

May 14, 1940.

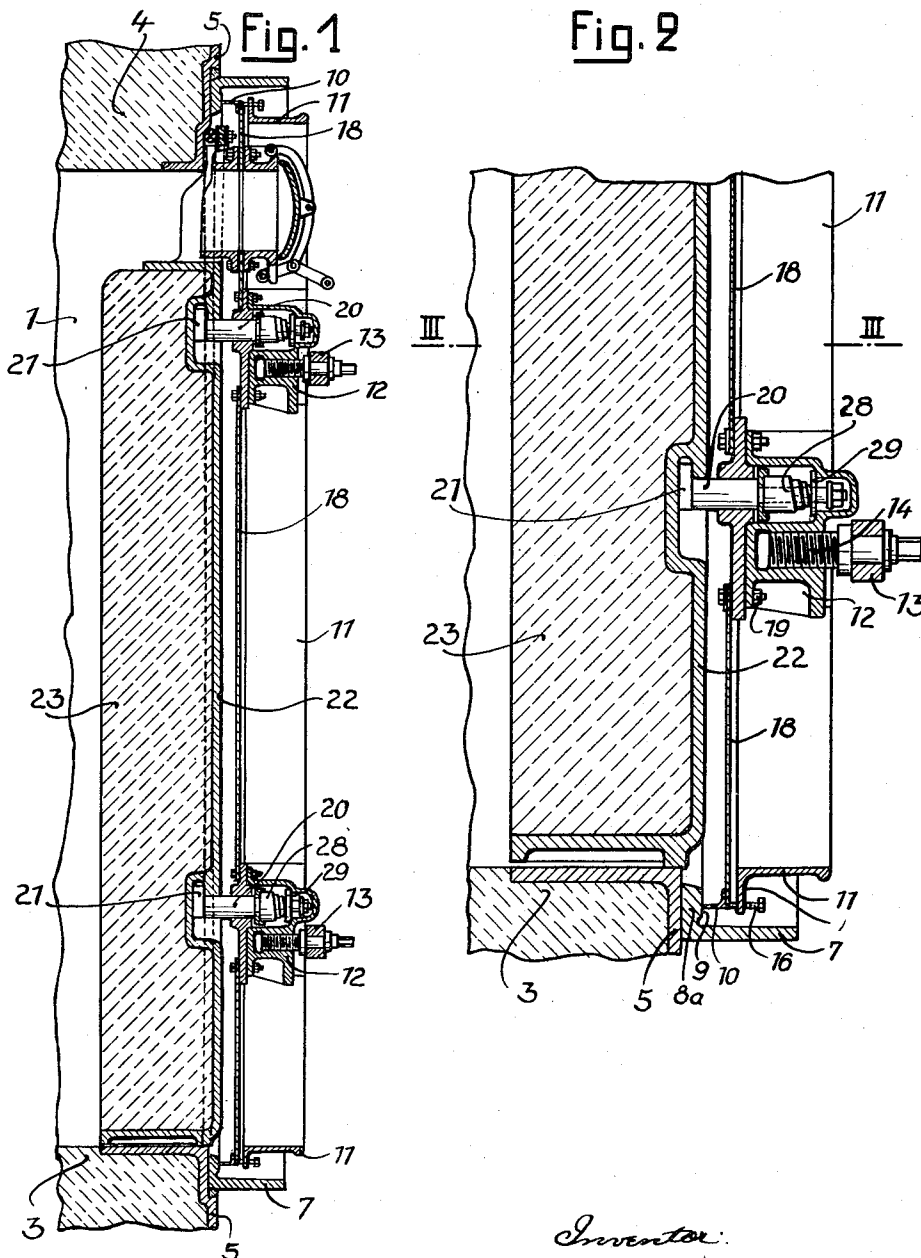
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2,200,403

