March 18, 1930. R. LA FRANCE 1,751,008

MEANS FOR COOLING FURNACE WALLS

Filed Sept. 9, 1927 2 Sheets-Sheet 1

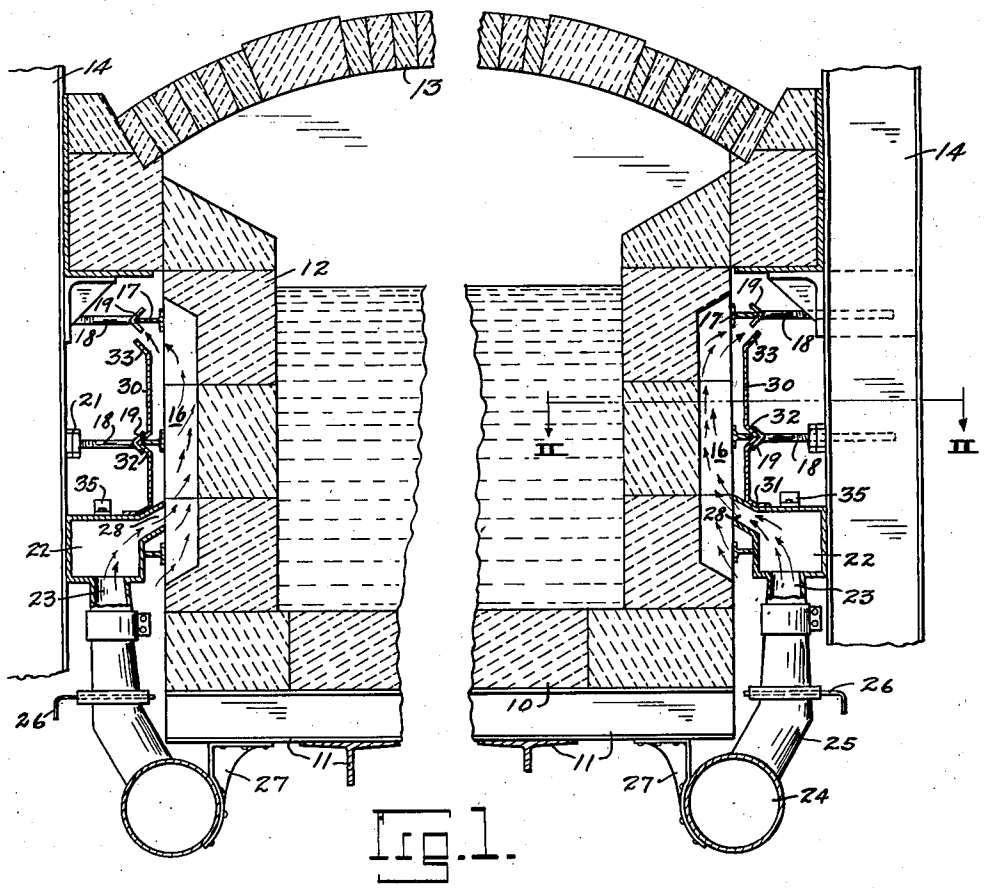


Fig. 1.

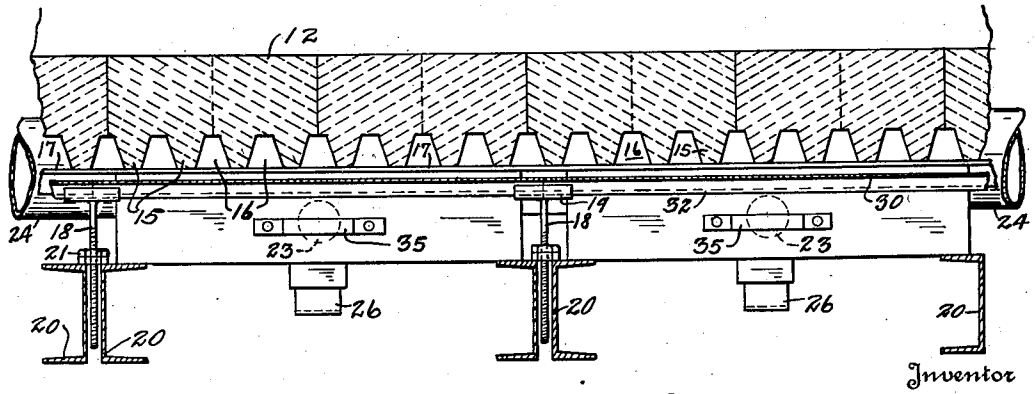


Fig. 2.

