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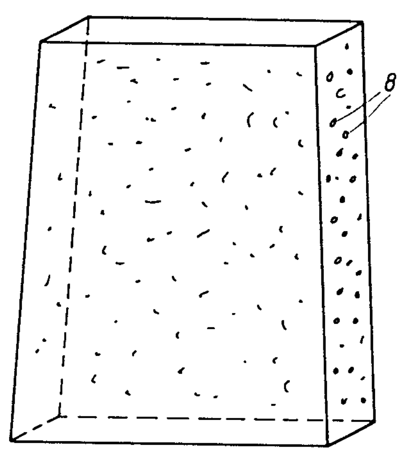
(54) **Brick for a bottom electrode, a rear lining or a hearth connection.**

(57) Brick for a bottom electrode, a rear lining or a hearth connection for a.d.c. arc furnace. According to the invention the brick consist of a porous material which has been impregnated by means of immersion into and/or spraying with an organic fluid, such as pitch, tar or a suspension of graphite, soot or the like, or synthetic resin, whereafter the brick has been coked, for example at a temperature of 350°C, thus creating electric current carrying paths containing coal which paths render the brick electrically conductive.



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Brick for a bottom electrode, a rear lining or a hearth connection

The invention relates to a brick for a bottom electrode, a rear lining or a hearth connection according to the pre-characterising part of claim 1.

With this kind of bricks, the required combination of good electrical conductivity and good heat insulating poses a problem. Too good a heat insulation may often involve poor electrical conductivity and vice versa. Electric conduction at the bottom of a d.c. furnace is sometimes arranged by means of bricks or compounds containing graphite. However, the addition of graphite deteriorates the heat insulating capacity, whereby cooling and/or a thicker lining are required to avoid thermal overload of the furnace shell at the bottom or in the wall, or of the shell in a ladle wall.

Insulating bricks with a varying degree of open porosity (50-90 %) are available on the market. In the case of d.c. furnaces (ladles) these bricks involve two decisive disadvantages. They are not electrically conductive and their mechanical strength is too poor for them to be used as rear insulating lining. Furthermore, gas flushing bricks with a directional open porosity are available on the market, but these bricks are electrically non-conductive.

The invention aims at developing a brick of the above-mentioned kind, which combines good electrical conductivity, good heat insulating, and considerable mechanical strength.

To achieve this aim the invention suggests a brick according to the introductory part of claim 1, which is characterized by the features of the characterizing part of claim 1.

Further developments of the invention are characterized by the features of the additional claims.

According to the invention, an electrically conductive, carbonaceous material has been added, completely or partially, to the open porosity.

To achieve a continuous carbon conductor in pressed magnesite graphite bricks, 13 per cent by weight coal (≈20 per cent by volume) is required at the present time. These bricks are to be regarded as chemically bound. In ceramically bound bricks with a porosity of about 20 %, it is presently possible to reach a content of carbonized residue of a maximum of 5 per cent by weight by means of impregnation. With a proper choice of the pore size of the grains and the viscosity of the coal carrying impregnating agent, it should be possible to obtain contents of carbonized residue of 13-23 % at a porosity of 50-90 %, which is sufficient to provide electrical conduction at the bottom of a d.c. arc furnace or ladle.

The cold compression strength of chemically bound magnesite graphite bricks is 20-35 MPa and for insulating bricks about 2 MPa. With a combination of both types of binding, the mechanical strength after impregnation and heat treatment (carried out once or several times) is increased. Instead of impregnation, or complementary to impregnation, spray treatment can be carried out as well.

The impregnating agent may, for example, consist of tar, pitch or resin, or of a suspension of graphite, soot or the like, or synthetic resin. The heat treatment is suitably carried out at a temperature when the binder is being coked, for example at 350°C or thereabove.

In bricks having a directional porosity, such as gas flushing bricks, the channels are filled with a material which, in the same way as described above, is allowed to coke. Depending on the degree of filling and the degree of graphitization, a sectional surface of channels of 3-30 % may be sufficient for the bottom of a d.c. arc furnace.

The invention will now be described in greater detail with reference to the accompanying drawings showing - by way of example - in

Figure 1 a d.c. arc furnace, in which bricks according to the invention are employed,

Figure 2 part of the bottom electrode (rear lining) of the d.c. arc furnace,

Figure 3 a brick according to the invention.

The d.c. arc furnace in Figure 1 is provided with an electrode having a hollow channel for reduction purposes. The arc 1 is struck between the electrode and the melt 2. Numerals 3, 4, 5 and 6 designate the various brick layers, with 3 being the layer located nearest to the melt 2 and 6 the layer located nearest to the hearth connection.

Figure 2 shows the brick layers (3-5) in greater detail and also the hearth connection 7. Either layer 5 or layer 6, that is, that part of the brick bottom or wall located nearest to the cold side, may consist of bricks according to the invention.