COKE OVEN DOOR OR THE LIKE

Filed Dec. 22, 1937

2 Sheets-Sheet 1



Inventor:
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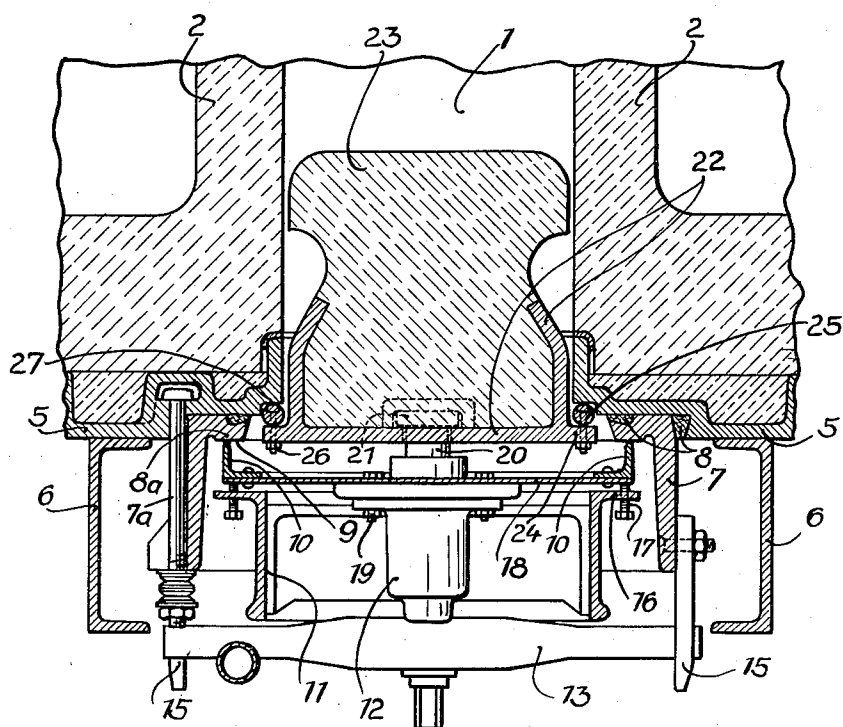
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2 Sheets-Sheet 2

Fig. 3



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UNITED STATES PATENT OFFICE

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COKE OVEN DOOR OR THE LIKE

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mesne assignments, to Koppers Company,
Pittsburgh, Pa., a corporation of Delaware

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5 Claims. (Cl. 202-248)

The invention relates to closure means for chamber or retort ovens for the production of gas and coke and in particular to the so-called self-sealing doors for those ovens.

In the description, the term "self-sealing door" is intended to cover that type of coke oven doors or the like in which the metal door fits in a gas-tight manner against the metal door-frame or doorway surrounds, without inserting between door and door-frame or doorway surrounds a non-metallic packing material, for instance asbestos or the like.

Self-sealing doors have a frame-like resilient member which fits against the door-frame or doorway surrounds, said member may be connected with the rigid body of the door by means of an elastic sheet metal plate. The front or knife edge of the said resilient member is carefully machined so as to insure a gas-tight seal when resting on a suitably machined surface of the door-frame or doorway surrounds. Means are provided on the body of the door in order to press the said resilient member with its knife-like rim or flange against the door-frame or doorway surrounds, when closing the door, in such a way that said knife-like rim follows exactly the packing or sealing surface of the door-frame or surround, even if the same should become warped on account of the heat radiating from the coking chamber.

The rigid door body is fitted with means for fastening the door in closed position, for instance locking bars, and is also equipped with means for carrying the refractory inside lining which protects the metal body of the door against the heat radiating from the coking chamber.

In order to obtain a good, gas-tight sealing with the so-called self-sealing doors of coke ovens, it is very essential that the packing surfaces of the door frame and knife-like rim of the resilient member extending at the outer margin of the door body, always be kept free and clean.

In this respect, the known types of self-sealing doors show certain disadvantages.

Tarry constituents developed in the coking process tend to enter the free space between the door and the door frame and condense on the comparatively cool metal parts of the closure means. Thus, accumulations and crustations are formed on the packing surfaces of the door frames, the removal of which is necessary in order to maintain a proper seal of the chamber opening. The removal of those accumulations and crustations requires much manual work.

Many suggestions have already been made to

prevent the formation of the before mentioned accumulations and crustations on the sealing surfaces of the doors. It has been tried to keep the metal parts of the doors, by means of a heat insulating bricklining, at such a high operating temperature that tarry constituents could not condense on these parts. It has, however, been found in practical operation that this provision was not effective enough although a slight improvement could be arrived at.

After this it has been suggested to equip the door with a second inner packing lying in a zone of such high temperatures that no condensations could take place on such inner packing means. According to that well-known proposition, the primary or inner packing consists of an elastic projection provided at the rigid body of the door. The elastic projection fits against the door frame when the door is closed.

