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[54] **SUBSTANCE FOR THE REFRACTORY LINING OF PIG IRON TROUGHS OR THE LIKE**

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[51] **Int. Cl.** **C04b 35/02**

[58] **Field of Search** 106/56, 58, 59

[56] **References Cited**

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[57] **ABSTRACT**

A refractory lining substance for pig iron troughs and the like contains (1) granular refractory material preferably about 30% of which is a 1–3 mm sieve fraction, the remainder being finer, (2) tar 8–15%, preferably 9–12%, preferably containing over 70% pitch and 9–11% C_2 resins, and preferably having a viscosity of less than 8,000 cp at 20°C; and (3) has at least 75% of the mass consisting of magnesite. It (4) preferably contains Cr_2O_3, and (5) may contain ground coal (anthracite and/or bituminous coal and/or coke) from 0–15%, preferably less than 5%, more preferably less than 1%. The processes for making and using same, and troughs lined therewith are also disclosed.

1 Claim, No Drawings

SUBSTANCE FOR THE REFRACTORY LINING OF PIG IRON TROUGHS OR THE LIKE

This invention relates to a substance for the refractory lining of pig iron troughs or the like, comprising granular refractory material and tar. A pig iron trough or the like includes such parts as the trough immediately joining the tap-hole of a blast furnace, the so-called skim or skimming plate and the further troughs or channels after this first trough. This invention also relates to a process for the manufacture of such a substance, a process for lining pig iron troughs or the like and the troughs or the like themselves. The troughs behind the tap-hole of a blast furnace, being open troughs, may be quite different mutually in dimensions and structure. Only as an example the following data of a certain known trough could be given. In this known trough the width is 50 to 80 cm. On a permanent background a layer of refractory material with a thickness of about 20 cm is applied, which layer per hole contains a quantity of such material in the order of magnitude of 20 tons.

Often the material used contains tar and coal and moreover aluminum silicates. The coal may be present as coke or as bituminous coal or as anthracite. The use of several types of tar is also known. In cases in which there is considerable danger of erosion of the troughs as a result of the flow of pig iron and slag it has also been proposed previously to add SiC to the material.

For such substances it is assumed that the tar serves as a binder and that the coal serves as a means to maintain the material sufficiently porous, so that on decomposition of the tar the volatile constituents are allowed to escape therefrom.

It has appeared that the refractory coating of the troughs obtained with the known materials has to be repaired and replaced quite frequently. As a result of erosion and corrosion by the slag and by the pig iron the coating of the trough is seriously attacked.

This not only requires high costs of refractory material to repair the troughs, but also it could restrict the capacity of the blast furnaces because the troughs cannot be repaired quite rapidly before the next tapping. Moreover, the working conditions when repairing the troughs are quite disagreeable and unfavourable as a result of the high temperatures.

Therefore it has long been tried to find a material which has a longer lifetime for lining the troughs. The present invention aims at obtaining such a material.

According to the present invention the said material consists of magnesite for at least 75%.

It should be remarked in this respect that what we here call magnesite is material which consists of at least 70% of MgO. Better results were obtained if the percentage of MgO in the magnesite is higher. Good results may also be obtained according to the invention if the granular refractory material also contains Cr_2O_3. This Cr_2O_3 may be present separately from the MgO or bonded thereto as ($MgO.Cr_2O_3$).

Dependent upon the kind of tar the optimum quantity of tar in the material differs. It has, however, appeared that with the most diverging types of tar which are suited for the application according to this invention, favourable results are obtainable if the mass contains 8 to 15% of tar as well as 0 to 15% of ground coal. In this respect both coke and bituminous coal and a mixture thereof may be used. With such masses the lifetime of the lining of the troughs can be increased by a factor of 2 to 10, which not only gives a saving in material and work, but also a clear gain in productivity of the blast furnaces.

The good operation of the new mass should mainly be explained by the fact that during the first tapping the influence of the jet of tapped pig iron with slag is withstood by the material. Thereafter there is clearly such a strong bond between the magnesite grains obtained by the heat that the trough in fact behaves as a monolithic body of mainly magnesite.

This bond between the magnesite grains should probably in part be attibuted to a carbon bond as a result of the carbonization of the tar, and in part to a ceramic bond by means of $CaOFe_2O_3$ (calcium-ferrite).

This last sinter bond is probably generated by the fact that the calcium ferrite decreases the temperature, at which the magnesite is sintered, from about 1400°C to about 1000°C.

Good results were obtained with a mass in which the tar content and the carbon content both are about 10%.

Also good results were obtainable if the carbon content was less than 5% and preferably less than 1%. It has even appeared possible to leave out the coal entirely. As the refractory grains become finer the formed refractory coating is more coherent. Thus preferably a mass is chosen in which the refractory grains mainly consist of fine grains.

If, however, a mass is used, to which no coal is added, this grain structure could give rise to the formation of fine cracks at temperature changes.

In that case such crack building could according to the invention be restricted by having the refractory material consist for about 30% of the sieve fractions between 1 and 3 mm, and for the remainder of finer grains.

Finally it has appeared that the final behaviour of the lining formed much depends on the composition of the tar. Better results were obtained according to the invention if the mass contained 9 to 12% of tar, which consisted for more than 70% of pitch, has a content of C_2-resins of 9 to 11% and a viscosity of less than 8000 cp at 20°C.

It may be remarked in this respect that by C_2-resins the tar products are meant, which are soluble in pyridine but not in toluene. Pitch in this respect means the tar product which mainly consists of the fractions of the tar which are the first to soften at the highest temperatures. The quantity of gaseous material therein as a rule is restricted to only a few percents, and the quantity of water to a few tenths of a percent.

As illustrative of the foregoing disclosure, reference may be had to Table I, Examples (1)–(6), setting forth in tabular form particular modes of practicing the invention as above described.

TABLE I I

Example	(1)(2)	(3)(4)	(5)	(6)
Ingredients (%)				
Magnesite[1]	75 75	80 80	84[2]	85[2]
Tar[3]	10 15	10 10	15	15
Ground Bituminous Coal	15 —	10 —	1	—
Coke	— 10	— 10	—	—

[1] Magnesite having an MgO content of at least 70%.

[2] Seive fractions: below 3 mm, 100%; below 1 mm, about 70%.

[3] Pitch content, more than 70%; C_2-resins content, 9–11%; viscosity, less than 8,000 cp at 20° C.

Finally the invention also relates to the pig iron troughs and the like troughs, skimming plates etc., if coated with the material as described above.

We claim:

1. A refractory lining composition for pig iron troughs and the like, said composition comprising

a. ground granular refractory material constituting at least 75% of the composition and not over 92% of the composition,

b. tar constituting at least 8% of the composition and not over 15% of the composition, and

c. from 0 to 15% of ground carbonaceous material selected from the class consisting of bituminous coal and coke,

d. said ground granular refractory material consisting essentially of magnesite having a magnesium oxide content of at least 70%,

e. said ground refractory material consisting about 30% of seive fractions between 1 and 3 mm, with only the remainder of finer grains, and

f. said tar having a pitch content of at least 70% and a C_2-resins content of 9–11%.

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