

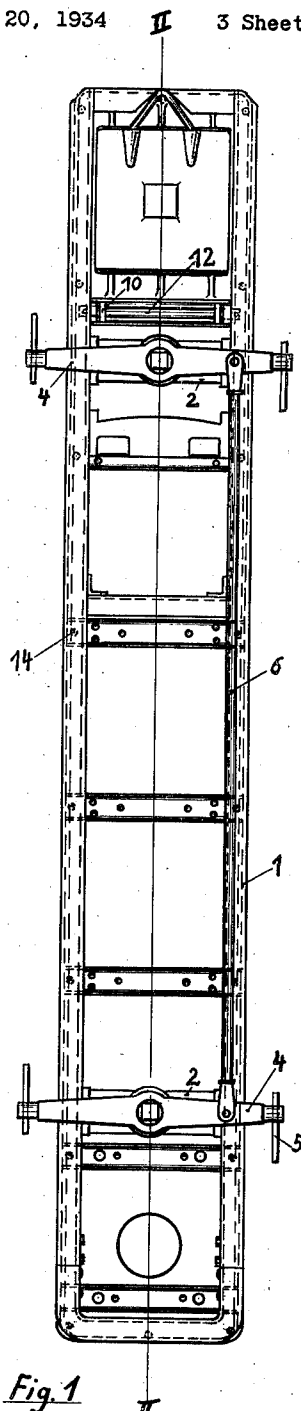
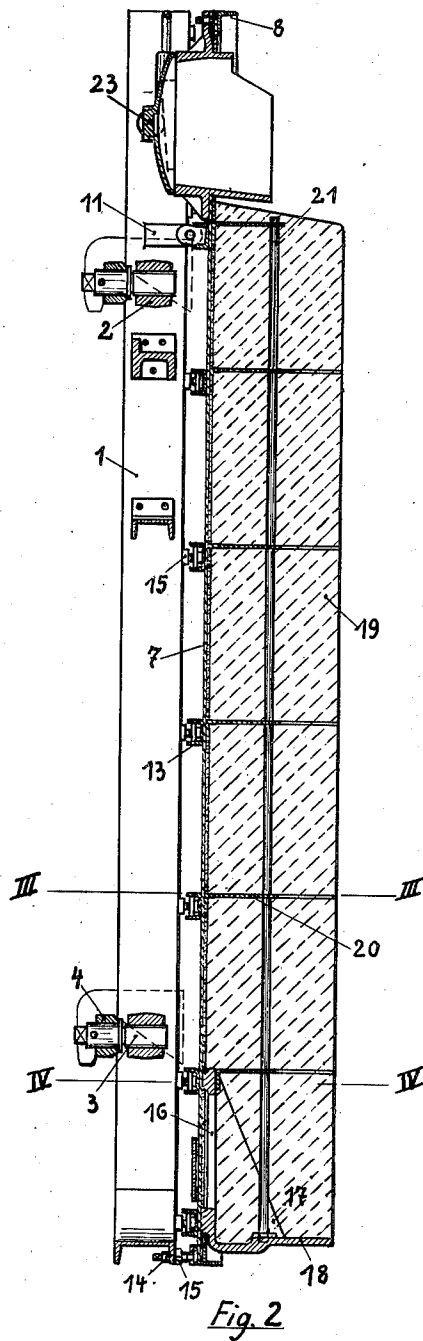
Aug. 9, 1938.

