

March 28, 1961

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2,977,106

FURNACE CLOSURE

Filed May 8, 1957

2 Sheets-Sheet 1

FIG. 1

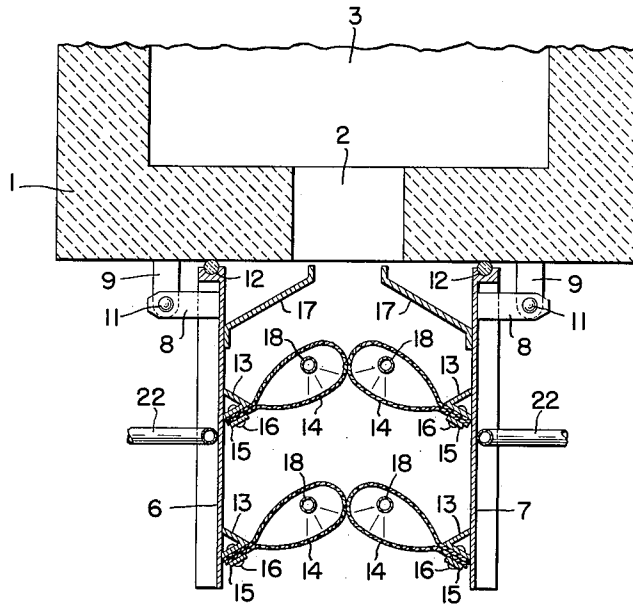
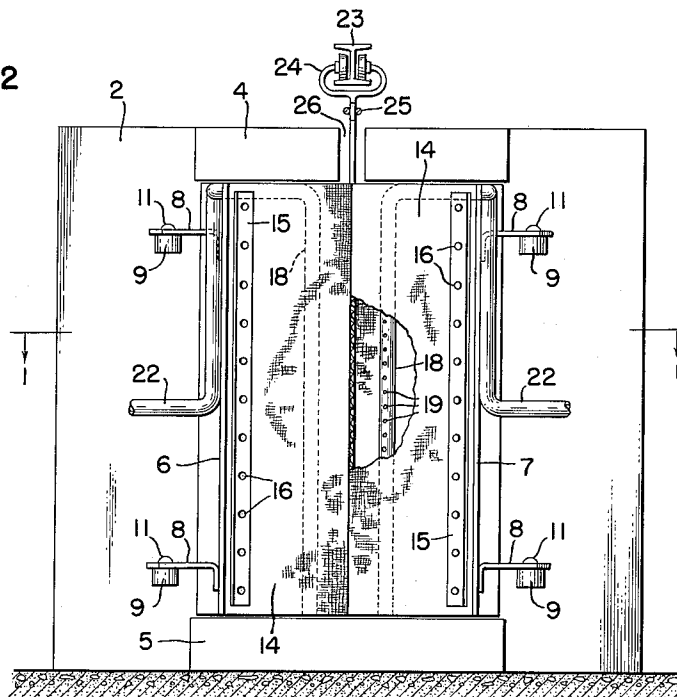


FIG. 2



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FIG. 3

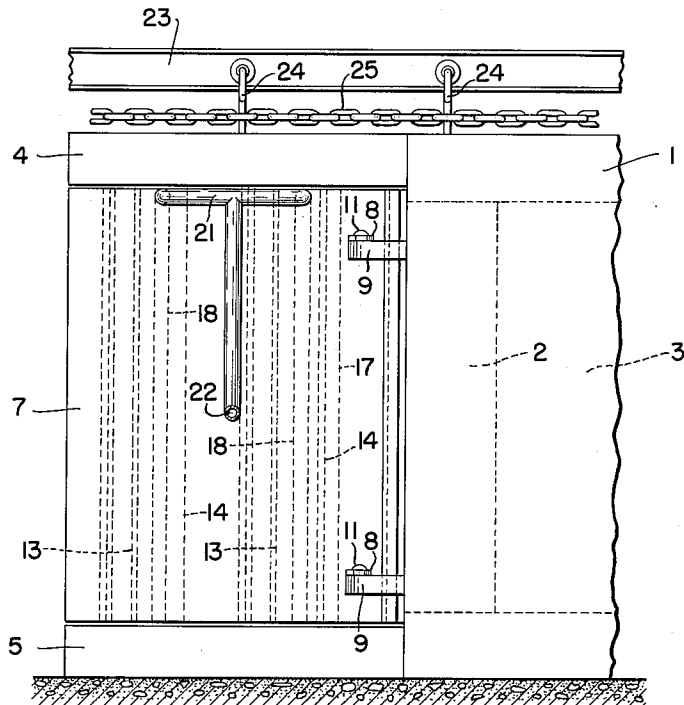
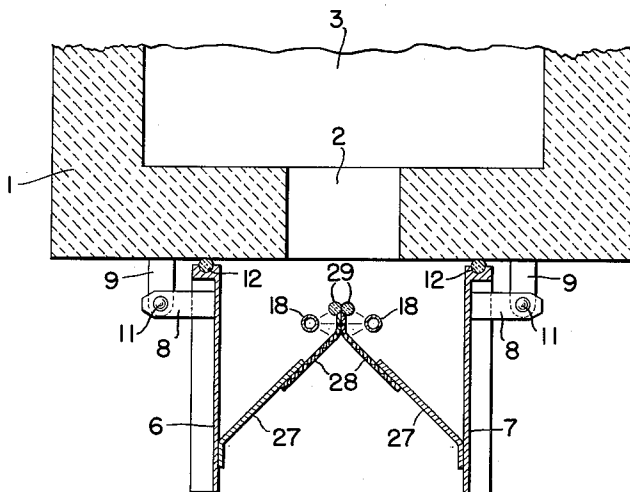


