June 17, 1941. E. J. McDONNELL 2,246,403

WATER-COOLING DEVICE FOR FURNACES

Original Filed Sept. 9, 1938

Fig. 2.

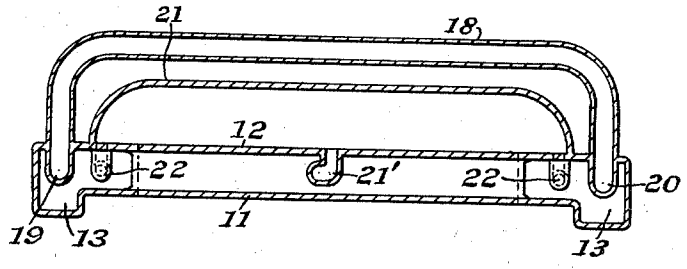


Fig. 4.

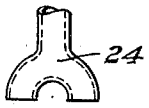


Fig. 1.

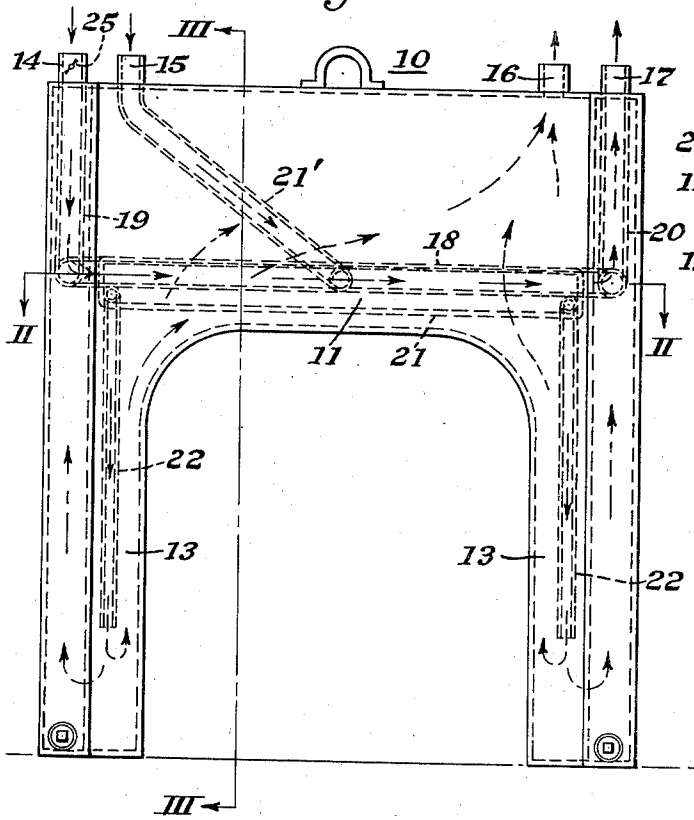
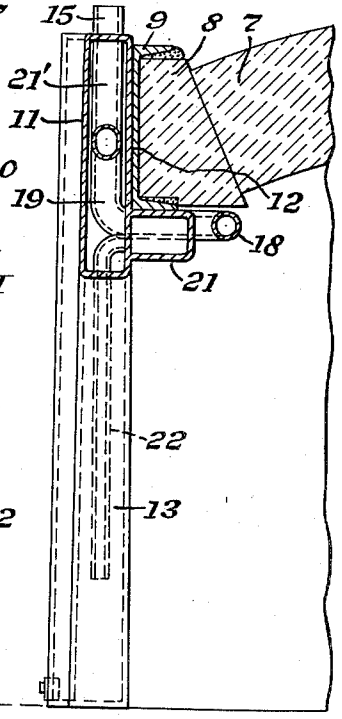


Fig. 3.



INVENTOR

Edward J. McDonnell

By C. P. Byrnes

His attorney

Patented June 17, 1941 2,246,403

UNITED STATES PATENT OFFICE

2,246,403

WATER-COOLING DEVICE FOR FURNACES

Edward J. McDonnell, Pittsburgh, Pa., assignor to Blaw-Knox Company, Pittsburgh, Pa., a corporation of New Jersey

Original application September 9, 1938, Serial No. 229,117. Divided and this application July 1, 1940, Serial No. 343,406

5 Claims. (Cl. 122—499)

This invention pertains to water-cooling devices for furnaces, and especially, to a water-cooled furnace door frame and skewback channel cooler combination and to improvements therein.

This application is a division of my copending application Serial No. 229,117, filed September 9, 1938, and entitled "Water-cooling devices for furnaces."

In the Chandler Patent 2,074,576, a combination was provided in which cold water first enters and is initially heated in leg portions of the frame before it is introduced into the lintel; the purpose being to cut down oxygen corrosion in the latter. In the Robinson Patent 1,864,762, cooling water is first introduced into the lintel or nose portion and is then conducted from outlets in the lintel into leg portions of the main frame; the purpose being to wash out sediment and scale that readily form in the lintel.

