A. PETERSSON.

METHOD OF CHARGING ELECTRIC RESISTANCE FURNACES.

APPLICATION FILED NOV. 27, 1909.

971,782. Patented Oct. 4, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

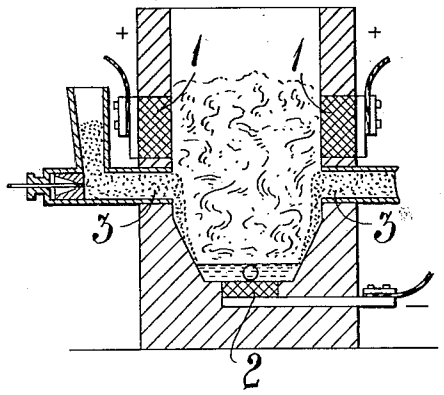


Fig. 2.

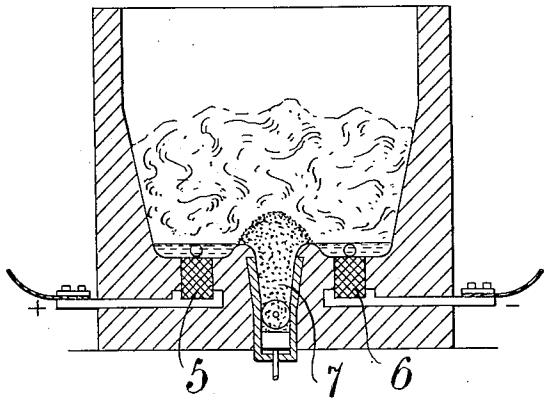
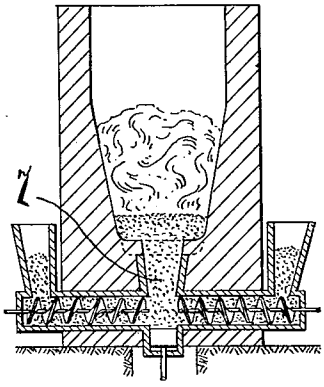


Fig. 3.



Witnesses
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2 SHEETS—SHEET 2.

Fig. 4.

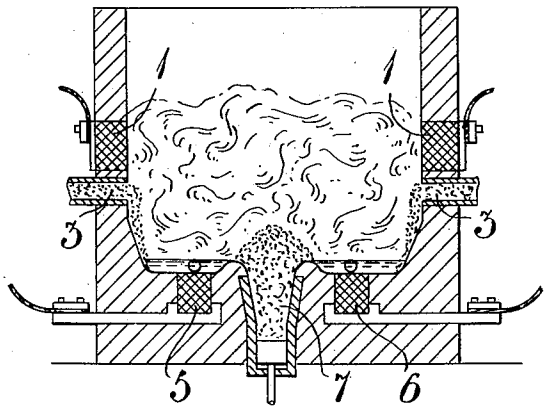


Fig. 6.

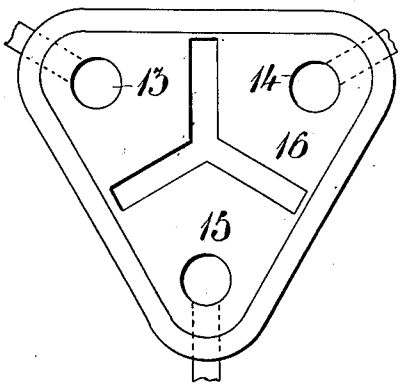


Fig. 5.

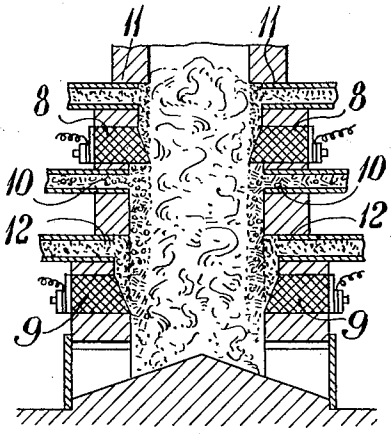
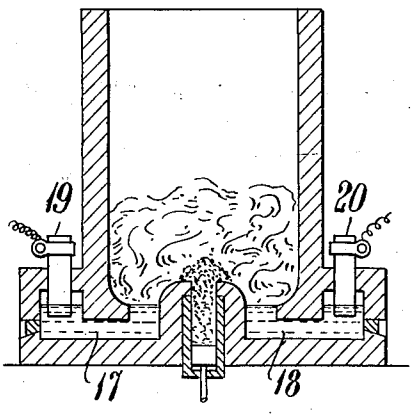


Fig. 7.



