June 21, 1949. G. M. HANSEN 2,473,681

PROCESS OF BREAKING UP THE CHARGE IN ELECTRIC SMELTING FURNACES

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Fig. 1

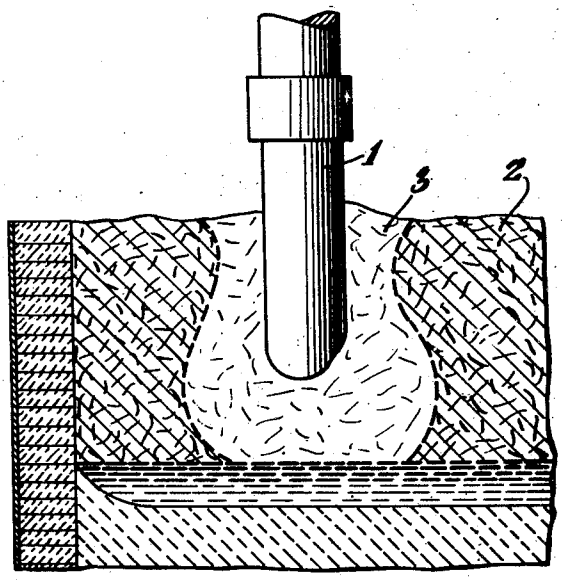
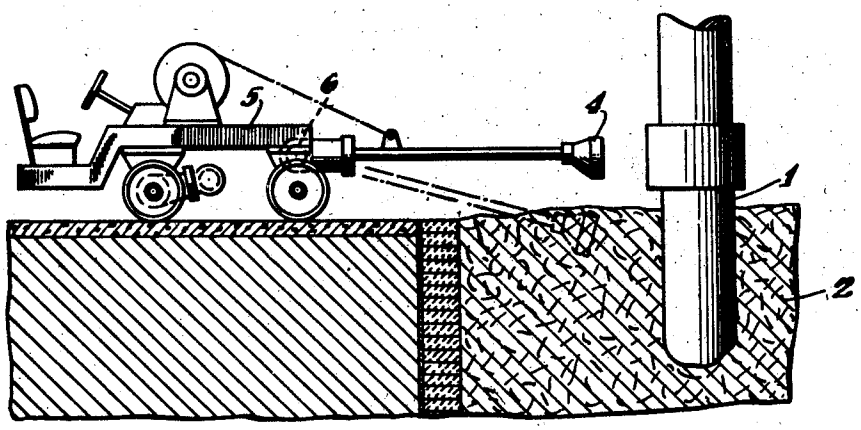


Fig. 2



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PROCESS OF BREAKING UP THE CHARGE IN ELECTRIC SMELTING FURNACES

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1 Claim. (Cl. 13—34)

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In the electric smelting of carbide and ferro-alloys, etc., where the charged is filled into the furnace around the electrodes and gradually sinks into the zone of fusion, there will be formed a crater around each electrode, and the reaction mixture sinks down into the crater through an opening which is tapered towards the surface. This form of crater is characteristic to most smelting processes and the most important difficulties of operation originate in said craters. The material in or above their narrow end at the surface will easily sinter and remain suspended, forming a roof whereby the supply of charge to the zone of reaction is very much hindered. The materials below said roof easily melt down, and hollows are therefore formed through which charge falls down from time to time. These materials cause strong gas evolutions when they fall into the overheated zone below and the furnace will easily "blow," that is; gas will accumulate below the creater roof where the gas pressure will rise until it is strong enough to break through the roof. All gas then escapes through the place of breakage, and gases escape in strongly overheated condition without having any opportunity to give off their heat to the materials to be smelted.

The gas also carries great quantities of evaporation products which means a considerable loss of materials during smelting.

To avoid the above mentioned difficulties the said roof-formation must be broken down as often as possible, for example by means of iron rods, wooden poles or the like. This operation, which is the most important one in the handling of the smelting furnaces, is troublesome and exposes the labourers to severe heat. It also increases considerably the amount of labour required in the operation of the furnaces. Many people have made considerable efforts to prevent the above mentioned formation of roofs. Stoking arrangements have thus been constructed which by means of hydraulic or pneumatic apparatus from time to time push the iron rod or the like into the charge thus breaking it up. It has, however, been found that such apparatus are very expensive and strongly subjected to heat radiation and have usually not given the favourable results which were expected.

Applicant's process consists in a pressing or rolling down of the charge, its surface being treated with a comparatively heavy body which is moved back and forth over the top of the charge, the whole surface thus being gradually

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subjected to the action of said body. This body may consist of any material having a sufficiently high specific gravity and being heat resistant. It may be actuated by hand but mechanical means are preferable. The mechanical part may then be placed outside of the furnace, away from the heat. The said heavy body, whose weight must be determined by the crust to be broken through, may be a block of iron, or preferably cast steel, fastened to a rod which may be moved back and forth allowing the block to exert pressure on the whole surface of the charge. The block may also be made in the form of a roller or of any shape suitable to each particular case. Its weight is usually between 50 and 200 kilos.

A suitable form of the invention is shown in the drawing, where Fig. 1 shows a section through an electric furnace. 1 is the electrode, 2 the charge, 3 the upper opening in the crater. The dashed line indicates the shape of the crater.

Fig. 2 shows a section through the same furnace with an arrangement for mechanical treatment of surface of the charge. 4 is a block of cast steel attached to a rod turnable around the point 6. 5 is a trolley of the type used for charging smelting furnaces and mechanically driven.

By running the trolley back and forth the block 4 will break the crater wall to pieces and cause an even sinking of the charge all around the furnace as the trolley is run around. As will be seen from the drawing, the block may follow a little way downwards when a cavity breaks down.

The same trolley may be used for charging the furnace and for subsequent surface treatment as the rod, to which the block 4 is attached, may easily be pulled out and put back in place. The great heat capacity of the block as well as the loss of heat through the rod is sufficient to prevent it from melting or being injured even if it be subjected to a strong blast flame.

Experience shows that this method of breaking the bridge formations has a very favourable influence on the furnace process. Cavities formed under the bridge disappear rapidly and an effective and quiet smelting may easily be attained. One man is quite sufficient to run the apparatus.

The smelting is usually effected by first charging the furnace by filling the materials around the electrode. The furnace is then left alone for some time whereupon the surface is treated in the above described way. Later on a new amount

of charge is filled in, etc. It is obvious that the details of carrying out the invention may vary greatly as they must be varied according to the type and construction of the smelting furnace, and the invention is therefore in no way limited to the construction illustrated in the drawing.

I claim:

The method of treating the charge in an electric smelting furnace of the type in which the charge melts around the electrodes and tends to sinter into a crust adjacent its surface in an area removed from the electrode to form a crater including a roof and crater walls below which roof are cavities into which roof material falls from time to time, which comprises applying to the surface of the charge a weight of sufficient specific gravity to effect the breaking of the sintered crust and moving such weight back and forth over and in contact with the charge to apply pressure thereto to break the crust, destroy such roof formations and break the crater walls to pieces, thereby gradually effecting an even sinking of the charge within the furnace.

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