Inventor

Richard La France

By J. A. Rule

Attorney

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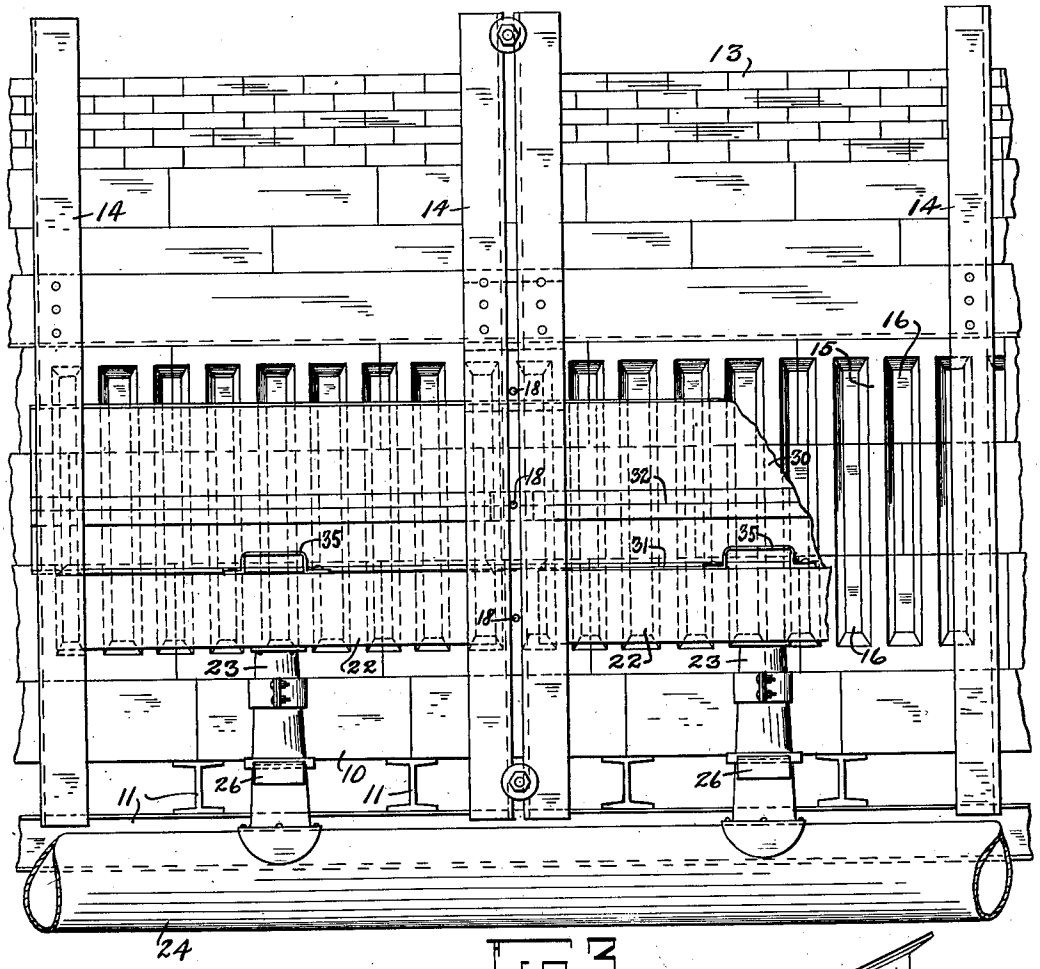


Fig. 3.

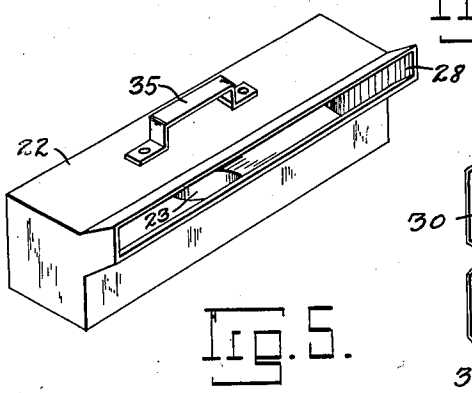


Fig. 5.

