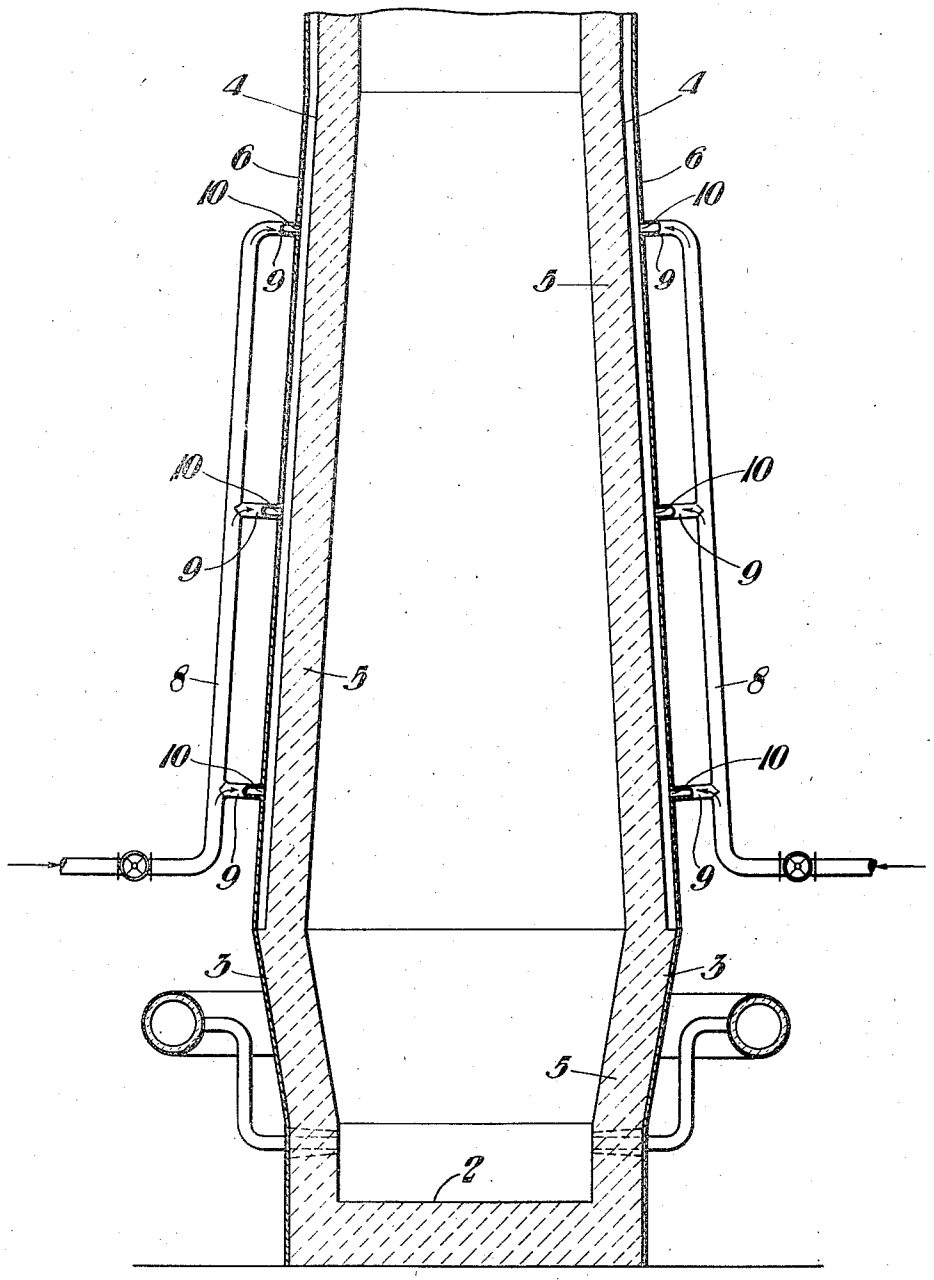
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METHOD OF TREATING VESSELS HAVING REFRACTORY LININGS

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## METHOD OF TREATING VESSELS HAVING REFRACTORY LININGS

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2 Claims. (Cl. 263—44)

This invention relates to a method of treating vessels having refractory linings, such as blast furnaces, open hearth furnaces, reheating furnaces, hot metal mixers, ladles, etc.

During the use of vessels having refractory linings, such as those of the type referred to immediately hereinbefore, the brickwork disintegrates due to the infiltration of carbon monoxide (CO) gas. Within certain temperature limits, the carbon monoxide reacts upon the ferric oxide ($Fe_2O_3$) of the refractory material, which is usually present in the quantity of from 1.4 to 3 per cent. This causes the formation of carbon, and a consequent expansive effort which is sufficient to cause destruction of the brickwork in particular temperature zones. It has been observed that as the refractory lining warms up and the different vertical strata pass through the range of from approximately 400° to approximately 550° C., there results an extremely deleterious effect upon the brickwork which is practically non-existent at temperatures below and above this range.

