

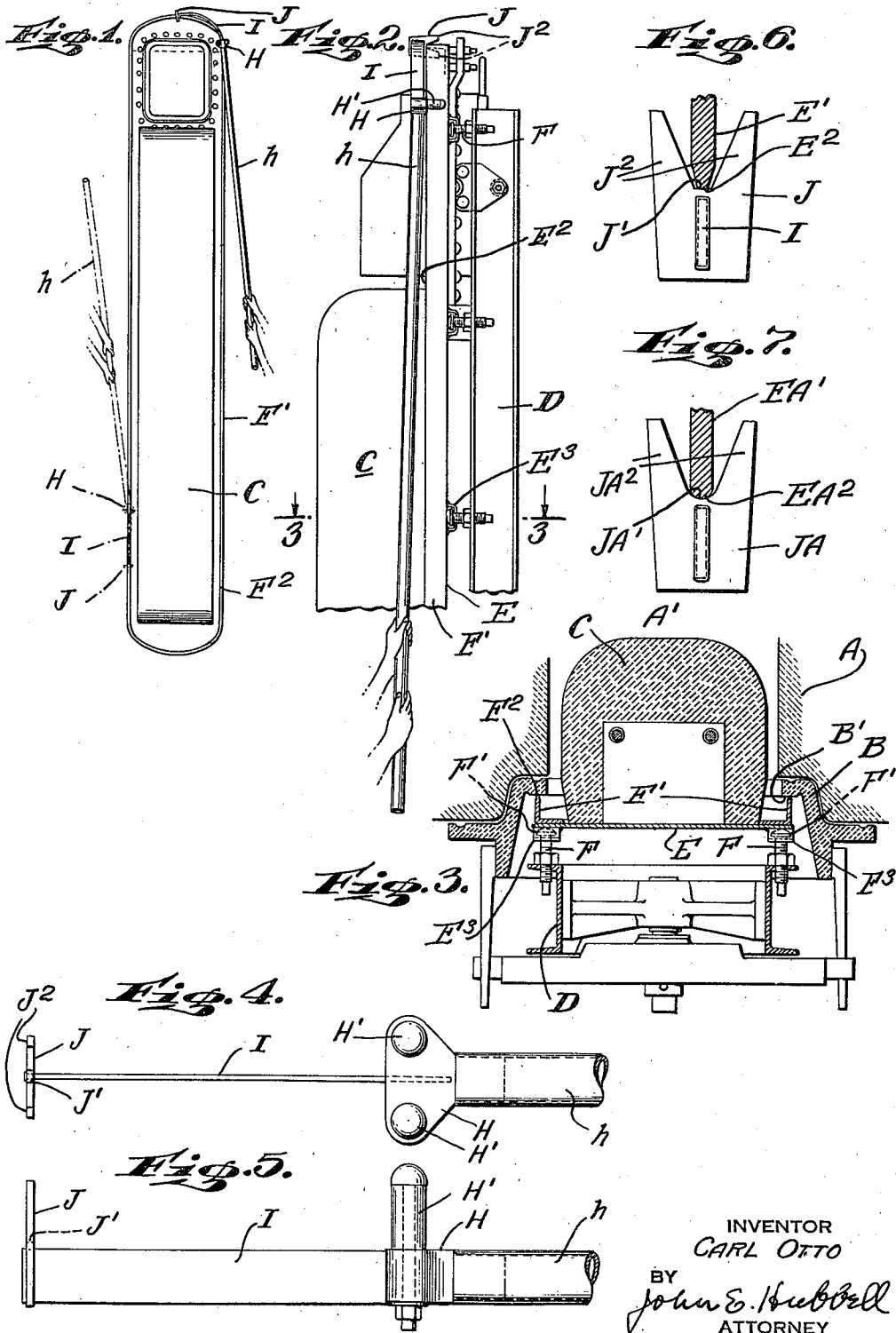
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COKE OVEN DOOR CLEANING MEANS

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COKE OVEN DOOR CLEANING MEANS

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The general object of the present invention is to provide improved means for cleaning the sealing edges of furnace doors, and particularly the sealing edges of self-sealing coke oven doors used to close the ends of horizontal coke ovens of the type in which practically all metallurgical coke is produced.

