

March 3, 1942.

H. KOPPERS

2,275,400

COKE OVEN DOOR

Filed Dec. 27, 1939

2 Sheets-Sheet 1

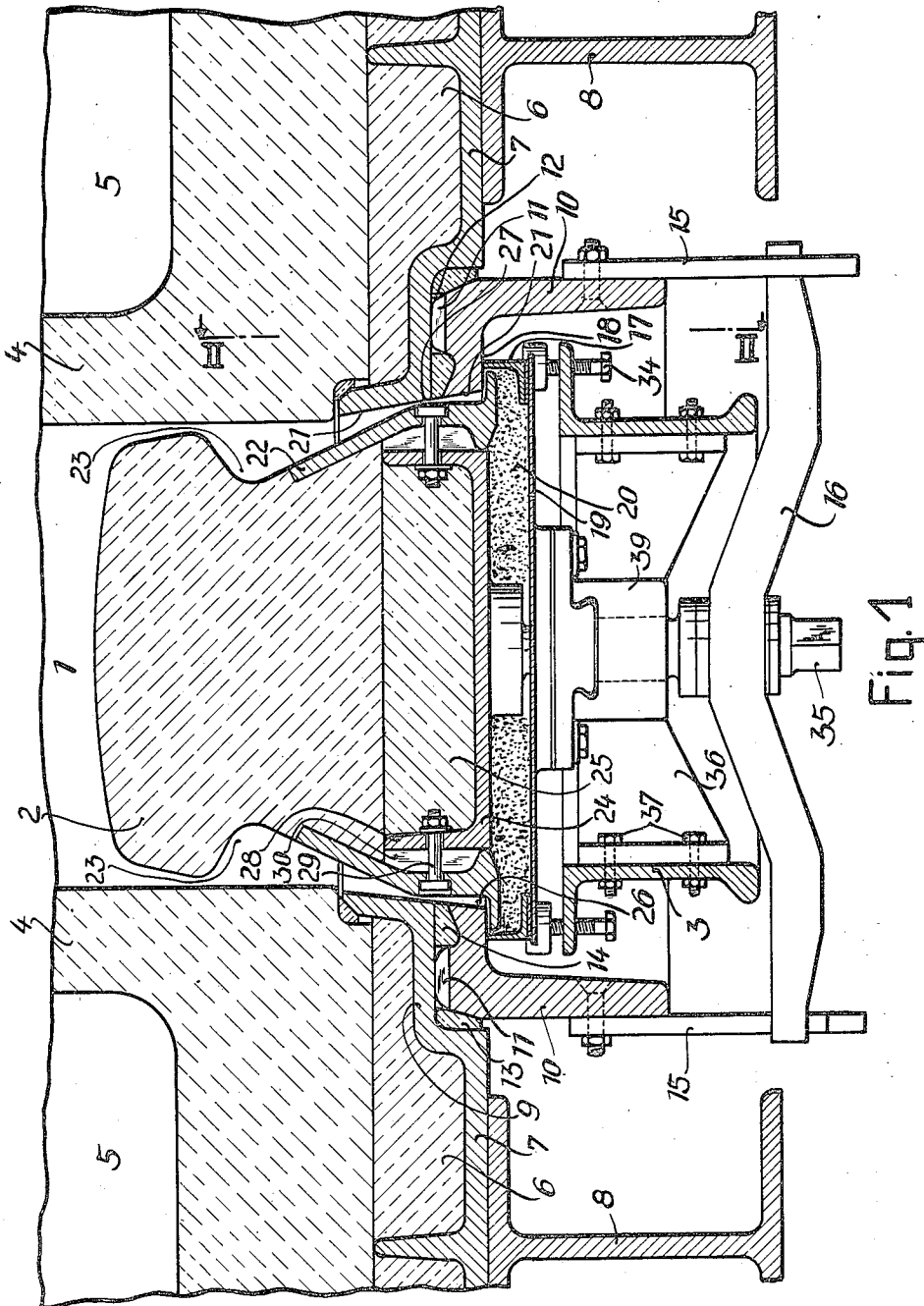


Fig. 1

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2 Sheets-Sheet 2

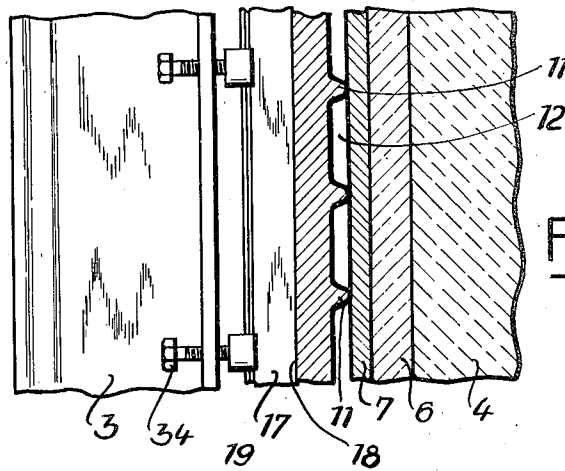


Fig. 2

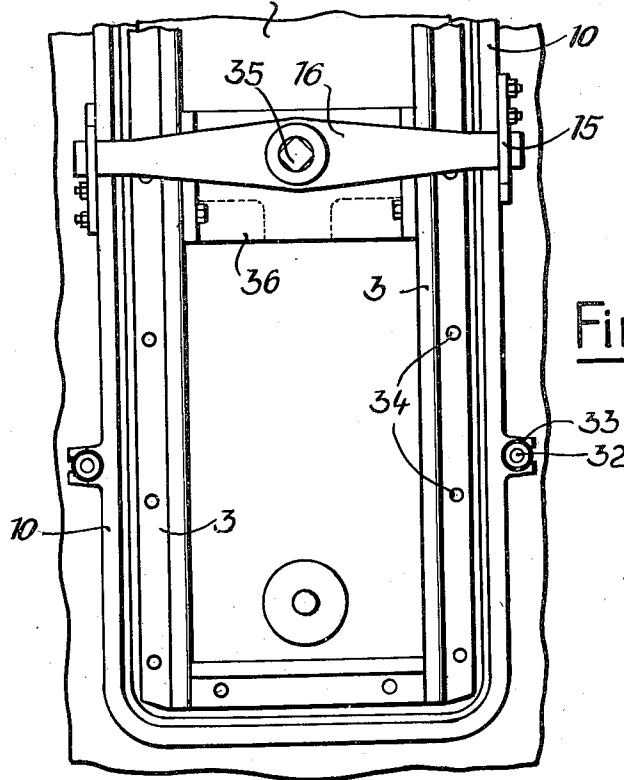


Fig. 3

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UNITED STATES PATENT OFFICE

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COKE OVEN DOOR

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Application December 27, 1939, Serial No. 311,134
In Germany December 27, 1938

2 Claims. (Cl. 202-248)

This invention relates to door closures for coke ovens or the like, for instance horizontal chamber ovens and more particularly to such coke oven doors in which the sealing of the joint between the oven chamber and the door is effected by means of an adjustable metallic frame pressed against a sealing face on the door frame and fixed to the door body. The frame for the knife-like sealing edge of these doors is resiliently connected with the door by means of an elastic metal plate or metal frame in such a manner that the sealing frame can be adjusted if uneven faces are formed on the door frame so as to achieve a constant gas-tight sealing.

A gas-tight sealing of such chamber doors is assured however, only when a thin tar film exists between the knife-like sealing edge and the sealing face of the door frame. The formation of such a tar film can only take place if the temperature of the door frame is rather low. In case the temperature of the door frame increases beyond a certain degree, the tarry constituents condensing at the door frame decompose with the formation of crusts for the removal of which considerable manual work has to be done.

An object of my invention is to construct the chamber closure in such a manner that a tar film may be formed on the sealing face of the door frame without the formation of tar decomposition products causing crusts, for the purpose of which the door frame is provided with a plurality of projections on the face towards the metallic oven reinforcement, said projections holding the body of the door frame at a certain distance from the metallic oven reinforcement.

If the chamber closure structure is carried out according to the present invention in which the door frame seats only at several points, the amount of heat transferring from the oven brickwork or the oven reinforcement on to the door frame is considerably less. In consequence thereof it is possible to keep the door frame at rather a low temperature which is just sufficient to obtain the desired formation of a tar-film without causing the decomposition of the precipitating tarry constituents. The chamber closure according to the present invention therefore provides on the one hand a very good seal, while on the other hand the expensive cleaning work is practically rendered unnecessary, as the tarry constituents required for the knife edge on the door frame cannot decompose on account of the low temperature existing on the door frame.