Such an inner packing is indeed most suitable to avoid the formation of accumulations or crustations on the outer packing means, which have to insure the gas-tight sealing. It has, however, been found that the elastic projection of the inner packing loses its elasticity rather quickly due to the high temperature to which the inner packing means have been brought during the operation of the coke oven.

Now the main object of the present invention is to provide such improvements in self-sealing coke oven doors or the like which makes possible a permanent and effective primary inner packing so that the important outer packing means are kept clean and fully effective.

My invention consists principally in providing the door with two independent packings sealed metal-on-metal, which are arranged movable and adjustable relatively to each other, at least in the direction of the doorway or opening of the chamber or retort to be closed, in such a way that by moving the door parts carrying the inner packing in the direction of the doorway, the inner packing can be sealed independently of the position of the outer packing means if the door is closed.

My present invention further consists in that the door parts carrying the inner packing and the door parts carrying the outer packing are connected with one another by springs, or another elastic means, arranged at the outer surface of the door in such a manner that on closing the outer packing, the inner packing means are moved elastically into their closing position.

According to my invention, both the inner and outer door parts may alternatively be intercon-

connected by set screws or other suitable means so that after fastening the outer door parts in the closing position, for instance by the ordinary bars, the door parts carrying the inner packing can be brought into their proper closing position by adjusting the set screws.

By way of example, one construction of a self-sealing coke oven door made in accordance with the present invention, will now be described with reference to the accompanying drawings, in which

Figure 1 is a vertical section through a door according to the present invention for a horizontal chamber oven for the production of gas and coke.

Figure 2 shows in an enlarged scale a vertical section through a portion of the door according to Figure 1 and

Figure 3 is a horizontal section on lines III—III of Fig. 2.

Figure 1 on the drawings shows a portion of a coking chamber 1, formed as usual by walls 2, bottom 3 and roof 4 made of refractory materials. The chamber 1 is provided with one opening at each of its ends, of which only one opening has been shown on the drawings. The brickwork of the oven is held together at the outside by sheet plates 5 and buckstays 6. The plates 5 around the chamber opening are provided with a cavity in which are arranged the door frame or surround 7 together with an elastic packing 8, for instance an asbestos rope. The door frame is connected with the plates 5 preferably loosely by screws 7a or in another suitable manner.

The door frame 7 possesses a flange 8a extending inwardly fitted with an encircling plane face 9. The outer knife-like rim projection 10 of the door fits against this surface in closing position of the door.

The door is equipped with an outer supporting frame 11, to which are attached two or several casings 12 carrying the locking means for the door.

In closed position, the door is fastened to the door frame 7 by means of the bars 13, fixed movingly to screws 14, which are bolted into the threaded holes of the casings 12. When swinging the bars 13 round the axis of these screws 14, the ends of the bars may be moved below the hook-shaped projections 15 fixed to the door frame 7. After the bars have been brought underneath the hook-shaped projections 15, the screws 14 are turned out of the threaded holes of the compartments 12 to a small extent by means of a spanner fitting on the square of the head. Due to this effect, the carrying frame of the door is moved towards the chamber and simultaneously, the knife-like rim projection 10 is pressed against the surface 9 of the door frame 7.

The carrying frame 11 is provided with an outer rim projection 16 on which are arranged a number of screws 17 acting on the rim projection 10. By the medium of the screws 17, the rim projection can be brought into such a form that its knife-like front edge follows exactly the packing surface 9.

The rim projection 10 is formed of an angle-iron, being carried by a flexible metal sheet plate 18 extending along the whole plane of the door opening. At those points where the casings 12 are situated, the metal sheet plate 18 has an opening. The sheet plate is connected gas-tightly with the casings 12 and is fixed to them by means of screws 19.

The metal sheet plate together with the rim

projection 10 and the casings 12 effect a complete closure of the door opening in the closed position of the door, no matter whether the rim projection 10 has been brought out of its original position opposite the rigid supporting frame 11 by manipulating the set screws 17, since the sheet plate 18 is able to follow exactly every movement of the rim projection.

In the casings 12 are arranged pins 20 reaching into the space behind the sheet plate 18 permitting relative movement between the inner and outer sections. These pins 20 carry on their heads 21 a frame 22 to which is arranged the inner refractory lining 23 of the door. As may be seen from Figure 2, the heads 21 of the pins 20 lie in a cavity of the frame 22. The frame 22 can be loosened from the pins 20 by lifting, whereby the heads 21 of the pins may come out of the recesses of the frame.

