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2,139,201

ELECTRICALLY HEATED SHAFT FURNACE

Filed April 1, 1937

Fig. 2.

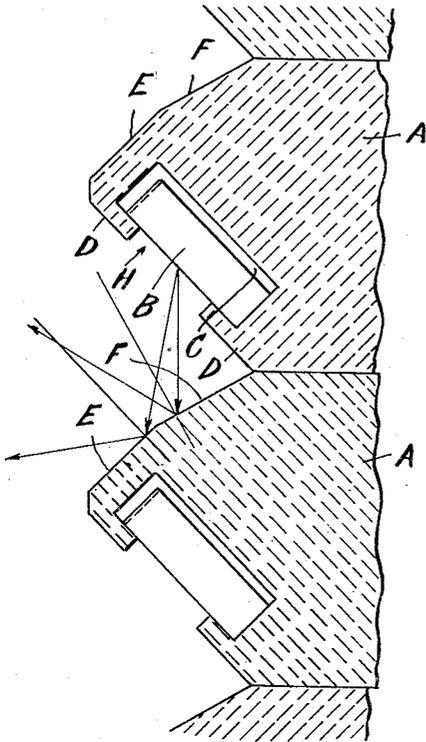


Fig. 3.

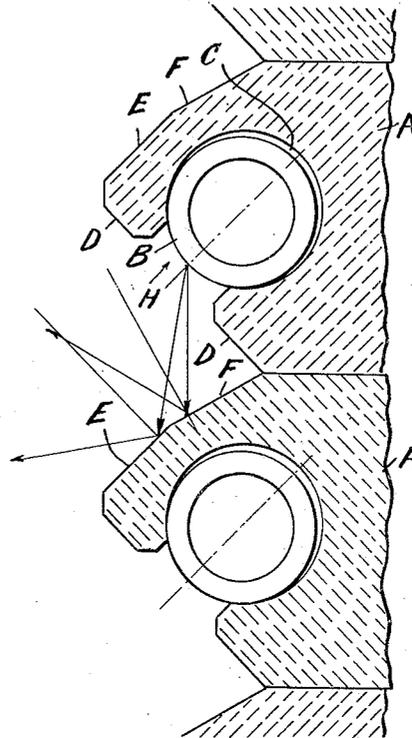
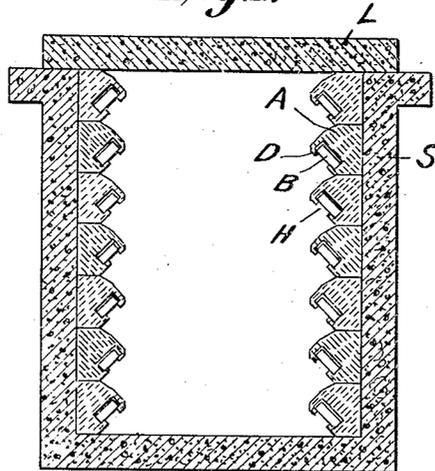


Fig. 1.



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ELECTRICALLY HEATED SHAFT FURNACE

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3 Claims. (Cl. 13—25)

In electrically heated shaft furnaces in which are used heating elements placed in the side walls of the furnace shaft, and having the form of corrugated bands or wires, the heating elements are exposed to damage by objects falling down, or by oxides and metal particles separated from the material being annealed or heated.

For the purpose of protecting the elements, it has been tried to place them behind plates made of ceramic material of high heat conductive power, for instance carborundum. This entails, however, several disadvantages, particularly, the one that the emission of heat to the interior of the furnace is rendered more difficult and that the heating elements positioned behind said plates will be exposed to very high temperatures, their life being thereby essentially reduced.

In order to avoid this inconvenience, it has also been tried to place the elements in deep recesses in the brickwork of the furnace walls, which recesses open perpendicularly towards the vertical longitudinal axis of the furnace shaft. Also in this case the elements are exposed to damage by oxides, metal particles or the like, separated from the material being annealed, which is especially the case when the elements are band shaped and have their broad side facing the furnace chamber.

Another great drawback occurring when the heating elements are placed in the manner just mentioned in recesses opening directly towards the furnace shaft, consists therein that the glowing element are visible from the charge opening at the upper end of the shaft when uncovering said opening for inspection or charging. By this the inspection of the material being annealed and the insertion of fresh objects on their proper place is rendered very difficult. Moreover, on account of the fact that the heat rays are directed perpendicularly outwardly towards the axis of the furnace shaft and since the heat tends to rise, the highest temperature will be concentrated at the upper parts of the furnace, and, in addition, upon opening the furnace shaft great amounts of heat will escape.