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2,126,239

DOOR FOR HORIZONTAL OVEN CHAMBERS

Filed Jan. 20, 1934 II 3 Sheets-Sheet 1



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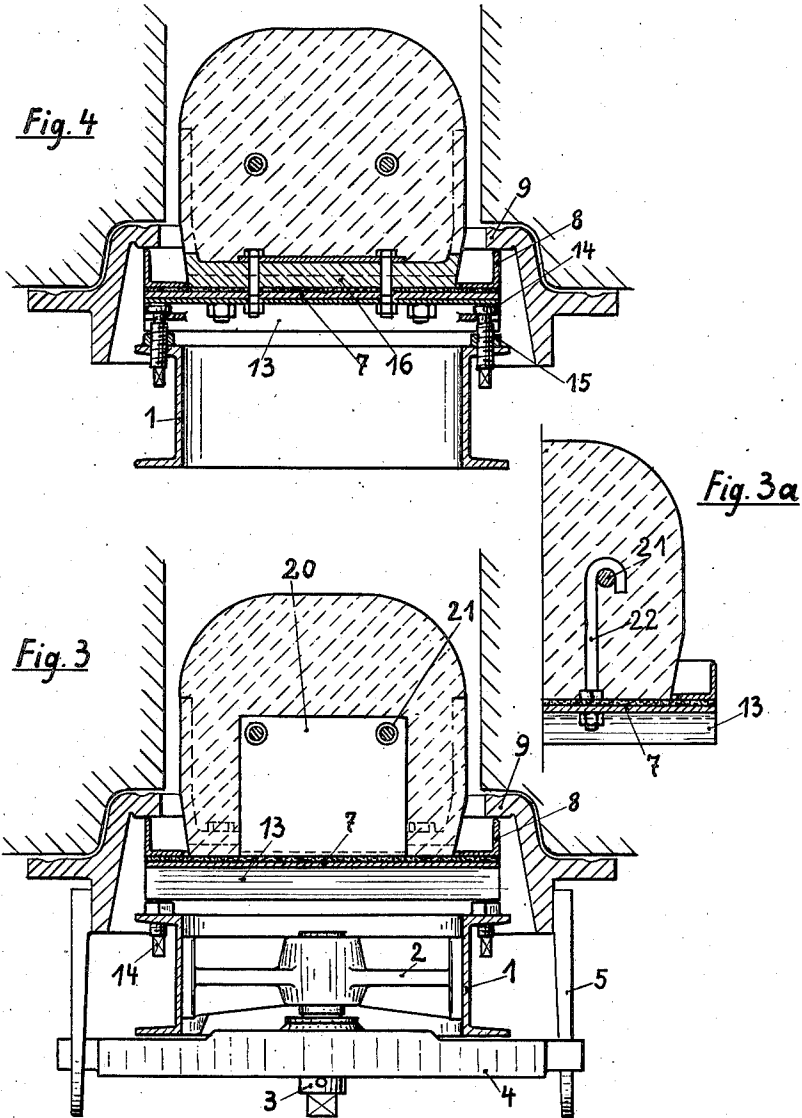
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DOOR FOR HORIZONTAL OVEN CHAMBERS

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DOOR FOR HORIZONTAL OVEN CHAMBERS

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3 Sheets-Sheet 3

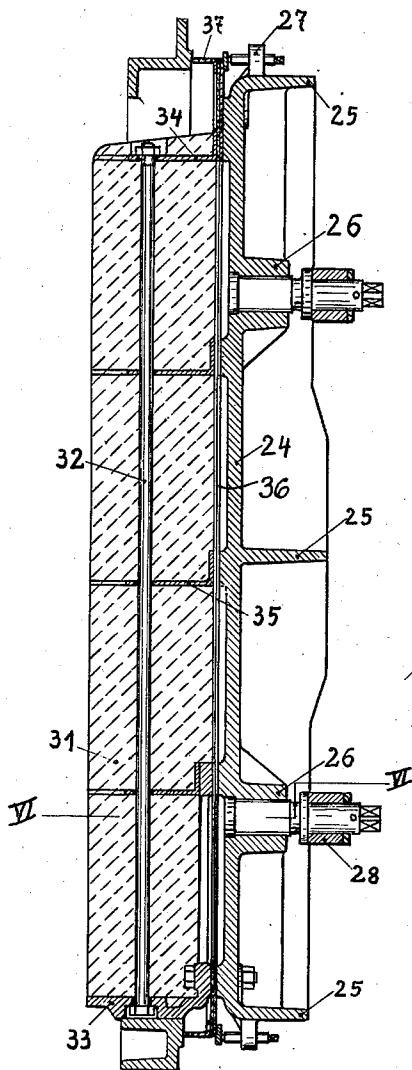


Fig. 5

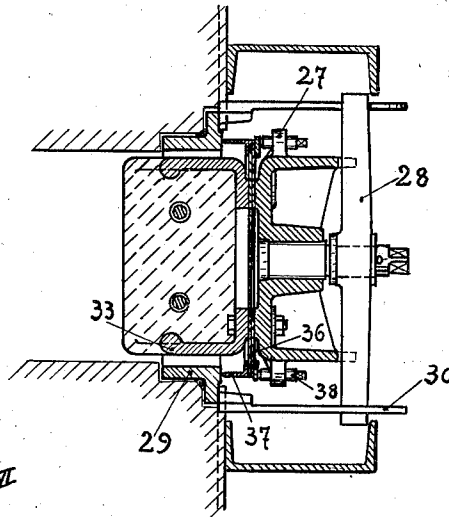


Fig. 6

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UNITED STATES PATENT OFFICE

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DOOR FOR HORIZONTAL OVEN CHAMBERS

