

July 25, 1961

H. L. COE

2,993,845

METAL PLUG TYPE COKE OVEN DOOR

Filed July 22, 1958

FIG. 1

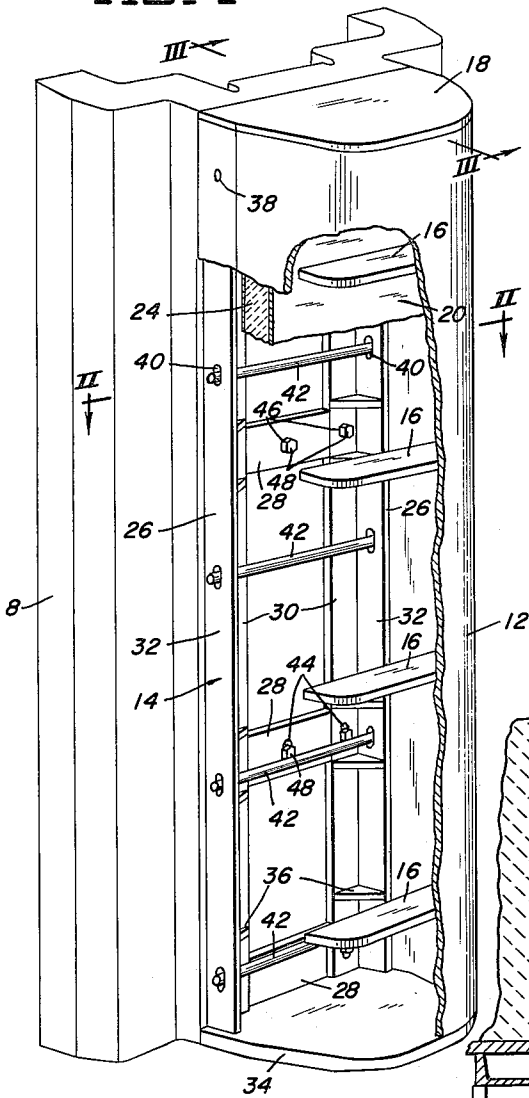


FIG. 3

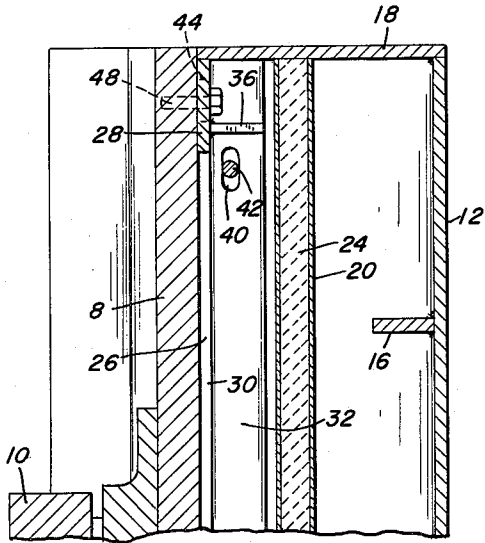
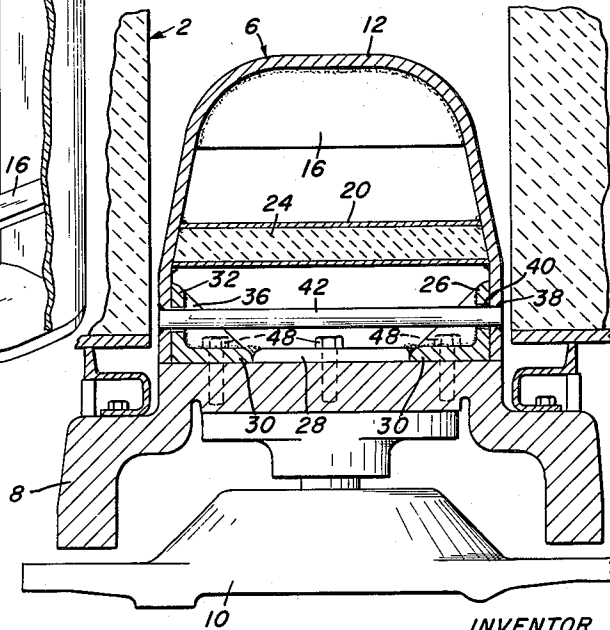