These drawbacks will be avoided by the present invention which is characterized by the fact that the furnace bricks are provided with projections inclined from the upper side downwards towards the bottom, and that beneath these projections are arranged recesses for the heating elements, the opening of said recesses through which the heat rays are emitted, being turned downwards in such a manner that an essential part of the generated heat radiates unhindered in a down-

ward direction towards the bottom portion of the furnace, whereas the heat rays which are not directly emitted through said openings, are reflected by the downwardly inclined surface of the projection of the underlying brick so that these rays will be directed upwardly towards the interior of the furnace.

In this way, the heating elements will be well protected against objects falling down and against oxides and metal particles separated from the material being annealed or heated, and, besides, the glowing elements will be invisible from the charge opening of the furnace shaft when said opening is uncovered, thus permitting the material under treatment to be inspected without difficulty and, upon the insertion of fresh charges, to place the objects in an appropriate manner. Moreover, the greater part of the heat rays will be directed downwards, which, as mentioned above, causes partly a more uniform division of heat in the furnace shaft, partly a reduction of the losses of heat upon uncovering the shaft.

The invention is illustrated on the accompanying drawing, wherein—

Figure 1 shows a vertical section through an electrically heated shaft furnace which is lined with bricks according to the present invention,

Figure 2 shows, on a larger scale, a section of two bricks fitted with inlaid heating elements in the form of bands, and

Figure 3 shows a similar structure to that shown in Fig. 2 with the exception that the elements are wire shaped.

A designates the refractory bricks forming the lining of the furnace shaft S, and B designates the heating elements which are placed in recesses C in the bricks.

According to Figures 1 and 2 these recesses are rectangular in cross section and occupy a position inclined upwardly towards the interior of the furnace. The elements placed therein consist of corrugated bands and are retained in place by projecting edges D. Due to this position of the recesses and of the heating elements the heat rays passing through the opening H turned downwards, will be directed obliquely downwards towards the bottom part of the furnace.

On the upper side, the bricks are provided with projections E inclined downwardly towards the bottom of the furnace, which projections protect the heating elements B situated beneath the same against objects falling down detached oxides and metal particles, etc., and, besides, the glowing heating elements situated beneath said projections will be invisible from the charge

opening at the upper end of the furnace shaft, upon the removal of the cover L.

The heat rays which do not pass directly in a downward direction through the openings H, encounter the surfaces F of the projections of the underlying bricks and are reflected by said surfaces in an upward and outward direction towards the interior of the furnace, as indicated by the arrows. The surfaces F are, therefore, inclined in a manner adapted to this purpose.

According to Figure 3, the arrangement is similar to that of Figure 2, with the exception, however, that the recesses C in the bricks are circular on account of the circular form of the heating elements B. The openings H between the projections D are, however, also in this case so arranged that the rays of heat are directed substantially downwardly towards the lower parts of the furnace, and, besides, the projections E make the glowing heating elements invisible from the charge opening.

According to Figure 2, the heating elements B which consist of corrugated bands are arranged in such a manner that their edge surfaces are facing the interior of the furnace, thus the advantage being obtained that they will not be exposed so strongly to the injurious influence of oxides, metal particles etc., as if the broad side were turned towards the interior of the furnace.

Heating elements may, according to the invention be arranged either only in two opposite

side walls, in case iron plates or the like are to be annealed, or in all four side walls, in case this is suitable for other objects to be heated.

I claim:

1. An electrically heated shaft furnace comprising superimposed bricks lining the furnace wall, each brick including a projection inclined downwards from the upper side of the brick and a recess below said projection for accommodating the heating element, said projection overhanging said recess and protecting the heating element from material falling through the furnace, said recess facing downwardly whereby the major part of the heat rays are directed towards the lower part of the furnace chamber, the heat rays not passing directly into the furnace chamber from said recess being reflected upwardly into said chamber by the upper surface of the projection of the underlying brick.

2. An electrically heated shaft furnace as claimed in claim 1 characterized in that the recesses are rectangular in cross section and contain heating elements consisting of corrugated bands arranged in the recesses in such manner that the edges thereof face the furnace chamber.

3. An electrically heated shaft furnace as claimed in claim 1 characterized in that the recesses provided in the bricks is circular in cross section and contain wire-shaped heating elements.

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