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EXPLOSION DOOR FOR FURNACES

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Fig. 1.

Fig. 2.

Fig. 3.

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This invention relates to relief assemblies for the walls of furnaces, for the purpose of providing a wall section which can easily be blown out in the event of gas explosions, relieving pressures which otherwise would damage the furnace structure.

Therefore various means to this end have been employed in gas or oil-fired furnaces, which usually are heavily insulated. For example, it has been customary to provide either a loosely fastened wall panel which would give way under the stress of an explosion, or a metal door or cup tightly fitted to a flanged collar. It is difficult to insulate the latter type of relief door adequately.

The older explosion-relief panels also have several disadvantages. Being an integral part of the furnace exterior wall structure, in case of an explosion they create a dirt nuisance in many places as for example in bakeries, because loose insulating material is scattered by the blast. Furthermore, reinstalling the blown-out section is a long and troublesome task. When single unitary blow-out doors are provided, it is difficult to make them gas-tight and at the same time so fit them that they will offer only a slight resistance to gas explosion pressures.

It is an object of my invention to overcome the disadvantages of these older structures by providing a novel explosion relief assembly which will be simple in construction, light in weight, and yet well insulated against the transmission of heat, which will be gas-tight to prevent unnoticed leaking of air into the furnace, yet will offer only slight resistance to puffing and explosions in the furnace.

A further object is to provide an explosion-relief structure which shall be easily and quickly replaceable when it has been blown out of place without the use of tools, and which affords convenient inspection of and access to the invention.

Other objects and advantages of the invention will be apparent in the course of the following description.

In the accompanying drawing forming a part of this specification, and in which like numerals designate like parts, Fig. 1 is a front elevation of an explosion door assembly according to the invention.

Fig. 2 is a diagrammatic top plan view partly in section, taken along line 2—2 of Fig. 1.

Fig. 3 is a sectional side elevation taken along line 3—3 of Fig. 2.

The blow-out structure shown in the drawing is installed in any suitable wall 1 of the furnace, and is particularly suited to oven structures in which a gas or oil-burning furnace is enclosed within the insulated walls of the oven. An opening or passage 2 is cut through wall 1, communicating with the interior of the furnace (to the right in Fig. 3). Passage 2 is lined with a casing 3, in this instance shown rectangular in cross-section, made of sheet metal so as to retain the insulating material of the wall structure 1. Casing 3 is of substantial length as can be seen from Figs. 2 and 3. That is, its end closures, to be described, are spaced apart and with the casing enclose an expansion chamber of substantial size for the dissipation of the force of minor puffings within the furnace. At the inner end of casing 3 there is fixed a peripheral flange 4 which defines a central opening substantially less in breadth and height than the passage 2.

A light-weight door 5 is provided, preferably hollow, made of light-gauge sheet metal and filled with insulating material. The inner face of door 5 is similar in shape to the opening in flange plate 4, but is considerably larger than that opening in cross-sectional area so that when door 5 is abutted against the flange 4 the opening therein is completely covered. While the face of the door 5 is thus large enough to close the opening in flange 4, its height or breadth or both are substantially less than the height and breadth of passage 2, so that there is a considerable clearance between one or more of its lateral edges and the walls of the casing 3. The thickness of door 5 is less than the length of the casing 3 so that the door fills only a portion of the total space enclosed by the casing walls.

The insulated door 5 is provided with hinge or pivot pins 6 located above its center and offset rearwardly from its center of gravity (to the right in Fig. 3). Two hangers or brackets 7 to receive hinge pins 6 are fixed one at each side wall of the casing 3, positioned so that when hung in them the door 5 will close the opening defined by the flange plate 4. Due to the offset position of the hinge pins 6 the weight of the door causes it to swing snugly into contact with the flange 4.

At the outside of casing 3 a cover plate 8 made of light-gauge sheet metal is secured in a frame at the oven wall by wing nuts 9. The edges of plate 8 are slotted to receive the bolts carrying nuts 9, so that an explosion will buckle the plate only slightly before causing it to slip from beneath the nuts. Plate 8 is suitably clamped by finish strips and gasket material to provide a
gas-tight seal, preventing leakage of air into the furnace. In gas or oil-fired furnaces such leakage can contribute to inefficient combustion for a long time before it is detected.

On the outer back wall of the insulated door 2 are provided for easy handling and reinstalling of the door, and as a further protective measure a chain 11 is passed through the handles to check the flight of the door in case of an exceptionally heavy explosion in the furnace.

The structure shown and described has several important advantages in use. The door 5, hanging in close contact with flange 4, effectually blocks radiation of heat through the opening 2. By virtue of its comparatively large bulk and light weight it serves to dissipate the energy of minor gas explosions within the furnace. In the case of such an explosion the door will rock to the left in Fig. 3, permitting the free escape of gases past its edges. The light-gauge sheet 8 is easily blown from its mounting without excessive buckling or damage. After such an explosion door 5 swings back against flange 4, permitting continued operation of the fuel burner and protecting the operator from heat while he replaces the sheet 8 in its mounting. In the case of a severe explosion, door 5 is blown from its place in hangers 7. The chain 11 checks its velocity, which otherwise might be a hazard to a person close to the opening 2. After such an explosion the door is readily hung back in hangers 7 and sheet 8 can be replaced in a few minutes without the use of any tools.

Since all insulation of the walls 1 is separated from the pressure relief opening and since the insulation of door 5 is entirely enclosed, an explosion does not scatter insulating materials which must be replaced.

While for purposes of illustration a preferred embodiment of my invention has been shown in the drawing, various modifications determined by the size of a specific furnace, the force of possible explosions, etc., may be made in the structure without departing from the invention. For instance, the shape and construction of the casing, the door, and its mounting may be modified to suit special requirements without departing from the scope of the appended claims.

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

1. In combination with a furnace wall, an explosion-relief assembly comprising a casing defining a passage through said wall, a peripheral flange at the inner end of said casing defining an opening substantially smaller than the cross-sectional area of said passage, a heat-insulated door, having an inner face larger in area than the opening in said flange, but smaller than the cross-sectional area of said passage, means for movably mounting said door in said passage so that it abuts against said flange and yieldingly closes the opening therein, and a gas-tight cover movably secured to the outer end of said casing and closing said passage.

2. In combination with a furnace wall, an explosion-relief assembly comprising an open-ended casing extending through said wall and having an internal flange around its inner end, a gas-tight cover movably secured to the outer end of said casing, and a heat-insulated door independent of said cover movably mounted within said casing to abut yieldingly against said flange and close the inner end of the casing.

3. A combination as claimed in claim 2, wherein the door is mounted by a pair of pivot pins at opposite lateral edges of said door movably received in brackets fixed to opposite side walls of the casing, said pins being located above and inwardly of the center of gravity of the door whereby the door is caused to hang yieldingly pressed against the outer face of said flange.

4. In combination with a furnace wall, an explosion-relief assembly comprising an open-ended casing of substantial length extending through said wall, a gas-tight cover secured to the outer end of said casing so as to be easily displaceable therefrom by force of an explosion within the furnace, and a heat-insulated door yieldingly mounted to close the inner end of said casing.

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