The frame 22 carrying the refractory brick-lining is provided with an encircling rim projection 24. A round iron-sealing rod circular in cross-section 25 is attached to this projection by means of screws 26. If the door is closed, the round sealing rod 25 lies in a recess 27 of the door frame 5 and the joint between the door and the door frame is sealed at this point.

The connection between the inner supporting frame 22 of the door and the outer supporting frame 11 is elastic according to the present invention. As already mentioned before, the pins 20 carrying the inner door frame 22, are arranged for relative movement between the same and the outer supporting frame in the longitudinal direction of the coking chamber or coking retort. The springs 28 arranged in a compartment of the casting 12, act upon these pins according to the present invention. The springs 28 also act on an abutment 29 for the pins 20 and are, on the other hand, supported on the casting 12. The springs 28 therefore have the tendency to press the pins 20 against the coking chamber. If the door has been brought into closed position, the springs 28 cause the inner supporting frame of the door to be pressed into the door opening so far until the round iron rod 25 rests against the door frame. If at this moment of the closing movement of the door, the outer packing means is not yet sealed, the screws 14, after latching the bars 13, are tightened, thus moving the outer supporting frame 11 against the door frame until the knife-like edge of the sealing iron 10 rests against the plane surface of the door frame. During this movement of the outer door frame, the springs 28 are tightened correspondingly and the casting 12 slides over the pins 20 towards the coking chamber. In this way, it is possible to bring the important outer sealing means at any rate exactly into their closing position whether the inner packing means, for instance the round iron rod 25 is in its proper closing position or not or delayed by any accumulations or the like.

The space of the door in front of the metal sheet plate 18 and the packing rim 10 is always shut-off by the inner packing means in such a manner that tarry constituents cannot penetrate from the oven chamber. The plane surface 9 of the door frame and the knife-like edge of the sealing frame 10 are kept free from any dangerous accumulations or deposits which may stick to them and it is easy to obtain a good, gas-tight sealing of the door opening by means of the outer packings without it being necessary to have the door frame 9 and the packing surface 10

arranged thereon cleaned before any insertion of the door.

Moreover it should be pointed out that instead of using the round iron rod 25, also other suitable packing means can be adopted, for instance asbestos rope or flat-irons similar to the outer packing means, as shown on the drawings. Furthermore it is possible to utilize the rim projection 24 as packing means and to arrange it with a knife-like rim.

Finally, the supporting pins 20 for the inner door framing may be firmly coupled with the casting for the screws 14 and then the outer door frame can be arranged in a relatively movable way. This method of carrying out the invention has, however, the disadvantage against the construction shown on the drawings, that a stuffing box or a similar packing has to be inserted between the sheet plate 18 and the casting 12. In the construction of the invention as shown on the drawings, this provision is not necessary since the supporting pins are placed movably in compartments in the castings 12 thus being gas tight from outside.

I have now above described the present invention on the lines of a preferred embodiment thereof, but my invention is not limited in all its aspects to the mode of it carrying 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 door assembly or the like with metal-to-metal gas-tight sealing, comprising an inner rigid door plug body; an outer resilient sealing member adapted to seat against the door frame for the door in the closed position of the door, and means for latching the door to the door frame, said resilient member being adjustable

and connected with the inner rigid door body by means of an outer elastic sheet metal plate; an inner sealing member on the inner rigid door body, said inner sealing member being adapted to seat in the closed position of the door against the door frame in a zone lying between the outer sealing member and the coking chamber; said inner rigid door plug body and said outer elastic sheet metal plate separably being connected with each other for separate movement as unitary wholes relative to each other and being provided with means for regulably adjusting the distance between them whereby said outer and said inner sealing members may be adjustable relative to each other in the direction of the doorway.

2. A coke oven door assembly as claimed in claim 1, and in which the inner of the sealing members is pressed against the door frame in the closed position of the door by means of spring means interposed between, and acting on, the inner rigid door body and the outer elastic metal plate.

3. A coke oven door assembly as claimed in claim 1, and in which a set screw is provided as the means for regulating the distance between the inner rigid door-plug body and outer metal plate for adjusting said sealing members relatively to one another.

4. A coke oven door assembly as claimed in claim 1, and in which the inner sealing member is constituted of a metal-sealing rod round in cross section.

5. A coke oven door assembly as claimed in claim 1, and in which the means for adjusting the outer sealing member and the inner sealing member relatively to each other are arranged on the outside of the coke oven door.

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