In the starting up of a blast furnace, there is a 4- or 5-hour period within which the different vertical strata pass through this temperature range and the carbon monoxide (CO) gas cracks and crumbles the brickwork as the successive layers pass through this zone. In other words, if a blast furnace is taken out of service after a one-week run and the lining removed, a very high percentage of the brickwork will show crumbling, spalling, and more serious disintegration along vertical seams where the brickwork is constantly held at a temperature of between approximately 400° and 550° C.

It is among the objects of the present invention to prolong the life of refractory linings of vessels operating at high temperatures, such as those specifically designated hereinbefore.

Another object is to control the temperature gradient of refractories for lined vessels of the type described.

A further object is to prevent the infiltration into refractory brickwork of carbon monoxide (CO) and other destructive gases, and thereby increase the life of vessels with refractory linings, zones of which operate at temperatures of 400° C. to 550° C.

The foregoing and other objects will be apparent after referring to the drawing, in which the single figure is a sectional view of a metallurgical blast furnace embodying apparatus which may be used to practice the method of the present invention.

Referring more particularly to the drawing, the numeral 2 designates the hearth or crucible of a metallurgical blast furnace; the numeral 3 the bosh, and the numeral 4 the stack or inwalls. All of these portions of the blast furnace are provided with a lining of refractory brickwork 5 which is covered by a metallic jacket 6. Due to the infiltration of carbon monoxide (CO) and the reaction thereof on the ferric oxide ($Fe_2O_3$) of the refractory, there results the disintegration referred to hereinbefore, followed by expansion, with the result that frequently the metallic shell 6 is broken. It is commonly supposed that the determining factor in the life of a refractory brickwork lining in a blast furnace is determined by the wearing action of the coke on the brickwork and the spalling and fusion of the brick due to the high temperature of the furnace; but I have reason to believe that the true determining factor in the life of such a refractory brickwork lining is the disintegration of the brickwork by the factors discussed hereinbefore.

According to the teachings of the present invention, I provide on the exterior of the metallic shell 6 of the blast furnace a number of vertically-extending conduits 8 having leaders 9 connecting with apertures 10 which communicate with the refractory brickwork 5 of the furnace. Through these conduits 8 there is forced air at a pressure slightly above that inside the furnace. Thus at several different points on the periphery of the refractory brickwork 5, air is permitted to filter through the bricks to prevent infiltration of carbon monoxide (CO) gas. It will be understood by those skilled in the art that air is effective for this purpose, and it may be conveniently used because of its ease of supply at the correct temperature and pressure from the cold blast main (not shown) of the furnace; but other mixtures susceptible of neutralizing the effect of furnace gases may be used.

As a specific example, let it be supposed that the pressure of the carbon monoxide (CO) gas endeavoring to enter the refractory brickwork lining 5 is 15 pounds per square inch and the pressure of the outside air entering the lining in an opposite direction is 25 pounds per square inch. There will result a 10-pound differential which will be sufficient to prevent the infiltration of carbon monoxide (CO) gas.

While the leaders 9 have been shown as so connected as to provide air only to the stack or inwalls 4, it will be readily understood by those skilled in the art that similar connections may be applied to the bosh 3 which is disposed therebelow.

While I have shown and described a specific embodiment of the present invention, it will be seen that I do not wish to be limited exactly thereto, since various modifications may be made without departing from the scope of the invention as defined in the appended claims.

I claim:

1. The method of treating blast furnaces lined with a refractory containing ferric oxide, said blast furnaces containing carbon monoxide in an amount sufficient to substantially attack the refractory by reacting with the ferric oxide when the refractory is at temperatures of from between approximately 400° C. to approximately 550° C., which includes forcing through the said refractory portions from the exterior thereof a gaseous medium which is neutral to the refractory to prevent infiltration of carbon monoxide into the refractory portions which are at the said temperature range of approximately 400° C. to approximately 550° C.

2. The method of treating blast furnaces lined with a refractory containing ferric oxide, said blast furnaces containing carbon monoxide in an amount sufficient to substantially attack the refactory by reacting with the ferric oxide when the refractory is at temperatures of from between approximately 400° C. to approximately 550° C., which includes forcing through the said refractory portions from the exterior thereof at different vertical positions a gaseous medium which is neutral to the refractory to prevent infiltration of carbon monoxide into the refractory portions which are at the said temperature range of approximately 400° C. to approximately 550° C.

FRANK ROBERSON.