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10 Claims. (Cl. 202-248)

The present invention comprises improvements in a door of known type, commonly called a self sealing door, for closing the doorway at the end of a horizontal oven chamber, and particularly an oven chamber for the production of gas and coke. The door of the type improved, comprises an outer metallic door section or portion provided at its edge with adjustable packing or sealing means for engaging and making a gas-tight joint with the door frame portion of the oven structure, and comprises an inner or plug section or portion of refractory and good heat insulating material which is adapted to take, absorb, or maintain within itself, a substantial portion of the difference or temperature drop between the temperature in the interior of the oven chamber and the outside air temperature, and thereby assist in preventing the temperature of the outer metallic door parts from becoming excessively high. The weight of the inner or plug portion of such a door is rather high, so that the metallic outer door portion must provide or include a supporting frame which is strong and rigid, but the packing or sealing means portion of the outer door section must be flexible and capable of adjustment to accommodate the warping of the door body and of the oven structure door frame, which is an unavoidable result of the conditions of use.

The primary object of the invention is to improve a door of the above mentioned type so as to secure the following advantageous conditions or features, namely:

A total door weight which is as small as is practically possible; a door construction in which the refractory liner or plug portion of the door, as well as the sealing means, has a certain capacity for yielding or giving way along the full height of the door to accommodate the warping of the adjacent portion of the oven structure; and an inner refractory or plug portion of the door having the best practically possible heat insulating effect so that the outer heat radiating surfaces of the door as well as its sealing means may remain sufficiently cool.

One of the chief expedients employed in accordance with, and for the attainment of the primary object of the invention, consists in an inner door or plug section construction which omits the usual heavy iron supporting or clamping members extending along the full length or height of the door and serving to hold the refractory plug section masonry in place, and includes in lieu thereof, one or more vertical metallic bars which pass through the individual super-

posed sections of the refractory masonry and hold the latter together.

To avoid objectionable bending of the said vertical bars and to maintain the refractory material of the plug section in suitable spaced relation with the metallic outer door portion, metallic parts are fixed to the last mentioned portion of the door at spaced points along the length of the latter, and extend into the plug section of the door between the superposed individual sections of the masonry and into embracing relation with each such vertical bar. The said superposed masonry sections of the plug portion of the door rest on one another, the lowermost section being directly supported by a base plate fixed to the metallic outer portion of the door. Said base plate and the refractory material above it are supported by the metallic outer portion of the door, however, only when the door is withdrawn from the doorway, since, when the door is in its normal position in the doorway, the base plate rests on the floor of the corresponding oven chamber.

In one preferred embodiment of the invention, the metallic outer door portion comprises a supporting frame and an elastic or flexible metallic plate which is interposed between said frame and the inner or plug section of the door and which carries packing or sealing means at its edge, and which is hinge connected to the supporting frame at the top of the door. The said supporting frame consists, as shown in the accompanying drawings, of two vertical metal bars of channel bar, or U shape, cross section, which are interconnected by transverse frame ribs, the flanges of each such bar being at the side of the latter remote from the other bar. Adjustable pressure screws, mounted on the supporting frame at intervals along the length or height of the door, act on the flexible plate at the edge of the latter to hold the said sealing means carried by the plate, in abutting relation with the door frame member.

In another embodiment of the invention, the supporting frame is formed by a rigid plate the edge of which is bent outwardly. This rigid plate may have strengthening ribs including transverse ribs wherein the door bolts or locking bars are mounted. In this embodiment an elastic or flexible frame is employed in lieu of the flexible plate employed in the first mentioned embodiment. Said flexible frame carries sealing or packing means at its outer margin and is clamped between the rigid plate and the refractory plug. Holders for the presser screws, by which the

packing or sealing means are adjusted or tightened, are mounted on the outer edge of the rigid plate.

Further characteristic features and details of the invention will be described hereinafter with reference to the accompanying drawings which show, by way of example, the two above mentioned embodiments of the invention, and in which:

Figure 1 is a front view of a door forming the first above mentioned embodiment of the invention;

Figure 2 is a vertical longitudinal section on the line II—II of Figure 1;

Figure 3 is a horizontal section on line III—III of Figure 2;

Figure 3a is a partial section taken similarly to Figure 3, and shows a modified form of the metallic parts which embrace the vertical bars;

Figure 4 is a vertical section on line IV—IV of Figure 2;

Figure 5 is a vertical longitudinal section of a door forming the second above mentioned embodiment of the invention; and

Figure 6 is a horizontal section on line VI—VI of Figure 5.

