May 3, 1938. P. HONEGGER 2,116,202

ELECTRIC SMELTING FURNACE COVER

Filed Feb. 13, 1936

Fig. 3.

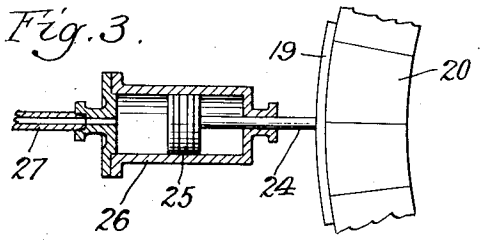
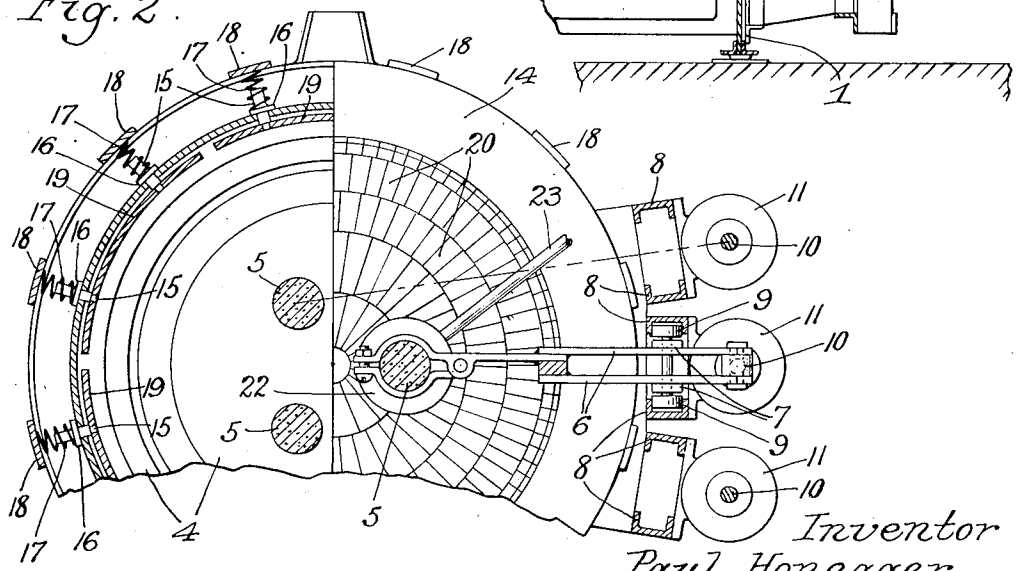


Fig. 1.

Fig. 2.



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ELECTRIC SMELTING FURNACE COVER

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3 Claims. (Cl. 13—9)

This invention relates to furnace covers and has for one object to provide a furnace cover which, irrespective of the shape of the furnace or its cover, provides automatic means to compensate for expansion and contraction.

Another object is to provide a furnace cover construction primarily suitable for use with electric arc furnaces in which the construction is such that the expansion and contraction of the furnace cover cannot crowd upon or otherwise interfere with the electrode or with its movement.

Another object is to provide means in connection with the cover of a furnace for elastically and yieldingly holding the members of which the cover is formed. Another object is to provide in connection with a furnace cover means for automatically compensating for temperature variations in the material of which the cover is formed.

Another object is to provide in connection with a furnace cover automatic means effective upon expansion of the cover, due to increase of temperature, to prevent displacement or shifting of the cover parts so as to cause jamming of the electrode.

Other objects will appear from time to time in the specification and claims.

The invention is illustrated more or less diagrammatically in the accompanying drawing, wherein:—

Figure 1 is a generally vertical section through one form of furnace to which the cover can be applied;

Figure 2 is a top plan view with parts in section, illustrating a portion of the top or upper surface of the cover in addition to a section through the supporting structure for the cover, taken generally at line 2—2 of Figure 1;

Figure 3 is an enlarged sectional detail showing a modified form of the yielding arch supporting structure.

Like parts are designated by like characters throughout the specification and drawing.

1 is a furnace supporting structure of any suitable form whose details form no essential part of the present invention. As shown, the furnace comprises a brickwork structure 2, reinforced by members 3 and having a lining portion 4 It is to be understood that this invention is not limited to any particular furnace nor to any particular details of furnace construction and it may be applied to almost any furnace and to a furnace of almost any shape although in the particular form herewith shown it is primarily adapted for application to an electric arc furnace in which a plurality of electrodes is positioned to extend through the cover into the interior of the furnace.

In the particular form here shown there are three electrodes 5 each of which is supported on an arm 6 which is secured to a moving support 7 mounted within the channel guides 8 and carrying rollers 9 which contact the members 8. At its outer end each arm is secured to a piston rod 10 which carries at its other end a piston, not shown, lying within a cylinder 11.

A servo motor or any other desired mechanism not here shown is effective to vary the pressure within the cylinder 11 in response to variations in the current intensity, so that the distance of the electrodes from the metal within the furnace is varied and in this way the length of the electric arc is adjusted or varied.

A cable 12, one for each electrode 5, furnishes current to the electrode to which it is attached. The cable is preferably flexible and secured to a conductor 13 which is mounted upon and moves with the arm 6. As in the case of the furnace itself, the electrode details just described are not essential to the invention and other electrodes or electrode mountings and adjustments, might equally well be used with the cover of the present invention. In fact, means other than electrodes for heating the furnace might be used.