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UNITED STATES PATENT OFFICE.

ALBERT PETERSSON, OF ODDA, NORWAY.

METHOD OF CHARGING ELECTRIC-RESISTANCE FURNACES.

971,782. Specification of Letters Patent. Patented Oct. 4, 1910.

Application filed November 27, 1909. Serial No. 530,093.

To all whom it may concern:

Be it known that I, ALBERT PETERSSON, a citizen of the Kingdom of Sweden, residing at Odda, Norway, have invented a new and useful Improved Method of Charging Electric-Resistance Furnaces, of which the following is a specification.

This invention relates to an improved method of charging electric resistance furnaces.

In electric resistance furnaces, especially those of the shaft type, in which the electrodes of both polarities are provided in the side walls of the furnace or in the bottom of the same or in which the electrodes of the one polarity are provided in the side walls and the electrodes of the other polarity in the bottom, there will always after a certain time of working appear a disadvantage consisting in that the electric current chiefly follows the side walls or the bottom of the furnace, *i. e.* the material which is in contact with the side walls (and) or the bottom, or the side-walls and the bottom themselves become such good conductors that the main part of the electric current flows through them and not through the central parts of the charge. Hereby the furnace walls are injured by being melted or vaporized, or if this does not occur, the process is not economical.

The object of the present invention is to obviate the said disadvantage and the invention consists in charging cold material through feed openings in the side walls of the furnace or the bottom between and suitably near to the electrodes so that at least a part of the walls of the furnace between the electrodes and the material nearest thereto are kept at a comparatively low temperature so as to offer a high electric resistance. Hereby the current will be prevented from following the walls of the furnace and will consequently be compelled to take its way through the central parts of the charge. By suitable arrangement of the said feed openings and by regulating the quantity of the charged material the density of the current can be regulated and the current be prevented from taking its way through parts of the furnace where the heating effect of the current would be disadvantageous. The comparatively cold, non-conducting material which is fed through the said feed openings also constitutes a heat insulating layer for the walls and the bottom of the furnace so that the same are protected from being destroyed by the high temperature in the furnace. Other advantages, such as reduced consumption of the electrodes, a more uniform working of the furnace, preventing the material from cooking and being thrown out from the furnace otherwise caused by too early melting of the charge and so on, may be reached by having the material which is charged through the said feed openings between the electrodes of another composition than that part of the charge which is introduced through the shaft, while the whole charge is of such a composition that the result desired will be obtained. For instance, it is suitable in the reduction of ore to introduce a charge having a high percentage of carbon through the shaft while at the same time introducing a charge having a great percentage of ore through the openings mentioned above in order to prevent both wearing of the electrodes and too early melting of the charge. In reduction of ore, ore dust, lime, fusing agents, and so on may be added through the said feed openings while ore together with an excess of carbon or only carbon may be introduced through the shaft. The introduction of the material through the feed openings may be effected by means of screws, pistons or other feed mechanisms of any well known or suitable construction.

In the accompanying drawings I have shown some furnaces for carrying the method into practice.

Figure 1 shows a vertical section of such a furnace. Figs 2 and 3 show vertical sections at right angles to each other of a second furnace. Fig. 4 shows a vertical section of a third furnace. Fig. 5 shows a similar view of a fourth furnace. Fig. 6 shows a plan view of a fifth furnace, and Fig. 7 shows a vertical section of a sixth furnace.

Referring to Fig. 1, 1 indicates the electrodes of one polarity, which are provided in the side-walls of the furnace. 2 indicates a bottom electrode, and 3 indicates feed openings provided below the electrodes 1. Through the said openings cold material, suitably in pulverous condition, is introduced, whereby the electric current from the electrodes 1 will be compelled to flow toward

the center of the furnace. The density of the current increases toward the bottom electrode 2.

The furnace illustrated in Figs. 2 and 3 has two bottom electrodes 5 and 6 of opposite polarity, between which the working current flows through the material. In order to prevent the current from following the bottom of the furnace cold pulverous material is charged through a feed opening 7 provided in the bottom of the furnace. By the said cold non-conducting material, which is renewed according as it melts, the electric current will be compelled to flow through the charge above the said cold material.

