Aug. 8, 1944. W. C. BULMER 2,355,142

FURNACE DOOR

Filed April 1, 1942

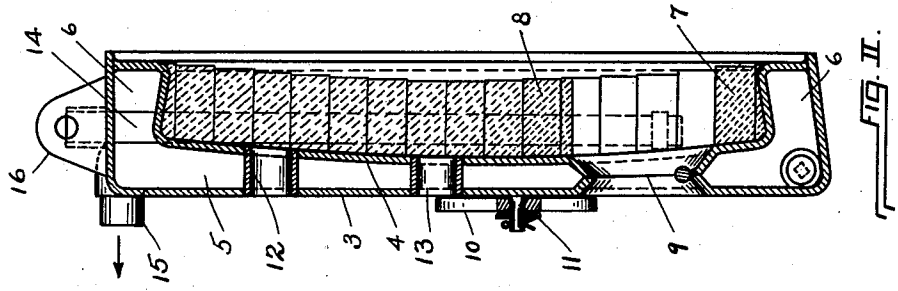

FIG. II.

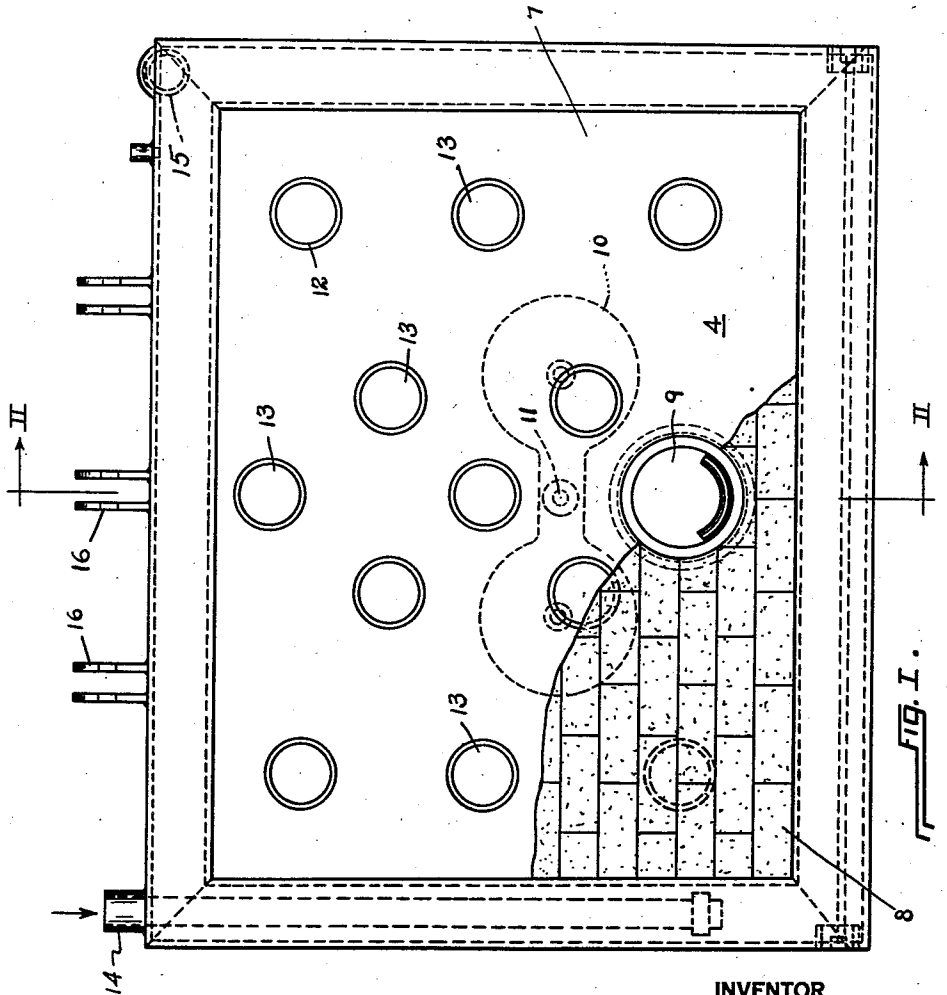

FIG. I.

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Patented Aug. 8, 1944 2,355,142

UNITED STATES PATENT OFFICE

2,355,142

FURNACE DOOR

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Application April 1, 1942, Serial No. 437,161

8 Claims. (Cl. 122—498)

This invention relates in general to the furnace art and is particularly applicable to furnace doors of the water cooled, metal frame, refractory faced type. These doors are used in furnaces, such as steel open hearth furnaces where comparatively high temperatures are encountered.

One of the disadvantages inherent in certain types of water cooled furnace doors in common use is the difficulty of readily determining the condition of the refractory lining which is exposed to the high temperatures encountered in melting and refining steel. In other types of furnace doors where considerable areas of refractory lining are visible from outside the door the operators are exposed to considerably more heat than is desirable.

By my invention I provide a door of such construction that the operator by rapid inspection, can determine the condition of the door lining and at the same time is exposed to relatively little heat. This I accomplish by providing a series of water cooled inspection holes spread over the furnace door area. By glancing through these holes the lining can be inspected and the need for relining determined.

It is also an object of my invention to provide a novel and very effective bracing arrangement for strengthening the door structure and which is such as to avoid impairment of the circulation of the fluid employed to cool the door and which presents no sediment retaining surfaces.