Another object of my invention is to construct

the refractory door body reaching into the oven chamber in such a manner that between said door body and the chamber walls there is provided in addition to the known vertical gas channel of a large cross section another vertical gas channel of small cross section in the neighbourhood of the elastic sealing frame. The effect of such gas channels is that the distillation gases flowing through the gas channels of large cross section maintain a temperature in the door body, the holder of the door body, as well as in that part of the oven reinforcement projecting into the oven chamber, so that no condensate will precipitate, while small quantities of condensate are fed to the sealing face of the door frame by means of distillation gas flowing into the channel of small cross section. On account of the fact that only small quantities of distillation gases enter the gas channel of small cross section, it is possible to keep the temperature transferred by these gases at a low point. Thus the favourable effect of low temperature for the maintenance of a tar film obtained by the reduced heat radiating from the oven reinforcement to the door frame is not interfered with by the delivery of small quantities of distillation gases by the small channel, which are necessary for the formation of the tar film.

Furthermore the invention also consists in the provision of a heat insulating material between the refractory door brick-lining projecting into the oven chamber and the plate enclosing the outer face of the lining and connected with the plug holder. This construction of the door between the plug section and plate further prevents flow of heat from the refractory brick material to the outside and thus assists in keeping the refractory portion of the door hot enough so that the precipitation of condensate on same is prevented.

Further objects and features of my invention will be in part obvious from, and in part specifically pointed out in, the description hereinafter contained, which taken in conjunction with the accompanying drawings, discloses a preferred embodiment thereof; such embodiment, however, is to be considered merely as illustrative of the principles. In the drawings of the invention:

Fig. 1 is a horizontal section through a door closure carried out according to this invention and inserted into the oven chamber which is only partly shown on the drawing.

Fig. 2 shows on an enlarged scale a vertical section taken through the door frame and the

adjoining part of the oven reinforcement on line II—II of Fig. 1.

Fig. 3 represents a partial front view of the door.

The coking chamber 1, as illustrated on the drawings, has inserted in its side opening an inner door plug section 2 of refractory material which is carried by an outer frame section 3. The oven chamber 1 is formed by heating walls 4 in which are provided, for instance, vertical heating flues 5. The outside of the refractory brickwork of the heating walls 4 is covered by a good heat insulating brick material 6 which is protected by the oven metallic reinforcement or armoring 7 consisting of cast iron plates or the like. The buckstays 8 fit against the oven reinforcement.

The oven reinforcement 7 is constructed stepwise around the opening of the coking chamber 1. The door frame 10 is inserted into the step 9 thus formed. The door frame 10 surrounds the door opening on all sides.

On its side facing towards the oven reinforcement 7 the door frame 10 is provided with a series of horizontal rib-like projections 11 spaced from each other as may be seen from Fig. 2. The heads of said projections are suitably rounded off so that a linear contact only exists at individual points between the projections 11 and the oven reinforcement 7. The space 12 between each two of the projections 11 remains free. An elastic packing material 13, 14 which closes the spaces 12 between the ribs 11 from the side is provided between the frame 10 and the oven reinforcement 7. Consequently a stagnate air layer is produced between the spaces 12 reducing efficiently the heat transfer from the oven reinforcement 7 on to the frame 10. Instead of the horizontal ribs 11, punctiform elevations may likewise be provided on the door frame 10.

The frame 10 is connected with the oven reinforcement 7 by means of screws 32. Between the screws 32 and the frame 10 are inserted spring washers 33 which permit a movement of the rigid frame 10 in case the oven reinforcement 7 becomes warped due to the expansion of the brickwork. On the outside of the frame 10 are provided holding means 15 into which engages the lock bar 16 of the door carrying frame 3.

The bearing body 39 for the lock bar 16 is firmly connected with the carrying frame 3 by means of ribs 36 and screws 37. Within the range of the bearing body 39 on the elastic plate 19 is attached a dove-tail plate which is connected with the bearing body 39 in such a manner that the plate 19 may expand in vertical direction.

If the door is in closing position as illustrated on the drawings, the front knife edge of the adjustable sealing frame 17 fits against the surrounding sealing face 18 of the door frame 10. At the point of contact of the sealing edge of frame 17 with the sealing face 18, a thin tar film is formed during the operating period of coking. This tar film seals the joint between the two parts of the seal, lying above each other.

The sealing frame 17 is carried by an elastic sheet plate 19 which is protected from the heat radiation of the oven chamber by the use of an insulating layer 20.

The sealing frame 17 can be reset relatively to the sealing face 18 of the door frame 10 by means of screws 34 which are fitted on the side of the door carrying frame 3 in order to avoid any local leakages after the door lock bar 16 has engaged into the closing hooks and when

turning the press screws 35, the sealing frame 17 is pressed against the sealing face 18.