Fig. 4 shows a furnace in which the devices shown in Figs. 1–3 are combined with each other. 1, 1 are two lateral electrodes which suitably are connected to one phase of a three-phase circuit, while the electrodes 5 and 6 are each connected to one of the other phases of said circuit. Feed openings 3 with feed mechanisms are provided below the electrodes 1, 1, and between the electrodes 5 and 6 is also provided a feed opening 7.

Fig. 5 shows a resistance furnace having the electrodes 8 and 9 of both polarities provided in the side walls of the furnace. Below the electrodes 8 the feed openings 10 are provided. Above the said electrodes 8 and 9 are further in well known manner provided feed openings 11 and 12 for introducing pulverous carbon in order to prevent the charge moving downward through the shaft from destroying the electrodes.

Fig. 6 shows a plan view of a furnace arranged to be worked by three-phase current. 13, 14 and 15 indicate three bottom electrodes each adapted to be connected to one wire of a three-phase net, and 16 indicates a star-shaped opening in the bottom of the furnace through which cold material may be introduced into the furnace in similar manner as described with reference to Figs. 2 and 4 in order to prevent the current or the main part thereof from flowing between the electrodes along the bottom of the furnace or through the material thereof. When four bottom electrodes and two-phase current are used, the feed opening in the bottom of the furnace may be cross-shaped.

Fig. 7 shows a furnace arranged substantially in the same manner as the furnace illustrated in Fig. 2 except that liquid electrodes are used for admitting the current into the furnace. The contacts 19 and 20 for leading the current to the melted electrodes may be of any suitable kind. For instance they may consist of rods dipping into the melted mass, as is shown in the drawing, or of bottom contacts of carbon or the like.

In each of the above described furnaces the main part of the charge, for instance a mixture of ore and carbon, is filled in the furnace from above in the usual manner.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. The method of charging continuously working electric resistance metallurgical furnaces having electrodes of different polarity in the walls thereof, which consists in introducing a part of the charge from above while a charge of cold material is introduced between electrodes of different polarity to maintain a comparatively cold layer of material on said walls in the hot zone of the furnace, whereby a short-circuiting of the current through the furnace walls is prevented.

2. The method of charging continuously working electric resistance metallurgical furnaces having electrodes of different polarity in the walls thereof, which consists in introducing a part of the charge from above while a charge of cold non-conductive pulverous material is introduced between the electrodes of different polarity to maintain a comparatively cold layer of material on said walls in the hot zone of the furnace, whereby short-circuiting of the current through the furnace walls is prevented.

3. The method of charging continuously working electric resistance metallurgical furnaces having electrodes of different polarity in the walls thereof, which consists in introducing a part of the charge from above while a charge of cold, non-conductive pulverous material is introduced through openings in the side walls of the furnace between electrodes of different polarity to maintain a comparatively cold layer of material on said walls in the hot zone of the furnace, whereby a short-circuiting through the furnace walls is prevented.

4. The method of charging continuously working electric resistance metallurgical furnaces having electrodes of different polarity in the walls thereof, which consists in introducing a part of the charge from above while a charge of cold, non-conductive, pulverous material is introduced through openings in the side walls and in the bottom of the furnace between electrodes of different polarity to maintain a comparatively cold layer of material on said walls in the hot zone of the furnace, whereby a short-circuiting of the current through the furnace walls is prevented.

5. The method of charging continuously working electric resistance metallurgical furnaces having electrodes of different polarity in the walls thereof, which consists in introducing a charge from above having a high percentage of carbon and simultaneously introducing, through openings in the side walls of the furnace between electrodes of different polarity, a cold charge having a

high percentage of carbon to maintain a comparatively cold layer of material on said walls in the hot zone of the furnace, whereby a short-circuiting of the current through the furnace walls is prevented.

6. The method of charging continuously working electrical resistance metallurgical furnaces having electrodes of different polarity in the walls thereof, which consists in introducing a charge from above having a high percentage of carbon and simultaneously introducing, through openings in the side walls and in the bottom of the furnace between electrodes of different polarity, a cold charge having a high percentage of carbon, to maintain a comparatively cold layer of material on said walls in the hot zone of the furnace, whereby a short-circuiting of the current through the furnace walls is prevented.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

ALBERT PETERSSON.

Witnesses:
GORG M. SAYE,
L. L. HJAMENIK.