otherwise leaving the surface of the shells 8 and 9.

It is obvious that the construction above described may be varied according to different ideas of design and proportion of parts and angle or other channel-irons may be used to strengthen and unite the parts, as is common in similar metallic constructions.

Many advantages result from the arrangement of parts above described, among which the following may be mentioned: all danger of water leaking into the interior of the furnace at points where leaks are difficult to discover. Such leaks are particularly liable to occur where embedded cooling-plates are used, arising from the unequal and uncertain expansion and contraction of the pipes due to the heat of the furnace. The walls of the furnace are cooled evenly from the highest melting zone to the twyer zone, which produces smooth interior walls and largely prevents what is known as "hanging" and "slipping," produced by uneven and irregular cooling, resulting in a corrugated surface of the furnace-wall. My device also allows cooling to be reduced or entirely removed from any desired portion of the walls in order to reduce and displace any interior accumulation at undesirable points without "losing" coils or plates, which when "lost" means no protection to walls at such points, and therefore shortens life of furnace.

By doing away with all cooling-plates and tubes within the bosh and cylindrical portions of the furnace, said portions being subject to the greatest wear, the latter may be easily removed and the walls relined without disturbing adjacent parts, and, finally, these advantages result in a furnace of much increased efficiency and economy and preserve the life of the furnace for a much longer time than heretofore has been possible.

Having thus described my invention, what I claim, and desire to protect by Letters Patent of the United States, is—

1. In a blast or similar furnace having masonry walls, a metallic shell or mantle-jacket extending downwardly from the base of the upwardly-tapering portion over the bosh, a main mantle having its outer periphery turned up to form an annular trough, a second or false mantle located at the top of the mantle-jacket, vertical plates between said mantles, each having an orifice in its lower edge, and means for playing water upon the mantle-jacket between and below the said mantles.

2. In a blast or similar furnace having masonry walls, a metallic shell or mantle-jacket extending downwardly from the base of the upwardly-tapering portion over the bosh, a main mantle having its outer periphery turned up to form an annular trough, a second or false mantle located at the top of the mantle-jacket and supported by the main mantle, means for playing water against the mantle-jacket between and below said mantles, and an annular downwardly-tapering flange surrounding the bosh but leaving an opening between its inner periphery and the mantle-jacket.

3. In a blast or similar furnace having masonry walls, a metallic shell or mantle-jacket extending downwardly from the base of the upwardly-tapering portion over the bosh, a main mantle having its outer periphery turned upwardly to form an annular trough, a second or false mantle located at the top of the mantle-jacket, vertical plates between said mantles, each having an orifice in its lower edge, means for playing water on the mantle-jacket between and below said mantles, and an annular downwardly-tapering flange surrounding the bosh, but leaving an opening between its inner periphery and the mantle-jacket.

4. In a blast or similar furnace having masonry walls, a metallic shell or mantle-jacket extending downwardly from the base of the upwardly-tapering portion over the bosh, a main mantle having its outer periphery turned upwardly to form an annular trough, a second or false mantle located at the top of the mantle-jacket, vertical plates between said mantles, each having an orifice in its lower edge, means for playing water upon the mantle-jacket between and below the said mantles, an annular downwardly-tapering flange surrounding the bosh, but leaving an opening between its inner periphery and the mantle-jacket, and an annular trough surrounding said mantle-jacket immediately above the twyers.

In witness whereof I have hereunto set my hand this 26th day of October, 1903.

LEDYARD HECKSCHER.

Witnesses:

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LEWIS H. VAN DUSEN.