In the door embodiment shown in Figures 1-4, the outer supporting frame portion of the door consists of main metallic members 1, of U shape or channel bar section, which are interconnected by transverse portions formed with threaded bores in which screws 3 are screwed. A transverse door bolt or latching bar 4 is rotatably mounted on each of the screws 3. The latching bars 4 are interconnected by rod 6, and are adapted to engage hooks 5 fixed to the door frame 9 of the oven chamber, so that by turning the screws 3, the door may be firmly pressed against said door frame.

A flexible metal plate 7 at the inner side of the supporting frame portion of the door carries at its edge a sealing means 8, which is adapted to abut against a machined face of the door frame 9. The plate 7 is provided at its outer side adjacent its upper end with bored lugs or eye parts 10 respectively alongside corresponding apertured lugs or eye parts 11 carried by the main supporting frame members 1. A horizontal bolt or bolts 12 passing through the apertures in the lug or eye parts 10 and 11, cooperate with the latter to provide a hinge connection through which the metal plate 7 is suspended from the supporting frame members 1. The plate 7 also has fixed to its outer side horizontal metallic strengthening ribs 13 of channel bar cross section, the ends of which are acted upon by presser screws 14. The latter are threaded through threaded passages or bores provided in the supporting frame members 1, and in flat eye or pad parts 15 fixed thereto. When the door supporting frame is in its normal position relative to the door frame 9, as shown in Figs. 3 and 4, the sealing means 8 carried by, and at the edge of the flexible metal plate 7, may be firmly pressed against the fixed door frame 9 of the oven chamber by adjustment of the presser screws 14.

To support the refractory plug or inner door, a metallic base plate 18 is fixed to the lower portion of the flexible plate 7. The base plate 18 is provided with an uprising extension or vertical rear wall 16, and with corner ribs 17 at the sides of the refractory plug. The refractory plug thus supported by the flexible plate 7, is composed of individual superposed masonry sections 19, between which are provided sheet metal plates 20.

Two vertical bars 21 pass through each of the sections 19 of the refractory plug, and through holes provided therefor in the plates 20, and thus interconnect the plug parts, and maintain the plug or refractory portion of the door at the permanent required uniform distance from the flexible metal plate 7. The sheet metal plates 20 are fixed to portions of the plate 7 alongside which the strengthening ribs 13 are located.

The connection between the plug bars 21 and the outer door may be effected, also, by holders differing in construction from the plates 20, such for example as illustrated in Figure 3a, wherein the holders are formed by flat iron hooks 22 which engage the vertical bars 21.

As shown in Figs. 1 and 2, the door is provided with an opening at its top, which serves for the introduction of the levelling bar and normally is closed by a cover 23.

In the closed position of the door shown in Figs. 3 and 4, the flexible plate 7 extends across the door opening and has its marginal portion projecting laterally away from the top and bottom and vertical sides of the refractory plug section of the door and overlapping the machined face, or sealing surface, of the stationary door frame member 9. The sealing means 8, as shown, constitutes a rectangular frame attached to the marginal portion of the plate 7 and surrounding the plug section of the door, said frame being formed of metal of angle bar cross section having one flange extending away from the plate 7 with its free edge in sealing engagement with the sealing surface of the door frame member 9, in the closed position of the door.

In the embodiment illustrated in Figures 5 and 6, the supporting body portion of the door is an integral cast metal piece which comprises a rigid plate 24, situated in front of the charge in the oven chamber, and which is provided with narrow strengthening ribs 25, strong transverse ribs 26, and eyes or apertures 27 in which presser screws 38 are threaded. Door bolts or latching bars 28 are mounted on the transverse ribs 26 and are adapted to engage hooks 30 fixed to the fixed door frame 29. In this embodiment, also, the refractory plug portion of the door is composed of individual sections 31 which are held together by vertical bars 32, the whole plug portion of the door resting on a base plate 33 fixed to the rigid cast plate 24. As shown in Fig. 5, the plug bars 32 are in the form of bolts threaded at one end, and engaging and extending between the base plate 33 and an upper holder 34. The latter as well as flat intermediate hooks or holders 35, are fixed to the plate 24.