Figure 3 shows a pressed brick of aluminium oxides, magnesite, or zirconium oxide. As will be seen, the brick is porous, and the open pores 8 have been impregnated with a carbonaceous material, for example pitch, tar, a suspension of graphite, soot or the like, synthetic resin, etc., for the purpose of achieving a carbon content in the brick which constitutes a conductor for the current, that is, the brick is electrically conductive while at the same time its porosity provides for good thermal insulation.

By using bricks which are chemically or ceramically bound and have a porosity of about 20 %, a content of carbonized residue of at the most 5 per cent by weight can be attained by means of impregnation. With a porosity of 50-90 %, contents of carbonized residue of 13-23 % can be attained. Complementary to the impregnation, spraying of the bricks can be used. In certain cases, only spraying may be sufficient. The treatment can be carried out once or several times. As mentioned above, the cold compression strength of the chemically bound magnesite graphite bricks is 20-35 MPa and for insulating bricks about 2 MPa.

The embodiment of the bricks according to the above may be varied in many ways within the scope of the following claims.

CLAIMS

1. Brick for a bottom electrode, a rear lining or a hearth connection for a d.c. arc furnace, characterized in that the brick consist of a porous material which has been impregnated by means of immersion into and/or spraying with an organic fluid, such as pitch, tar or a suspension of graphite, soot or the like, or synthetic resin, whereafter the brick has been coked, for example at a temperature of 350°C, thus creating electric current carrying paths containing coal which paths render the brick electrically conductive.

2. Brick according to claim 1, characterized in that it has a porosity of 50-90 % and a content of carbonized residue after treatment of 13-23 per cent by weight.

3. Brick according to claim 1, characterized in that it has a directional porosity (gas flushing brick) providing channels in the brick which are filled with a carbonaceous material which is caused to become coked, said channels occupying 3-30 % of the sectional surface of the brick.

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FIG.1

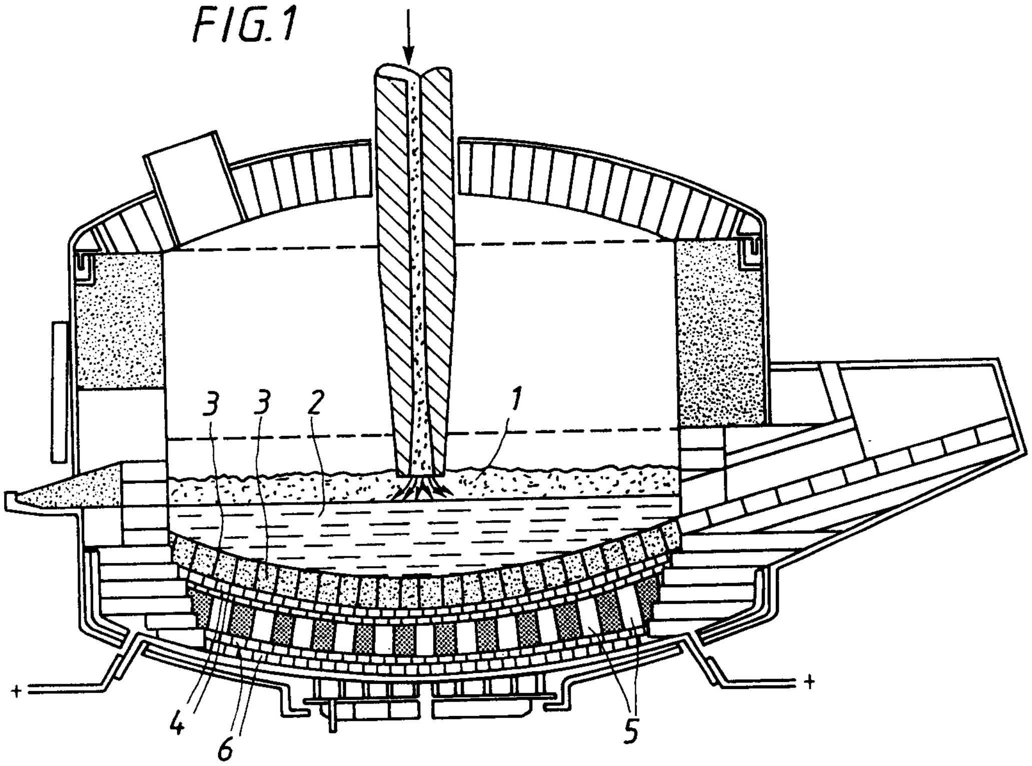

FIG.2

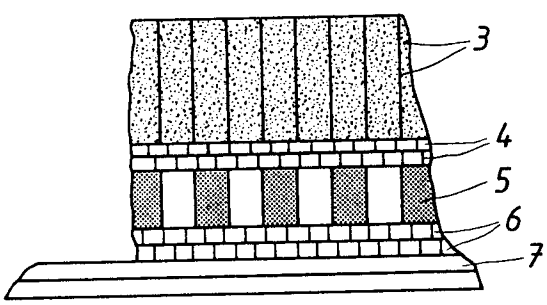

FIG.3