FIG. 2



INVENTOR
HERBERT L. COE
By *Donald L. Dalton*
Attorney

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2,993,845

METAL PLUG TYPE COKE OVEN DOOR

Herbert L. Coe, Pleasant Hills, Pa., assignor to United States Steel Corporation, a corporation of New Jersey
Filed July 22, 1958, Ser. No. 750,187
1 Claim. (Cl. 202—248)

The present invention relates generally to coke ovens and more particularly to an improved plug-type coke oven door.

Prior to my invention, the plug-type door used to close the open ends of modern coke oven chambers usually included a cast metal outer door element or panel and an inner plug section of refractory material secured to the outer door panel. When the door was in position overlying an open end of the coke oven the plug section extended inwardly from the cast metal panel into and substantially filled the end portion of the coke oven. The refractory plug sections consisted of special shaped refractory segments held together by various retaining means, usually made of steel or cast iron, or monolithic castings made from castable refractories which were secured directly to the outer door panel.

The purpose of the refractory plug was to provide an insulating medium which was highly resistant to damage by the heat and atmosphere within the coke oven chamber and which would provide insulation for the cast metal outer door panel as well as minimize heat loss from the coal in the coke oven near the door.

The cost of maintaining coke oven doors is one of the most expensive items in by-product coke oven operations. Up to the time of my invention, a considerable portion of this expense was incurred in the maintenance of the refractory plug sections of the doors since they were subject to relatively high rates of deterioration brought about by exposure to the tars and hot gases in the coke oven. The carbonaceous vapors within the oven impregnated the small voids and crevices in the refractory and, with subsequent heating and cooling, resulted in gradual expansion of the carbon with consequent fracture and disintegration of the refractory surfaces. Carbonaceous build-up between the refractory and the metal refractory retainers also caused disintegration of the refractory as well as distortion of the metal retainers. Further, the differences in the coefficients of expansion and contraction of the metal retainers and the refractory caused stresses to be built up between the metal retainers and the refractory which, in turn, caused surface fractures and premature failure of the refractory.

The present invention proposes and has as its primary object to provide a plug-type coke oven door having a metal plug section formed with a unitary outer wall and a partitioned hollow interior.

This and other objects will become more apparent after referring to the following specification and attached drawings, in which:

FIGURE 1 is a view in perspective with parts broken away for clarity of illustration;

FIGURE 2 is a cross-sectional view taken on the line II—II of FIGURE 1; and

FIGURE 3 is a partial vertical sectional view taken on the line III—III of FIGURE 1.

Referring more particularly to the drawings reference numeral 2 designates a conventional coke oven having the improved plug-type door of the invention installed thereon. The door of the invention consists of a metal plug section 6 and an outer door panel 8. The outer door panel 8, which is a metal casting, is conventional in structure and includes a conventional locking means 10 which operates in a manner well known in the art and, therefore, will not be described in detail.

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The plug section 6 of the invention consists of two essential parts including a metal nose section 12 and a metal retaining frame 14. The nose section 12, which may be fabricated from steel, cast iron or other suitable metal, is in the form of an upstanding plate bent into channel shape and mounted on the retainer 14. A series of horizontal metal plates 16 in vertically spaced relation may be welded or otherwise rigidly fastened to the interior of the nose 12 to strengthen and render the nose rigid. The top of the nose 12 may be capped by a suitable metal plate 18 which is affixed to the nose by welding or other suitable means.

The interior of the nose 12 is divided into two separate compartments by a partition wall 20 which extends between the sides of the nose 12 and is disposed between the closed and open ends thereof. The partition wall 20 consists of two spaced parallel metal plates which may be welded or otherwise secured to the interior sides of the nose 12. A mass of heat insulating material 24 such as magnesia block or similar material may be used to fill the void between the two plates of the partition.