The flexible frame, previously referred to as clamped between the rigid outer door plate and refractory plug portions of the door, is designated in Fig. 6 by the symbol 36, and is there shown as mounted on and clamped against the rigid plate 24. At its edge the frame 36 carries packing or sealing means 37 which engages with the fixed or stationary door frame 29 and cooperates with the latter in making a gas tight joint. The previously mentioned screws or bolts 38, adjustably mounted in the lugs or eyes 27, firmly press the flexible frame 36 with its sealing means 37 against the door frame 29. As shown in Figs. 5 and 6, the sealing means 37 is a rectangular frame of angle bar cross section with the free edge of one flange or blade adapted to engage the sealing surface of the door frame 29, as in the case of previously described sealing means 8, and the sealing frame part 36

is a rectangular frame-like body of sheet metal forming a flexible resilient metal web connecting the sealing means 37 to the rigid portion of the door structure.

Both door embodiments illustrated possess common characteristic and significant features, in that neither embodiment includes metallic parts having a large surface in contact with the hot oven chamber charge, or includes parts providing a good heat conducting path in the horizontal direction through the door to the outer side of the latter. Except for the lower plug supporting base plates 18 and 33 shown in Figs. 2 and 5, respectively, no metallic part of either door embodiment comes into contact with the oven charge. Neither the plug holding plates 20 shown in Fig. 3, nor other holding members, such as the flat hooks 22 shown in Fig. 3a, engaging the vertical plug bars, extend to the front surface of the plug. In consequence, the temperature of the outer metallic door surfaces are only slightly in excess of the outside air temperature and the heat losses due to radiation are thus kept relatively small. Furthermore, with each door embodiment, the metallic sealing flange is not heated by heat conduction to an extent sufficient to cause noticeable leakage or soiling of the sealing parts by the deposit thereon of condensed distillates.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A door for an oven producing coke or gas, consisting of an outer door section comprising a rigid door plate, and a refractory liner carried by a holder connected to said door plate, said plate having at the rim thereof a packing frame in the form of a blade which is connected to the door by a resilient metal web and bears with its edge against the door frame and said web being connected to said plate by clamping it between said plate and holder.

2. In a self sealing plug door for a horizontal oven chamber, the combination of a rigid metallic outer door section, a refractory inner plug section, metallic plug section holding means secured to the inner side of said rigid outer section, and sealing means comprising a flexible metallic web portion clamped between said rigid outer section and holding means, and a metallic sealing blade portion connected to said web portion at the outer edge of the latter extending away from the inner side of said web portion alongside the outer portion of the edge of said plug section.

3. A plug door for a horizontal oven chamber with a door opening and a sealing surface at the margin of said opening, said door comprising an inner plug section of refractory material, an intermediate sealing section and a rigid outer section forming a support for said inner and intermediate sections, said intermediate section comprising a flexible metallic plate portion clamped between the inner and outer sections and projecting away from the sides of the latter to overlap said surfaces and comprising a metallic sealing portion extending inwardly from said plate portion adjacent the margin of the latter and adapted to engage said surface, and adjustable presser means mounted on said support and adapted to act between it and said plate portion at points adjacent, and distributed along the length of, said margin to press said sealing portion against said surface.

4. A plug door for a horizontal oven chamber having a door opening, and a sealing surface at

the margin of said opening, said door comprising an outer supporting body formed by a rigid plate having its edges bent outwardly, an inner door part of refractory material, supporting means for said refractory material fixed to said supporting body, a flexible metallic frame clamped between said supporting body and said inner door part and having sealing means at its margin, and presser screws mounted in, and distributed along the outer edge of said supporting body and adapted to act upon the outer edge of said flexible frame to press said sealing portion against said surface.

5. A plug door for a horizontal oven chamber with a door opening and a sealing surface surrounding said opening and adjacent the margin thereof, said door comprising a rigid outer section, an inner plug section of refractory material, supporting means for said refractory material comprising metallic parts secured to said outer section, an intermediate sealing section comprising a flexible metal plate portion clamped between said supporting means and said outer section and projecting away from the latter to overlap said surface and comprising a metallic sealing portion extending inwardly from said plate portion adjacent the margin of the latter and adapted to engage said surface, and adjustable pressing means mounted on said support and adapted to act between it and said plate portion at points adjacent, and distributed along the length of, said margin, to press said sealing portion against said surface.