FIG. 4



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FURNACE CLOSURE

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3 Claims. (Cl. 263—50)

The present invention relates to furnaces, and more particularly to apparatus for closing the entrance and exit openings of a furnace between the times that work is being moved into and out of the same.

In many cases work pieces to be heated are moved consecutively through an elongated furnace by some type of conveyor mechanism. If some means is not provided to close the furnace openings between the times that work pieces are being moved through them quite a bit of heat will be lost. More important, however, the drafts that are set up in the furnace chamber when the entrance and exit openings are not kept closed will upset the heat pattern within the chamber and cause improper heating of the work pieces.

It is an object of the present invention to provide a closure for a furnace opening. It is a further object of the invention to provide such a closure that remains closed normally, but which can be opened by the work as it moves into or out of the furnace.

A more specific object of the invention is to provide pneumatically operated flaps that serve to close the openings to a furnace.

In following the invention a sheet of material such as asbestos, which may be in the form of a loop, is attached to each side of the furnace opening and extending lengthwise thereof. These sheets of material form flaps that meet each other to close the opening. A supply of air under pressure discharged against the sheets or within the interior of the loops is used to keep them in engagement with each other. When a work piece is to be moved past the closure into the furnace the flaps can be moved against the pressure but will be returned thereby immediately to a closed position. Furthermore, the flaps are separated only to the extent necessary for the work piece to pass.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a plan view, in section, of the invention taken on line 1—1 of Fig. 2.

Fig. 2 is a front view partly in section,

Fig. 3 is a side view, and

Fig. 4 is a section similar to Fig. 1 of a modification.

Referring to Figs. 1 to 3 of the drawings, there is shown a furnace 1 having a vertically elongated opening 2 in one end thereof leading to a furnace chamber 3 through which it is intended to have work move from one end to the other. The invention is primarily concerned with a closure for this opening and includes parts forming a vestibule in front thereof. These parts include top and bottom portions 4 and 5 which are shown as consisting of extensions of the furnace refractory, and side

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portions 6 and 7 which can be made of sheet metal. These latter portions are pivoted to the front of the furnace so that they may be swung aside in order to give access to the entrance opening. To this end each of the

5 sides 6 and 7 is provided with a pair of horizontally extending hangers 8 that rest upon supports 9 projecting forwardly from the front of the furnace. Suitable pivots 11 extend through the hangers and supports to form hinges around which the sides 6 and 7 can be pivoted. 10 When the sides are in their operative position as shown the cracks between these sides and the front of the furnace are sealed by strips 12 that may be made of some suitable material, such as asbestos rope which is fastened to the sides.

15 The entrance is shown as being closed by two pair of flaps 14, although a larger or smaller number may be used depending upon furnace temperature and draft requirements. The flaps are supported by sides 6 and 7, and to this end each of the sides has on its inner face a 20 pair of vertically extending angle irons 13 to which the flaps 14 are fastened. Each of these flaps comprises a rectangle of flexible material which may be a stiff fabric, such as asbestos fabric, with parallel edges of the fabric drawn into a loop and fastened to the angle irons by 25 strips of metal 15 and screws 16. As best shown in Fig. 1 of the drawings, the flaps are of such a size that they form a V with the apex pointing toward the opening. Each of the flaps can be made in one piece extending from top to bottom of the opening, or they may be 30 made in several pieces and attached to angles 13 end to end. Radiation shields 17 are used to protect the flaps somewhat from the heat of the furnace. The flaps can be further protected from the heat by coating them with a refractory paint.

35 The flaps that extend inwardly from the opposite sides engage each other at substantially the center line of opening 2, and are resiliently held in engagement with each other by jets of air that are directed toward the inner surface of one side of the loop. Air is supplied 40 by a pipe 18 extending downwardly through each of the loops. The pipes are provided with a series of openings 19 directed toward the side of the loop away from the furnace. These pipes are supported at their upper ends from the sides 6 and 7 respectively. The pipes 45 on each side are joined by a pipe 21 which is connected with a suitable supply of air under a pressure of five to ten pounds per square inch through a pipe 22. It is noted that these supply pipes will have in them a flexible section, not shown, to permit the sides to be moved around pivots 11. It is further noted that any suitable means can be used to hold sides 6 and 7 in their operative position, which means can be released to permit 50 these sides to be swung outwardly.

