March 17, 1953 R. F. WILLIS 2,631,836

REFRACTORY LINING

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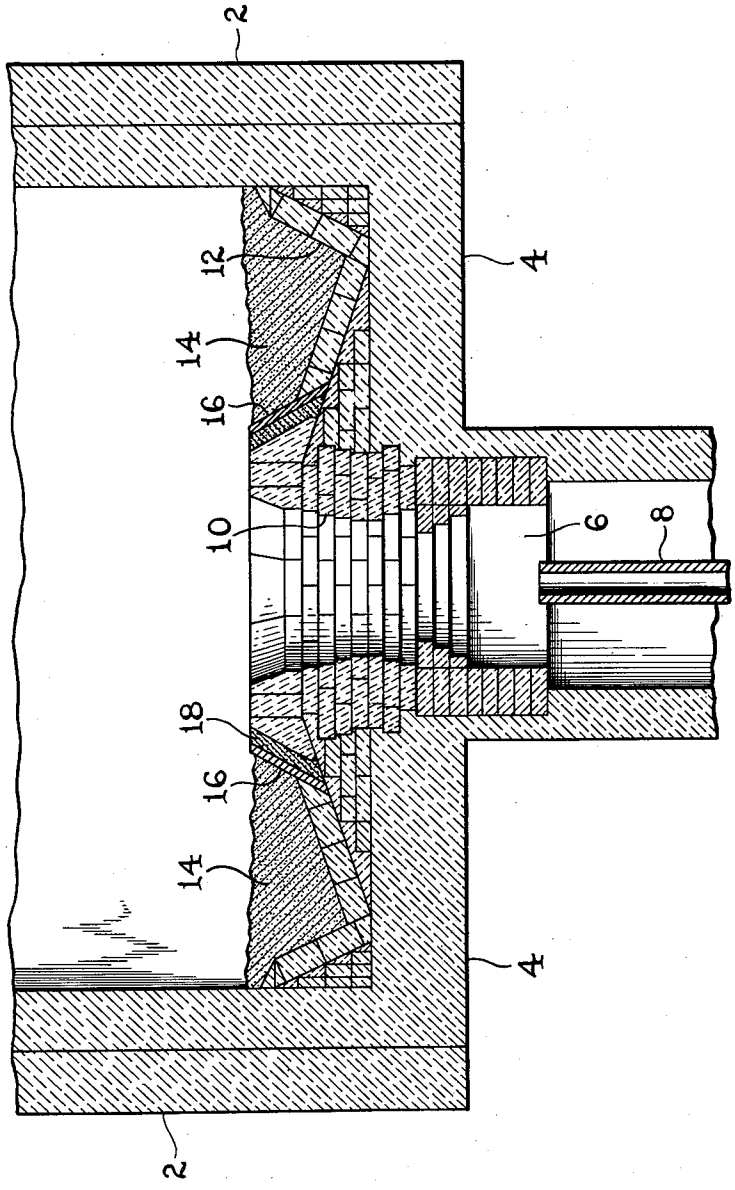

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REFRACTORY LINING

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2 Claims. (Cl. 263—46)

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This invention relates to refractory linings and is directed more particularly to a refractory lining for a gas port in a soaking pit having a centrally located gas port, such as shown in the patent to Morton No. 2,124,888. The gas port projects above the furnace floor level in order to prevent coke breeze, which forms the hearth, and other material from falling therein. During the charging and drawing of the ingots from the soaking pit, the crane operator often bumps or otherwise damages the projecting part of the gas port, thus causing premature failure and undue shutdown of the soaking pit. In order to strengthen the gas port, the operators resorted to the practice of "baking in," which involves firing the furnace for some time prior to the charging thereof so that the refractory brick solidified into a mass. This practice has met with some success, but is objectionable in that it requires a considerable period of time so that the furnace has to be out of production for a longer period than is desirable. In a few instances, pre-cast refractory gas ports have been used, but these are expensive and very difficult to install.

It is therefore an object of my invention to provide a refractory lining which will have a long life.