The retaining frame 14 is preferably fabricated from a pair of steel angles 26 and a plurality of flat plates 28. The angles 26 are disposed in parallel spaced relation with one leg 30 of each disposed parallel with the outer panel 8 and one leg 32 projecting normal to the panel. Plates 28 are welded to and extend between the opposing edges of the legs 30 of the angles 26 at spaced intervals along the lengths of the angles. A steel toe plate 34 which is preferably welded to and projects normally from the bottoms of the angles 26 and the lowermost plate 28 forms the bottom of the retainer frame. Gusset plates 36 are welded at spaced intervals along the lengths of each of the angles 26 between the legs 30 and 32 thereof to strengthen the retainer frame.

In assembling the plug section of the invention, the nose 12 is positioned on the retainer frame with its sides disposed adjacent the projecting legs 32 and its bottom resting on the toe plate 34. Vertically spaced countersunk holes 38 are provided in the sides of the nose adjacent the vertical edges thereof which align with elongated holes 40 in the projecting legs 32 of the angles of the retaining frame when the nose section 12 is positioned over the retaining frame. Round rods 42 are inserted through each set of the aligned holes 38 and 40 and welded in place in holes 38 to secure the nose section to the retaining frame. The bottom edge of the nose is welded to the toe plate 34 to complete the assembly of the plug section 6.

Groups of elongated holes 44 and a group of round holes 46 are provided in the legs 30 of the angles and the plates 28 for securing the assembled plug section to the door panel 8 by means of stud bolts 48 or similar means. The round holes 46 together with the stud bolts 48 serve to fix the retainer frame in proper position on the door panel 8 while the elongated holes permit expansion of the frame relative to the door panel.

In use, the dead air spaces formed by the partition 20 within the plug section 6, augmented by the mass of insulating material 24, provides thermal insulation which minimizes heat loss from the coal being coked in the end of the chamber and provides thermal protection for the outer door panel casting. If desired, more than one partition can be provided so that more than two dead air spaces will be formed.

Experience has demonstrated that the metal plug-type door of the invention, whose initial construction cost is less than half of that of a conventional refractory plug-type door, has a greater life expectancy and can be maintained substantially less expensively than conventional refractory plug-type coke oven doors. Under normal op-

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erating conditions no measurable deterioration or distortion of the metal plug-type door of the invention due to the heat or corrosive atmosphere inside the coke oven has been found. The possibility of tar and/or carbon build-up on the metal plug of the invention is minimized because of the absence of voids and crevices in the surface of the metal nose 12. What little tar and carbon does adhere to the outer surface of the nose during use is much more easily removed with far less labor than is required for cleaning conventional refractory plugs.

While one embodiment of my invention has been shown and described, it will be apparent that other adaptations and modifications may be made without departing from the scope of the following claim.

I claim:

A coke oven door comprising an outer panel dimensioned to overlie a door opening in a coke oven, a plug of metal plate in upstanding channel section having two sides and a front wall, said two sides and front wall being integral and constituting a one-piece construction, a pair of spaced upright angle bars affixed to said panel, each of said angle bars having one leg projecting substantially normal to said panel, said plug being secured at its edges to the normally projecting legs of said angle bars so as to project inwardly therefrom into the door opening, said projecting legs of said upright angle bars and

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the sides of said plug adjacent said projecting legs each having aligned holes spaced therealong, the holes in one side of said plug and the projecting leg adjacent thereto being aligned with the holes in the other side of said plug and the projecting leg adjacent thereto, a retaining rod fitted into each opposing set of aligned holes and spanning said plug to thereby secure said plug to said angle bars, said retaining rods each being fixedly connected adjacent each end with the sides of said plug, the holes in each of said projecting legs each being elongated in the direction longitudinally of the leg thereby providing space for movement of said rods upon expansion of said plug, and a partition wall extending between the sides of the plug spaced inwardly from said panel and generally parallel therewith.

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