The furnace cover comprises a supporting ring 14. This ring conforms generally to the shape of the furnace, whatever shape that may be, and is preferably of generally I-shaped cross section, thus providing an upper and a lower flange, generally horizontal, and a generally vertical web joining them. This web is pierced to provide convenient passage for pins 15 of which a number are positioned about the supporting ring 14.

Each pin has a collar 16 which serves to limit its inward movement through the web of the ring 14. A spring 17 is positioned about each pin. Each such spring bears at one end against collar 16 on its particular pin 15, and at its other end bears against a supporting member 18, formed as a part of or secured to the supporting ring 14. The springs thus normally tend to urge the pins inward to the limit of their movement, that is to say, until the collars 16 are in contact with the generally vertical web of the supporting ring 14. The pins are shown in this position in Figures 1 and 2.

Positioned inside of the supporting ring 14 and engaged or supported by the inner ends of the pins 15 are a plurality of preferably segmental

members 19. These segmental members serve as the support for the several stones or pieces of which the cover of the furnace is formed. These may be of any suitable refractory material, for instance, silica-brick. They are indicated generally by the numeral 20. It is to be understood that they may be of any desired shape and arrangement and the particular arrangement shown comprises merely one example. The furnace cover is provided with a perforation or opening 21 for each electrode. In the particular form shown herewith there are three electrodes. For packing or sealing, and in order to reduce the loss of heat, a ring 22 may be positioned upon the cover and about each electrode 5. As shown this ring is hollow and arranged to receive a cooling liquid from any suitable source through the conduit 23.

In Figure 3 a modified form for mounting the segments 19 is shown. In this form, instead of springs, hydraulic or other fluid pressure may be used. Thus each of the segments 19 is mounted on or in contact with a piston rod 24 which has on its opposite end a piston 25. This piston is positioned within a cylinder 26, which receives pressure fluid from any desired source and of any desired nature through a conduit 27. It is obvious that the form of Figure 3 comprises therefore a fluid pressure device which accomplishes the same purpose and permits the same conditions of operation as those accomplished and permitted by the structure of Figures 1 and 2. Each of these forms has the common purpose of providing a yielding, flexible or elastic mounting for the furnace cover.

It will be realized that whereas I have herewith shown and described a practical operative device, nevertheless many changes might be made in the size, shape, number and disposition of parts without departing from the spirit of the invention and I wish, therefore, that my showing be taken as in a sense diagrammatic.

In particular the cover might have any desired plan, round, polygonal or otherwise. While the supporting ring 14 has been shown as a unit, obviously it might be made of sections, rigidly positioned, or any other generally fixed mounting might be provided about the edge of the cover as a base and support for the segments 19.

The use and operation of my invention are as follows:

As above noted, the parts are shown in Figures 1 and 2 in the position which they occupy when the furnace is not heated, or at least when it has not been heated sufficiently to cause any effective expansion of the stones or bricks of the cover. Upon a sufficient heating of the furnace the cover is, of course, heated, the stones or other pieces of which the cover is made expand and the segments 19 are, or tend to be, pressed outwardly. Since the segments 19 are elastically or yieldingly mounted, with respect to the fixed support 14, the members 20, upon expansion, due to heating, press these segments outwardly a distance depending upon the amount of expansion. Since the segments 19 are discontinuous, should non-uniform expansion of the cover occur, a non-uniform outward movement of the segments 19 occurs to compensate for it and no displacement or distortion of the various members 20 of which the cover is made can occur sufficiently to cause jamming or distortion about the electrodes to interfere with their operation. Further, the pressure stresses of the cover and of the separate members of which it is made are made more uniform due to the selective yielding possible as a result of the fact that the segments are discontinuous and separately mounted, and thus excessive tension within the cover which might be disastrous to it is avoided.

Upon cooling the separate members 20 under contraction are not separated from each other and distortion of the cover cannot occur, again because, due to the elastic or yielding mounting of the segments 19 with respect to the fixed supporting ring 14, the members 20 are pressed inwardly again and so retain their original arrangement. Thus the elastic and yielding mounting of the edge of the cover, whether in the form of Figures 1 and 2 or of Figure 3, automatically permits and compensates for the expansion of the cover due to heating. It prevents crowding and jamming of the electrodes and prevents excessive tensions and stresses in and resultant damage to the cover, both during expansion and contraction.

I claim:

1. For use with an open topped furnace, a cover including a circumferential compression member, a self-supporting roof surrounded by the compression member including a plurality of fitted blocks of heat-resistant material adapted to expand or contract in response to temperature changes, and a plurality of separate yielding means associated with said compression member and adapted to direct thrusts inwardly against the outer edge of said roof at various points thereabout, said roof being apertured to permit the passage of electrodes therethrough.

2. For use with an open topped furnace, a cover including a circumferential compression member generally circular in form, a self-supporting roof surrounded by the compression member, including a plurality of fitted blocks of heat-resistant material adapted to expand or contract in response to temperature changes, a plurality of abutment segments opposed to the edge of said roof, a plurality of separate yielding means associated with said compression member and adapted to direct thrusts inwardly against said abutment segments at various points about the edge of said roof, said roof being apertured to permit the passage of electrodes therethrough.

3. For use with an open topped furnace, a cover including a circumferential compression member, a self-supporting roof surrounded by the compression member, including a plurality of fitted blocks of heat-resistant material adapted to expand or contract in response to temperature changes, a plurality of abutment segments opposed to the edge of said roof, guiding members therefor, said compression member being apertured to permit said guiding members to pass therethrough, and yielding means adapted to thrust said segments inwardly against the edge of said roof at various points thereabout.

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