6. A self sealing door for a horizontal coke oven chamber which has a door opening and a sealing surface at the margin of said opening, said door comprising an inner plug portion of refractory material, an outer metallic portion including sealing means, and including a metallic part extending beneath and supporting the weight of said plug portion, and a vertical metallic member embedded in said refractory material and connected at different levels to said outer metallic portion, said sealing means comprising a flexible metallic web portion at the outer side of said plug portion and projecting laterally therefrom and comprising a metallic portion carried by said web portion at the margin of the latter and adapted to engage said sealing surface when said plug portion is entered in said door opening, and said refractory material being exposed to the interior of the oven chamber at the side edges of said plug section for substantially the full horizontal extent of said edges along the major portion of the vertical extent of said plug section.

7. A self sealing door for a horizontal coke oven chamber which has a door opening and a sealing surface at the margin of said opening, said door comprising an inner plug portion of refractory material, an outer metallic portion including sealing means, and including a metallic part extending beneath and supporting the weight of said plug portion and including vertical parts at the opposite sides of a relatively short lower portion of said plug section, a vertical metallic member embedded in said refractory material and connected at different levels to said outer metallic portion, said sealing means comprising a flexible metallic web portion at the outer side of said plug portion and projecting laterally therefrom and comprising a metallic portion carried by said web at the margin of the latter and adapted to engage said sealing surface when said plug portion is entered in said door opening, and

said refractory material being exposed to the interior of the oven chamber at the side edges of said plug section for substantially the full horizontal extent of said edges along the vertical extent of the plug section except for the portions of said edges alongside said vertical parts.

8. A self sealing door for a coking chamber which has a door opening and a sealing surface at the margin of said opening, said door comprising an inner plug section of refractory material, a metallic outer frame section, a flexible metallic plate interposed between said frame and plug sections and having a marginal portion projecting laterally away from the edge of said plug section, metallic sealing means carried by said plate adjacent its margin and extending inwardly from said plate and adapted to engage said sealing surface when said plug section is entered in said door opening, means providing a hinged connection between said frame section and plate adjacent their upper ends with the hinge axis of said connection horizontal and parallel to said plate, a metallic part connected to the lower portion of said plate and extending away from the inner side of the latter beneath said plug section and supporting the weight of the latter, means including a vertical bar connected to said plate at different levels and embedded in said refractory material for maintaining the latter in spaced relation with said plate, and adjustable presser means mounted on said frame section and adapted to act between it and said plate at points adjacent and distributed along the length of, said margin, to press said sealing means against said surface.

9. A self sealing door for a coking chamber which has a door opening and a sealing surface at the margin of said opening, said door comprising an inner plug section of refractory material, a metallic outer frame section, a flexible metallic plate interposed between said frame and plug sections and having a marginal portion projecting laterally away from the edge of said plug section, metallic sealing means carried by said plate adjacent its margin and extending inwardly from said plate and adapted to engage said sealing surface when said plug section is entered in said door opening, a metallic part connected to the

lower portion of said plate and extending horizontally away from the inner side of the latter beneath said plug section and supporting the weight of the latter, means including a vertical bar connected to said plate at different levels and embedded in said refractory material for maintaining the latter in spaced relation with said plate, and adjustable presser means mounted on said frame section and adapted to act between it and said plate at points adjacent and distributed along the length of, said margin to press said sealing means against said surface, and means providing a connection between said frame section and plate through which the latter is supported by said frame section with freedom for horizontal movement toward and away from the section of the said points of said plate, said refractory material being exposed to the interior of the oven chamber at the side edges of said plug section for substantially the full horizontal extent of said edges along the major portion of the vertical extent of said plug section.

10. A self sealing door for a horizontal coke oven chamber which has a door opening and a sealing surface at the margin of said opening, said door comprising an inner plug portion of refractory material, an outer metallic portion including sealing means, and including a metallic part supporting the weight of said plug portion and of a vertical extent which is a small fraction only of the vertical extent of the plug section of the door and a vertical metallic member embedded in said refractory material and connected at different levels to said outer metallic portion, said sealing means comprising a flexible metallic web portion at the outer side of said plug portion and projecting laterally therefrom and adapted to engage said sealing surface when said plug portion is entered in said door opening, and said refractory material being exposed to the interior of the oven chamber at the side edges of said plug section for substantially the full horizontal extent of said edges along the major portion of the vertical extent of said plug section, whereby the transfer of heat from the inner side of said plug section through the latter to the outer portion of the door is made relatively small.

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