As may be seen from Fig. 1 that part of the door frame directly adjoining the door opening and that part of the oven reinforcement adjacent thereto are conically constructed and marked 21 on the drawings. The plug holder 22 is bent in such a manner that the bending point 27 lies only at a small distance from the conically drawn-in oven part 21 and vertical gas channels 23 and 26 are formed. The vertical gas channels 23 are of a comparatively large cross section so that large quantities of distillation gas may circulate through them. The refractory bricklining 2 and the plug holder 22 lying within the range of the channel 23 and the conical part 21 of the oven reinforcement are thus kept at such a high temperature that no condensate will precipitate.

The plug holder 22 is bent at its end 40 facing the elastic sealing plate 19 to the outside nearly up to the sealing frame 17 and thus forms a closure between the insulating layer 20 and the vertical gas channel 26. The small channels 26 are of a comparatively small cross section which is dimensioned in such a manner that only such quantities of distillation gas can penetrate into these channels and stagnate there-in as necessary for the formation of the tar film so that a good sealing on the face 18 of the door frame is assured.

A channel iron 24 is provided between the sides of the plug holder 22. The sides 28 of the channel iron 24 are connected with the sides of the plug holder 22 by means of screws 29. The plug holder 22 possesses ribs 30 which are carried out similar to the ribs 11 of the door frame 10. The channel iron is filled with an insulating material 25. The refractory material 2 of the plug is therefore safely protected from the heat radiation.

I have now above described my present invention on the lines of a preferred embodiment thereof but my invention is not limited in all its aspects to the mode of carrying it out as described and shown, since the invention may be variously embodied within the scope of the following claims.

I claim:

1. A coke oven closure comprising a door constituted of an inner plug section comprising a refractory liner with continuous metallic liner-retainers at its sides and a front metallic closing panel connected thereto, an outer frame section, and an intermediate flexible automatically acting sealing means; a metallic oven-reinforcement covering the outer oven brickwork at the sides of the doorway; a door frame fixed to said reinforcement and surrounding said door with a clearance and having a sealing surface on its outer surface for sealing contact with the sealing means on the door; said door frame having projecting ribs arranged in spaced relation around the doorway between its inner surface and the metallic reinforcement so that the only metal to metal contact between the door frame and reinforcement is with the spaced ribs, and a continuous packing on opposite sides of the ribs leaving a row of dead air pockets around the doorway intermediate the door frame and the reinforcement to keep the door frame below tar film decomposition temperature; said plug section providing between the sides of the same and the chamber walls large inner vertical gas channels for vertical flow of hot gas to prevent

condensation on the inner portions of the plug section and very small outer channels between the large inner channels and the sealing surfaces for penetration and stagnation of small quantities of cooler gas from the chamber to form a tar film on the sealing surfaces, and said plug section having heat insulating material between the refractory liner and the front metallic closing panel and so disposed intermediate the refractory liner and the very small channels and the door frame and sealing surfaces as to prevent flow of heat from the refractory liner to the very small channels, the door frame, and sealing surface, and thus aid the inner portion of the plug section in staying hot enough to prevent condensation on the inner portion of the plug section.

2. A coke oven closure comprising a door constituted of an inner plug section comprising a refractory liner with continuous metallic liners at its sides and a front metallic closing panel connected thereto, an outer frame section, and an intermediate flexible automatically acting sealing means; a metallic oven-reinforcement covering the outer oven brickwork at the sides of the doorway; a door frame fixed to said reinforcement and surrounding said door with a

clearance and having a sealing surface on its outer surface for sealing contact with the sealing means on the door; said door frame having a row of rounded projections arranged in spaced relation around the doorway between its inner surface and the metallic reinforcement so that the only metal to metal contact between the door frame and reinforcement is a linear contact of the reinforcement with the spaced projections, and a continuous packing interposed between the door frame and the reinforcement, on opposite sides of the row of projections, leaving a stagnate-air-layer chamber around the doorway intermediate the door frame and the reinforcement to keep the door frame below tar film decomposition temperature; said plug section providing between the sides of the same and the chamber walls large inner vertical gas channels for vertical flow of hot gas to prevent condensation on the inner portions of the plug section and very small outer channels between the large inner channels and the sealing surfaces for penetration and stagnation of small quantities of cooler gas from the chamber to form a tar film on the sealing surfaces.

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