Another object is to provide an improved type of gas port for a soaking pit.

These and other objects will be more apparent after referring to the following specification and attached drawing, in which the single figure is a cross sectional view of the gas port in a soaking pit.

Referring more particularly to the drawing, reference numeral 2 indicates the walls of a soaking pit having a bottom 4 made of fire brick. Extending upwardly through the center of the bottom 4 is a gas port 6 having a burner 8 at the lower end thereof. The upper part of gas port 6 is lined with chromite refractory brick 10. On each side of the gas port 6 is a trench 12 which is filled with coke breeze 14 upon which rests the ingots to be heated. I provide a frustoconical ferrous metal shield 16 around the refractory lining 10. This shield may be fabricated from low carbon steel plate or may be cast. A typical cast iron shield may contain 4.25% carbon, 0.50% manganese, 2.00% silicon, .080% phosphorus and .030% sulphur. A layer of chrome ore refractory 18 is tamped into place between the lining 10 and shield 16. This chrome ore refractory may be installed as a wet mixture of 50% chrome ore and 50% fire clay. The chrome ore refractory lining and the ferrous

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metal shield not only protect the lining 10 while the lining fuses and solidifies enough to withstand normal use, but also the shield itself becomes fused to the chrome ore lining and forms a very hard ferro-chromo-siliceous mass which is highly heat resistant and far superior in strength and wearing qualities to materials previously used in gas ports. This mass results when the furnace is heated up to its operating temperature which is approximately between 2300° F. and 2700° F. It has been found that the chemical analysis of this material varies somewhat as indicated below:

	Percent
Iron oxide, Fe_2O_3	45 to 50
Aluminum oxide, Al_2O_3	14 to 18
Chromium oxide, Cr_2O_3	14 to 18
Silicon dioxide, SiO_2	10 to 13
Magnesium oxide, MgO	7 to 9
Calcium oxide (lime), CaO Carbon, C	Remainder

A particular analysis which has proven extremely satisfactory in use is as follows:

	Percent
Iron oxide, Fe_2O_3	47.56
Aluminum oxide, Al_2O_3	15.92
Chromium oxide, Cr_2O_3	15.78
Silicon dioxide, SiO_2	11.51
Magnesium oxide, MgO	8.13
Calcium oxide (lime), CaO	0.95
Carbon, C	0.15
Total	100.00

This refractory material has a predominantly crystalline character at the temperatures indicated and has a comparatively small amount of glass phase which is highly viscous at the operating temperature and imparts ductility and toughness to the heated material. The average life of a soaking pit gas port has been increased from approximately two months to approximately nine months by the use of my invention. Apparently this increase in life is due to the ductility of the material. In other words, there is a certain amount of give to any impact so that chipping and cracking, which normally occur when hot ceramic materials are hit, are eliminated. Apparently the chrome ore refractory is saturated with the molten iron under slightly oxidizing conditions at operating temperatures. It will be seen that the shield protects the gas port from damage during the baking in period so that the soaking pit can be put into immediate operation, and then as the heat is applied the

shield will fuse and react chemically to form a very hard and heat resistant material. While the refractory was developed primarily for gas ports for soaking pits, it can also be used for gutters or runners in billet or slab heating furnaces as well as for other installations.

While one embodiment of my invention has been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claims.

I claim:

1. A gas port for a soaking pit or the like comprising a layer of refractory brick forming the inner lining of the port, an outer ferrous metal shield entirely surrounding the periphery of the lining at the exit end of the port, and a layer of chrome ore refractory between the refractory forming a separating layer and the shield, the ferrous shield being fused with the chrome ore refractory.

2. A vertical gas port for a soaking pit or the like comprising a layer of refractory brick forming the inner lining of the port, an outer frusto

conical ferrous metal shield surrounding the periphery of the top part of the lining with its small diameter uppermost, and a layer of chrome ore refractory between the refractory and the shield, the ferrous shield being fused with the chrome ore refractory.

RALPH F. WILLIS.

REFERENCES CITED

The following references are of record in the file of this patent:

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