More specifically stated, the object of my present invention is to provide a simple and effective cleaning element for use in cleaning the sealing edge of a self-sealing coke oven door.

The usual self-sealing coke oven door includes a sealing member comprising a flexible metallic sealing plate carrying a transverse sealing flange or edge part. In the closed position of the door, the sealing plate overlaps a sealing surface on a metallic door frame extending around the end of the coking chamber closed by the door, and the sealing edge part extends from the peripheral portion of the sealing plate into contact with the sealing surface.

With any of various self-sealing doors now in use, a satisfactory gas tight joint between the sealing surface and sealing edge can be maintained, provided the engaging surfaces are kept clean, but those surfaces have been difficult to keep clean. Tarry distillation constituents formed in the coking operation, condense and deposit on the exposed door frame and door carried sealing parts, which while normally at temperatures below the boiling temperatures of said constituents are hot enough to dry out the deposited material and eventually convert it into pitch. Furthermore, coke breeze and fine coal particles become embedded in the tar deposits, with the result that in time, the pitch formed becomes so hard that it is difficult to remove even by means of a chisel. However, if the sealing surfaces are cleaned after each coking operation, the deposited material can be removed by a relatively simple scraping action. The problem of cleaning the sealing edge of the door is complicated, however, by the form and dimensions of the sealing edge, and by its proximity to the refractory plug section of the door, which normally is hot enough to glow when the sealing edge of the door should be cleaned.

My improved cleaning element is characterized by the fact that it comprises a scraping part, notched to receive the sealing edge part of a coke oven door, and to have the sealing edge of said part in engagement with the bottom wall of the notch and connected by an elongated flexible metal connector to an actuating element, which also engages the sealing edge of the door and has

guiding leg portions at opposite sides of the sealing edge part. The connecting strip is sufficiently flexible in a plane parallel to the sealing plate frame, to permit the scraping part to move along a rounded corner portion, and along a top or bottom portion of the sealing edge while the actuating element is moving along a vertical side portion of the sealing edge. When the cleaning element is intended for manual use, its actuating member may be provided with a handle extension, which is grasped and moved by the hands of the user.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages, and specific objects attained with its use, reference should be had to the accompanying drawing and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

Of the drawing:

Fig. 1 is a somewhat diagrammatic elevation of a self-sealing coke oven door as seen from its inner side, and with one of my improved cleaning elements in operative engagement with the sealing edge of the door;

Fig. 2 is an elevation, taken at right angles to Fig. 1, of a portion of the door there shown;

Fig. 3 is a cross section on the line 3—3 of Fig. 2;

Figs. 4 and 5 are elevations at right angles to one another of one of the cleaning elements shown in Fig. 1; and

Fig. 6 is a partial section taken on the line 6—6 of Fig. 1; and

Fig. 7 is a view taken similarly to Fig. 6, illustrating a modified form of sealing edge part and cooperating scraper element.

In the drawing I have illustrated, by way of example, the use of the invention in cleaning the sealing edge of a known form of plug type, self-sealing, coke oven door, employed to removably close one end of a coking chamber A' of conventional form, extending horizontally through the coke oven battery structure A. In a coke oven of the type described, the coke oven brickwork is reinforced and armored at each end of each coking chamber by a metallic door frame member B, formed with a sealing surface B' extending around the corresponding coking chamber and transverse to the coking chamber axis.

The coke oven door illustrated by way of example in the drawing is of a general type and

character disclosed in the Beimann patent, No. 2,126,239, including an inner plug section C of ceramic material, a rigid outer metallic supporting section D, and an intermediate sealing member comprising a flexible metallic sealing plate E and a metallic sealing edge part E'. The plate E, as shown, is of the through plate variety and extends entirely across the coke oven doorway and overlaps all portions of the sealing member B', in the closed position of the door. As shown, the sealing edge part E' is formed by one flange of an angle bar which has its other flange along-side and suitably secured to the sealing plate E, adjacent the margin of the latter. In the normal closed condition of the door, its rigid outer section D is held in predetermined relation with the sealing surface B', and with the sealing edge E² of the part E in engagement with the surface B', by door locking or retaining means, which are not shown, as they form no part of the present invention and may be of any one of various well known and suitable types.