In the accompanying drawing, wherein I have shown for purposes of illustration only a preferred embodiment of my invention:

Fig. I is a plan view showing the door in rear elevation, but with part of the refractory lining broken away, and

Fig. II is a view in vertical section along the line II—II of Fig. I.

In the drawing there is shown a water cooled, furnace door formed of rolled steel suitably shaped and welded together to form a shell in which a refractory lining is placed. The door includes a front plate 3 and a back plate 4 spaced from the front plate. The plates 3 and 4 are spaced apart and shaped so as to enclose a main water space 5 and a peripheral water space 6, around the edge of the door. The space 6 projects inwardly from the main water space 5.

The back or inner plate 4 is shaped so as to provide a reentrant space or recess 7, in which a refractory lining 8, usually of fire brick, is placed. The lining 8 is omitted from the space in line with a wicket hole 9 which extends through the plates 3 and 4. A statically balanced dumb-bell shaped wicket cover 10 is swivelly attached at 11 to the outer plate 3. The cover can be swung into position to cover or uncover the wicket hole 9.

In the main panel portions of the plates 3 and 4 (those portions which enclose the main water space 5) I provide spaced apart alined openings, the edges of which openings are welded to the ends of short pieces of metal tubing 12 which extend between the plates. This construction provides a series of water cooled tell-tale apertures or inspection openings 13 through which the condition of the refractory lining 8, which closes the holes 13 can be viewed.

The tubes 12 are shown as round in section, but it is evident that the tubes of other sections such as square, diamond, or even rectangular could be used. Whatever shape is used, the tubes should be so placed as to present as small an area as possible on which sediment could gather. Thus if a triangular shaped tube is used it should preferably be placed so that the base will be at the lower part of the opening.

It will be observed that the construction does not include the customary stay-bolts between the inner and outer plate. Such stay-bolts are unnecessary since the tubes 12 themselves are effective stay-bolts.

I prefer to locate the inspection holes so that any hole is not much over one foot from another one. At the middle part of the door I prefer somewhat closer spacing, as this is the area where the refractory lining generally disintegrates most rapidly and therefore should be more closely inspected.

A water inlet pipe 14 extends from one corner of the frame into the side portion of the peripheral water space 6 to a point near the bottom of the water space 6. An outlet pipe 15 is provided at the opposite upper corner. Lifting lugs 16 are provided at the top of the door.

While I have shown the inner plate 4 as dished and the outer plate 3 as flat, it is to be understood that both plates may be flat or both dished, and that either one may be dished and the other flat. It is also possible to cast such a door.

By my invention I provide a water cooled furnace door which is relatively cool and consequently protects the workmen from excessive heat, is sturdy in construction, inexpensive to fabricate and one in which the condition of the refractory lining is at all times visible.

While I have illustrated and described a preferred embodiment of my invention, it will be understood that it is not limited thereto, but may

be otherwise embodied and practiced within the scope of the following claims.

I claim as my invention:

1. A water cooled furnace door including an outer plate and an inner plate spaced from the outer plate, the plates enclosing a water space, said outer plate having a plurality of spaced apart openings, said inner plate having corresponding and aligned openings, tubes extending from one plate to the other and secured to the portions of the plates surrounding the openings, said door having a refractory lining adjoining the inner plate.

2. In a water cooled furnace door including an outer plate, an inner plate, said plates enclosing a space, and a refractory lining for said inner plate, the invention which consists of hollow stays connected to and extending between said plates and providing an inspection opening through the plates and through which the refractory lining may be viewed.

3. In a water cooled furnace door including an outer plate, an inner plate, said plates enclosing a space, and a refractory lining for said inner plate, the invention which consists of a plurality of tubular members connected to and extending between and through said plates and providing an inspection opening through the plates and through which the refractory lining may be viewed.

4. In a water cooled furnace door including spaced apart walls lined with a refractory, the invention which consists of a plurality of tubular members extending between and integrated to said walls the bores of said tubular members extending through said walls and providing inspection openings through which the refractory lining may be viewed.

5. A water cooled furnace door having a water cooling chamber substantially coextensive with the area of the door, the chamber being formed between spaced metal walls, a refractory lining on the inner face of the door, and hollow stays extending crosswise of the chamber and through the opposite walls thereof.

6. A water cooled furnace door including a front plate and a back plate spaced from the front plate, the back plate having a portion bowed toward the front plate, the plates enclosing a water space, a plurality of spaced openings in the bowed portion, the front plate having corresponding aligned openings, tubes extending from one plate to the other and secured to the portions of the plates surrounding the openings and a refractory lining extending rearwardly from the back plate.

7. A water cooled furnace door including a front plate and a back plate spaced from the front plate, the back plate having a portion bowed toward the front plate, the plates enclosing a water space, a plurality of spaced openings in the bowed portion, the front plate having corresponding aligned openings, tubes extending from one plate to the other and secured to the portions of the plates surrounding the openings and a refractory lining of substantially uniform thickness, extending rearwardly from the back plate.

8. In a furnace door including a double walled structure provided with a heat-resisting facing and forming between the walls a cooling space, said walls having a plurality of spaced openings, with the openings in one wall aligned with the openings in the other wall, the invention which comprises a plurality of tubes secured to and extending between said walls at the aligned openings therein to provide for inspection of said facing.

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