Frequently, and as shown herein, the work is moved 55 to and through the furnace by an overhead conveyor. To this end there is provided a rail 23 that extends lengthwise of the furnace above a slot 26 in its roof. Work supports 24 ride along the rail and extend downwardly through the slot with the work hanging in the furnace chamber at the lower ends of the hangers. A plurality 60 of hangers is moved, one after the other, along the rail and they may be separated and moved in any suitable manner. As shown herein, there is a chain 25 which extends between the various hangers to pull them along the rail and to keep them properly spaced. A suitable shield may be used over slot 26 in order to protect the conveying mechanism from the gases which may be discharged through the slot. It will be obvious that the conveyor could be below the furnace with work holders 70 extending upwardly through a slot in the bottom.

In the operation of the apparatus, jets of air discharged from pipes 18 to the interior of the loops form-

ing the flaps, as indicated in Fig. 1, resiliently hold the outer ends of the flaps together to close the opening to the furnace. As the work pieces are moved by the conveyor into the furnace, upwardly in Fig. 1, these work pieces will engage the flaps and separate them against the force of the air pressure. The flaps are separated only enough to permit the piece to pass and will be immediately returned to their closed position shown in the drawing. Thus, it will be seen that there is provided a closure for the furnace chamber which is maintained in its closed position at all times and which can be opened by the work itself as the work is moving through the vestibule into the chamber.

The form of the invention disclosed in Fig. 4 differs from that previously described principally in the form of the flaps. Referring to that figure, it will be seen that each of sides 6 and 7 has a rigid support 27 attached to it and extending inwardly at an angle toward the center of the vestibule and toward the furnace entrance 2. A sheet of flexible material 28, such as asbestos fabric, is attached to each of the supports.

The flaps in this case comprise sheets of flexible material 28, such as asbestos fabric, that are attached to supports 27. A rod 29 of a suitable heat resisting material is attached to the outer edge of each of the flaps to prevent them from curling or drooping.

The flaps are held against each other to close the furnace opening by jets of air that are discharged from pipes 18, as in the previously described embodiment. In operation, pieces to be heated are moved by the conveyor between the flaps into the furnace. As this occurs the flaps are separated against the force of the air jets. Immediately after the piece has passed, the flaps are moved together to close the opening. While only one pair of flaps has been shown in this embodiment, it will be obvious that any necessary number of pairs of flaps can be used in tandem.

Closure members similar to those described above, can also be used at the exit of the furnace. In this case the flaps would be positioned relative to the path of the work as they were at the entrance. In order to use the same structure for the exit that is used for the entrance, it is only necessary that the hangers 8 be moved to the opposite end of the side pieces 6 and 7.

From the above, it will be seen that I have provided a closure for the opening of a furnace chamber which will remain closed at all times except when the work is being moved past it. This closure is kept in its closed position by a pneumatic force which is readily overcome by the work. The same force, or the air that is used to keep the flaps closed, also serves to cool these flaps and therefore increases their useful life.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit and scope of the invention set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

What is claimed is:

1. Apparatus for closing an opening in a furnace including a wall extending substantially perpendicularly from each side of said opening, a flap formed of flexible material rigidly attached to each wall, said flaps extending toward said opening and toward and engaging each other at an angle in front of and spaced from said opening, said flaps engaging throughout their length which is substantially equal to the length of said opening, and means to force said flaps resiliently toward each other, said flaps being in the form of loops, and said means to force said flaps toward each other including a pipe having a row of perforations therein received within the loop of each flap, said perforations being directed away from said openings and means to supply air under pressure to said pipes.

2. Apparatus for closing the entrance of a furnace comprising a pair of flaps each being made of a rectangle of flexible material with parallel edges folded together to leave a loop between them, means to mount one of said flaps on each side of the entrance, said mounting means engaging said folded edges and being so spaced that the loop portions of said flaps engage each other at an angle, a pipe having a row of perforations therein extending through each loop, said perforations being directed toward the engaging portions of said loops, and means to supply air under pressure to each pipe, the force of the air escaping from the perforations holding said loops in engagement with each other.

3. Apparatus for closing an opening in a furnace wall comprising structure forming a vestibule having a top, bottom and side walls extending outwardly from said wall around said opening, a pair of flexible flaps of heat resisting material across said vestibule extending from the top to the bottom thereof, means to attach one of said flaps rigidly to each of said side walls with the extending edges of said flaps engaging and meeting at an angle to said wall with the apex of the angle pointing toward said opening, said flaps bending as work moves past them to the furnace, and pneumatic means normally biasing said flaps into engagement with each other, said flaps comprising a loop of flexible material with the edges of said loop being held by said means to attach and said pneumatic means including a pipe having a row of perforations therein extending through the loop of each flap with the perforations pointing towards the portion of the loop away from said opening and means to supply air under pressure to said pipes.

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