A coke oven door frame member, such as the member B, customarily becomes warped or deformed, as a result of the severe mechanical and thermal stresses to which it has been subject in operation. The usual adjusting screw connections F between the rigid outer section D of the door and the peripheral edge of the sealing member are provided for the purpose of bending the sealing edge into suitable conformity with the contour of the sealing surface B', at all points along the length of the latter, no matter how badly said sealing surface may have been warped or deformed by the stresses of use. In practice, also, when the sealing surfaces are not properly cleaned, the adjustments of the connections F compensate more or less for the tendency of irregular pitch deposits on the sealing parts to prevent the door from properly sealing the end of the coke oven. As shown, the rigid outer door section D is in the form of a metallic frame of channel bar cross section, and the adjusting screws F are threaded through the inner flange of the section D, and each screw F has a head F', at its inner end, which is received in a pocket formed in a metal pad E³ welded to the adjacent portion of the sealing member. Each of the multiplicity of adjusting screws F may thus subject the corresponding pad E³, and hence the adjacent portion of the sealing member, to a push or a pull, depending on the direction of rotation of the screw.

The plug section C may be connected to and supported by the sealing member in any customary manner and the outer door section D may be connected to the sealing member to support the weight of the latter and of the plug section of the door in any usual or suitable manner, as; for example, by a hinge connection between the upper portion of the sealing member and the support D as described in said Patent No. 2,126,239.

As will be understood, the door construction illustrated in Figs. 1, 2 and 3, is merely a typical example of one of many forms of coke ovens having a sealing edge E² which may advantageously be cleaned by the use of my improved cleaning element. In a preferred form illustrated in Figs. 4, 5 and 6, said cleaning element comprises a scraping blade J formed by a notched or bifurcated piece of sheet metal. In its intended use, illustrated in Fig. 3, the bottom wall J' of the notch in the part J is in engagement with the

sealing edge E² of the sealing edge part E', and the notch side wall portions J² of the member J then straddle the sealing edge part E'. The scraping blade J is secured to the end of a flexible metal strip or bar I, which has its opposite end anchored or rigidly secured to the actuating element H, which, as shown, is rigidly secured to the adjacent end of a shaft or handle h, and which comprises two rollers H' adapted to straddle the sealing edge E', which is straddled by the sides J² of the notch J of the cleaning device.

In Figs. 1 and 2, I have illustrated a preferred mode of use of my improved cleaner. In Fig. 1, a cleaning element is shown in full lines, as held in the hand of an operator engaged in cleaning the top portion of the sealing edge E², and a cleaning element is shown in dotted lines, as held in the hands of an operator engaged in cleaning a vertical portion of the sealing edge E². As will be apparent, a single operator, while at one side of the door can clean the adjacent vertical side portion and the adjacent half or more of the top and bottom portions of the sealing edge E², and can then move to the other side of the door and clean the remaining portions of the edge E². The lateral flexibility of the strip I permits the scraping part J to be in proper relation with the sealing edge, when the scraper part is in engagement with a generally horizontal portion of the sealing edge and the actuator H is in engagement with an adjacent generally vertical portion of the sealing edge, and permits the operative relation of the cleaning element with the sealing edge to be maintained notwithstanding a considerable divergence of the handle h away from parallelism with the portion of the sealing edge engaged by the part H.

A particularly important feature of the cleaning element is its capacity for properly cleaning the corner portions of the sealing edge at which the adjacent horizontal and vertical portions of the sealing edge merge into one another, provided said corner portions are rounded generally as shown in Fig. 1, as they way well be. The ease with which a horizontally disposed portion of the sealing edge may be cleaned is of especial importance, because the bottom portion of the sealing edge, is the portion most in need of regular and proper cleaning.

As those skilled in the art will understand, the door frame sealing surface B', as well as the door carried sealing edge E², need to be kept clean. The cleaning of the surface B', however, does not present the special problems which my improved cleaning element is adapted to solve, and so far as the present invention is concerned, the sealing surface B' may be cleaned in any usual or suitable manner.