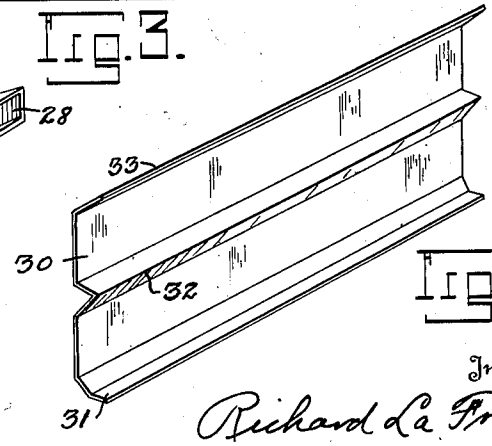


Fig. 4.

Inventor

Richard La France

By J. F. Rule

Attorney

Patented Mar. 18, 1930 1,751,008

UNITED STATES PATENT OFFICE

RICHARD LA FRANCE, OF TOLEDO, OHIO, ASSIGNOR TO OWENS-ILLINOIS GLASS COMPANY, OF TOLEDO, OHIO, A CORPORATION OF OHIO

MEANS FOR COOLING FURNACE WALLS

Application filed September 9, 1927. Serial No. 218,454.

The present invention relates to improvements in means for cooling furnace walls and particularly walls of tanks employed in melting and refining glass.

The side walls of tanks or furnaces employed in melting and refining glass are subjected to intense heat and unless wall cooling means is provided, the blocks wear away rapidly with the result that the tank or furnace springs a leak after a relatively short period of operation. It is the usual practice to blow considerable cooling air around the vertical side walls which retain the molten glass and thereby to a greater or less degree control the wall temperature. However, the wall construction of the average furnace or tank is such that cooling air cannot be applied advantageously, this being due to the plain flat surface formation of the blocks making up the wall structure and the absence of means to cause prolonged contact of a cooling medium with the walls.

An object of the present invention is to provide a tank or furnace whose walls are formed with a series of channels and ribs serving to materially increase the surface exposed to the atmosphere, said channels being associated with cool air supply means which operates to cause a continuous flow of cooling air through said channels. Also, there is provided means to confine the applied cooling medium within the channels over a predetermined length thereof. Thus, I provide means to directly apply a cooling medium to the exterior surfaces of tank or furnace walls, and means to materially increase the cooling surface to which this cooling medium is applied.

Another object is to provide wall cooling means comprising a series of cooperating units, any one of which may be removed independently of the remaining units and may be adjusted to meet the particular conditions of a given section of the furnace wall.

Other objects will be apparent hereinafter.

In the accompanying drawings:

Fig. 1 is a transverse sectional view through a glass melting furnace embodying my improved cooling means.

Fig. 2 is a sectional view taken substantially along the line II—II of Fig. 1.

Fig. 3 is a fragmentary side elevation showing the side wall of a furnace embodying my improved cooling means, certain of the angle-iron units being left out for the sake of clearness.

Fig. 4 is a detail perspective view of one of the plates used to partly enclose the vertical channels.

Fig. 5 is a detail perspective view of one of the air pressure boxes.

Referring to the accompanying drawings, the tank or furnace in connection with which the present invention is illustrated, is of substantially the usual construction and includes a floor 10 supported on suitable girders 11 or the like base. Side walls 12 rise vertically from the floor 10 and in part support an arch or cover 13. The furnace, as is customary, is built up of suitable refractory blocks, the side walls and cover being retained in proper position by a framework 14.

In providing an effective means for cooling the furnace walls, the blocks 12 are formed on their outer surfaces with longitudinally spaced vertical ribs 15 and alternate vertical channels or ways 16. In the form illustrated, the intermediate block 12 is provided with channels and ribs extending throughout their lengths, while the ribs and channels in the upper and lower blocks terminate inwardly from the extreme upper and lower ends to thereby close the opposite ends of channels 16 which are formed by vertically aligning the ribs and channels of the superimposed wall blocks.

Vertically spaced longitudinally extending angle-irons 17 are positioned to prevent outward movement of the wall blocks 12, said angle-irons being held against these wall blocks by retaining bolts 18 formed with substantially V-shaped heads 19 (Fig. 1) which straddle one flange of the angle-irons. These bolts extend between channel irons 20 (Fig. 2) forming part of the wall retaining frame 14 and are threaded for engagement with locking nuts 21 which serve to positively inter-engage the bolt heads 19 and the angle-iron units 17.