Heretofore it has been customary to bevel off the sealing edge portion of the sealing member as shown in Fig. 6, so that the sealing edge E², while flat and parallel to the sealing surface, is narrow enough to cut through deposits on the sealing parts, which it could not be cut through if the sealing edge portion E² were not so bevelled. The provision of proper cleaning means makes it feasible to employ a sealing edge part EA' having a rounded sealing edge EA², as shown in Fig. 7. To clean such a rounded sealing edge, the bottom JA' of the notch formed in the corresponding cleaning part JA, is correspondingly rounded, as shown in Fig. 7. Except for this rounding of the bottom JA of the notch, the cleaning element in-

cluding the part JA may be identical with the previously described cleaning element including the part J. With clean sealing surfaces, the rounded sealing edge EA² shown in Fig. 7, permits of a line contact between the door carried sealing edge and the sealing surface B'.

The proper cleaning of the sealing parts makes it possible to obtain practically important advantages, in addition to the ultimate advantage of permitting more effective door sealing, and of making it practically feasible to employ a rounded sealing edge as shown in Fig. 7. In particular, it makes unnecessary frequent readjustments of the adjustment screws F, otherwise required to compensate for the effect of deposits on the sealing surfaces which are too hard to be cut through by the sealing edge, with any practical door sealing pressure. It also permits of a reduction in the excessive door sealing pressures which have been employed in an endeavor to maintain the suitably tight joints between door sealing parts not subjected to effective cleaning operation. In practice, the sealing pressure employed in some cases has been as high as about 75 pounds per inch of length of sealing edge. This means an aggregate sealing pressure of about 30,000 pounds per door in the case of a door of normal width and 15' high, which is not abnormal, as modern coke oven doors customarily range in height from 12 to 15 feet.

Even with a door 15' high, a user of normal height standing on a bench portion of the coke oven structure a foot below the oven floor level, can clean the top portion of the sealing edge of a door with a handle element h, which is not too long to be unduly cumbersome when used in cleaning the bottom and vertical portions of the sealing edge. It is to be noted in this connection, moreover, that normally there is little or no appreciable deposit on the top portion of the sealing edge. The condensate initially depositing on the upper portion of the edge tends to pass away from the latter by gravitational flow. As those skilled in the art well know, the difficulty of cleaning a sealing edge of a self-sealing coke oven door is augmented by the fact that normally the door is away from its closed position at each oven discharging operation for a few minutes only and during the coke oven cleaning operation, the plug section of the door will normally be at a temperature of the order of 1800° F.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

Having now described my invention, what I

claim as new and desire to secure by Letters Patent, is:

1. An element for removing deposits on the sealing edge parts of self-sealing coke oven doors, comprising a bifurcated scraping blade adapted to straddle a sealing edge part, and means for moving said scraping blade along said sealing edge comprising a bifurcated guiding part adapted to straddle said sealing edge part, and a force transmitting connection between said blade and guiding part which tends to hold them in the positions in which they are adapted to respectively straddle and extend transversely across aligned, longitudinally displaced, portions of said sealing edge part, and which is flexible in the direction of a plane transverse to said edge part to permit said blade and guiding part to straddle and extend transversely across portions of said sealing edge parts which are inclined at a substantial angle to one another.

2. An element for removing deposits on the sealing edge parts of self-sealing coke oven doors, comprising a bifurcated scraping blade adapted to straddle a sealing edge part, and means for moving said scraping blade along said sealing edge comprising a bifurcated guiding part which tends to hold them in the positions in which they are adapted to respectively straddle and extend transversely across aligned, longitudinally displaced portions of said sealing edge part, and which is flexible in the direction of a plane transverse to said edge part to permit said blade and guiding part to straddle and extend transversely across portions of said sealing edge parts which are inclined at a substantial angle to one another, and an elongated handle connected to said guiding part adapted to be grasped by the hands of a user engaged in cleaning said sealing edge.

3. An element for removing deposits in the sealing edge part of a self-sealing coke oven door, having a sealing edge part comprising top and bottom portions connected to elongated side portions by rounded corner portions, said element comprising a bifurcated scraping blade adapted to straddle the sealing edge part, and means for moving said scraping blade along said sealing edge comprising a bifurcated guiding part adapted to straddle said sealing edge part, and a force transmitting connection between said blade and guiding part which tends to hold them in the positions in which they are adapted to respectively straddle and extend transversely across aligned, longitudinally displaced, portions of said sealing edge part, and which is flexible in the direction of a plane transverse to said edge part to permit said blade to straddle, move along, and extend generally transverse to a rounded corner portion of said sealing edge part, while said guide part is straddling, moving along, and extending generally transverse to a side portion of said part.

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