A series of air injecting boxes 22 is arranged along the furnace walls adjacent the lower ends of the channels 16 between the channel iron side frame members 20 and the furnace walls 12. Each box 22 is formed with an inlet opening 23 in its bottom having communication with a header 24 by means of an elbow pipe 25. A valve 26 is arranged in each elbow 25 to control the passage of air therethrough to the pressure box 22 from the header 24. This header or supply pipe 24 is suspended from the girders 11 by suitable arms 27. Each air box 22 is formed with a slot-like upwardly directed nozzle 28 extending lengthwise at the upper corner and normally abutting the outer surfaces of the ribs 15 (Figs. 1 and 2).

The walls which partly close the channels 16 are formed of a series of metal plates 30 (Figs. 1 and 4), each having a laterally directed foot 31 resting upon the nozzle 28 and upper wall of the air pressure boxes 22. Thus, the plates 30 are partially supported by the air boxes 22. At an intermediate point, each wall plate 30 is formed with a longitudinal V-shaped rib 32 (Fig. 1) which snugly fits into a correspondingly shaped head 19 on one of the retaining bolts 18. The extreme upper end 33 of the wall plate 30 is flared outwardly into substantially parallel relation with the upper end of the channel 16 to thereby facilitate exhaust of air from the channels and consequently provide for rapid circulation of cooling air through the ways or channels.

In operation, cooling air is supplied through the header 24 to the air injecting boxes 22 and passes under pressure from these boxes to the lower ends of and upwardly through the channels or ways 16 formed in the outer surfaces of the wall blocks. The rate of flow is controllable by adjustment of the slide valves 26 in the pipes connecting the header 24 and the air boxes 22 (Fig. 1). The injection of air into the channels 16 serves to draw in a greater or less quantity of outside air as indicated by the arrows in Fig. 1, such outside air entering the extreme lower ends of the channels or ways. Due to the location of the wall plates 30, the cooling air is more or less confined in the channels 16 so that it is retained in direct contact with the outer surfaces of the blocks throughout the length of said channels. Thus, the cooling air is directly applied to substantially the entire surface of the walls and effectively operates to prevent the blocks from overheating and wearing away too fast. The air boxes 22 may be removed independently of each other and are provided with suitable handles 35 facilitating such removal. The sectional wall plates 30 may be removed individually by properly adjusting the nuts 21 on the lower set of retaining bolts 18 (Figs. 1 and 2), sufficient loosening of these nuts permitting ready removal of the plates without disturbing or interfering with the other elements.

Manifestly, certain modifications may be resorted to within the spirit and scope of the appended claims.

What I claim is:

1. A tank including side walls formed with a series of vertically extending ways in their outer surfaces, means to direct air into one end of said ways, and cover plates to confine the air within said ways for a major portion of their lengths, said plates formed to provide means allowing exhaust of air at the other end of said ways.

2. A tank including side walls formed with a series of vertically extending ways in their outer surfaces, means to close a major portion of the lengths of said ways, said means terminating short of the ends of said ways to provide ports at the upper and lower ends of the ways communicating with the atmosphere, and means to inject air through certain of the ports into the corresponding ways, said air being exhausted through the ports at the other end of the ways.

3. A tank including side walls formed with a longitudinal series of vertically extending ways in their outer surfaces, means to close a major portion of the lengths of said ways, said means positioned to provide ports at the upper and lower ends of the ways communicating with the atmosphere, an air pressure box arranged adjacent the lower ends of said ways, an injector nozzle formed on said box and opening into the lower portions of said ways, and means to supply air pressure to said box.

4. A tank including side walls formed with a longitudinal series of vertically extending ways in their outer surfaces, means arranged adjacent the lower ends of the ways to inject air into the latter, and means extending upwardly from the air injecting means and terminating at a point spaced below the upper ends of said ways to cause the injected air to travel along the length of said ways.

5. A tank including side walls formed with a longitudinal series of vertically extending ways in their outer surfaces, means arranged adjacent the lower ends of the ways to inject air into the latter, closure plates rising vertically from the air injecting means to cover a major portion of the lengths of said ways, and means to releasably hold the closure means in operative position.

6. The combination of a tank wall having a series of vertically extending channels in its outer surface, means arranged to direct a cooling medium into the lower ends of and upwardly thru said channels, closure plates rising vertically from said means and positioned to confine the cooling medium in said channel, said plates terminating short of the upper end of said channel to provide ex-

haust ports for said cooling medium, and means to removably secure the plates in said position.

Signed at Denver, in the county of Denver and State of Colorado, this 1st day of September, 1927.

RICHARD LA FRANCE.