And, it has been an object of the present invention to provide apparatus incorporating the advantageous features of the Robinson and Chandler patents without the disadvantageous and limiting features thereof.

Another object has been to provide a new and improved water cooler construction that will enable a better control of the cooling water and/or of cooling temperatures of the various parts thereof.

A further object has been to provide a cooling device enabling independent and/or parallel flow of cooling water through frame and lintel portions thereof.

These and many other objects of my invention will appear to those skilled in the art from the drawing, the description, and the appended claims.

In the drawing—

Figure 1 is a front elevation of a cooler constructed in accordance with the present invention;

Figure 2 is a horizontal sectional view taken along the line II—II of Figure 1;

Figure 3 is a vertical section taken along the line III—III of Figure 1; and

Figure 4 is a front elevation of a connector for individual inlet and/or outlet portions of the main frame construction.

In accordance with the usual practice, see Figure 3, a portion of a furnace roof 7 abuts a skewback 8 that is supported by a skewback channel 9.

The cooler designated generally by the reference numeral 10 comprises a front body or face portion 11 and a back portion 12 having hollow leg portions 13 extending vertically downwardly adjacent opposite ends thereof. The above-described same general description applies to the various embodiments of my invention illustrated, and for this reason, the same reference numerals are employed.

As will be appreciated, the lintel or nose portion of a cooling device is subjected to the highest temperature, while the frame portions, including the legs, are subjected to a lesser temperature. For this reason, the lintel portion is more subject to corrosion and sedimentary deposits than the other portions of the device. That is, the higher temperatures involved in the lintel portion will cause additional hardness precipitation from the cooling water, and will aid electrolytic action and oxidation produced by gases evolved from the cooling water. The present construction is devised in such a manner that corrosion and precipitation are controlled and/or limited in the lintel and the used water is led off without contaminating the main frame portions of the cooling device. That is, previously, there has been a tendency for sediment and corrosion from the lintel to deposit in the leg portions of the main frame where it is difficult to remove them.

It will be apparent that the present invention eliminates the disadvantageous features of the previous constructions in that the cooling water supply is definitely controlled and segregated in the various portions of the construction and an independence of operative control and temperature regulation has been made possible. For example, in the embodiment of my invention illustrated in the figures, the frame is provided with a pair of inlets 14 and 15 and a pair of outlets 16 and 17. An auxiliary cooler or lintel 18 has been provided that extends somewhat horizontally beyond the normal position of a primary lintel 21 and is connected at one end by an inlet pipe 19 with the inlet 14 of the main frame, and is connected at its other end with an outlet pipe 20 which, in turn, cooperates with the outlet 17 of the main frame.

The primary or main lintel portion 21 is provided with an inlet pipe 21' connected through a substantially-centrally located opening or port in a front face portion thereof to the inlet 15 of the main frame. Outlet pipes 22 are connected to opposite ends of the lintel 21 and extend downwardly along the legs 13 of the main frame, delivering cooling fluid as indicated by the arrows. It will be seen that the flow from the inlet 15 is first to the main or primary lintel 21, then to the bottom of the leg portions 13

and finally to the main body portion of the frame and outwardly through the outlet 16.

The auxiliary, or secondary lintel portion 18, prevents cutting back of the skewback brick 8 beyond the main lintel 21. It also gives additional protection to the skewback channel 9 and lessens the heat that must be absorbed by the water within 21, so that less sediment is formed therein. As both ends of the lintel 18 are directly connected to frame outlet and inlet pipes, it will be apparent that they can be readily and continuously flushed out and that the cooling water introduced therein may have the exact desired temperature.

As shown in Figure 4, the inlet portions 14 and 15 may have a common connection 24 and the outlet portions 16 and 17 may have a similar Y-shaped common outlet connection 24. This connection, of course, provides a common source and/or a common outlet, but insures a parallel or separate flow of cooling water through the main frame and lintel portions of the device as distinguished from the secondary or auxiliary lintel portions thereof. Thus, the lintel 18 lowers the cooling load of lintel 21 and lowers the temperatures to which it is subjected; the lintel 18, being subjected to higher temperatures, is more subject to sediment contamination. The cooling water leaving lintel 18 is prevented from contaminating the water in the other portions of the cooling device. Where a common inlet, such as 24, is applied to the inlets 14 and 15, I preferably also provide a valve 25 in the inlet pipe 19 in order to obtain a suitable proportioning of fluid flow through the various cooling parts involved.

It will be apparent that in the embodiments of my invention illustrated in the figures, separate and independent streams of water may be employed between lintel and main body portions of the device. It is also apparent that the stream of water supplied to each portion may thus have the exact desired temperature for best prohibiting corrosion and sedimentation while at the same time obtaining a more efficient and uniform cooling action of a particular portion of the furnace construction. However, if desired, the pipes may be connected externally in series or in parallel, so as to have the same or a parallel flow sequence. The preferable arrangement will depend on local conditions such as the size of the furnace and frame and the available water supply as well as the characteristics of the particular supply. If economy in use of water is not necessary, the use of fresh water having a suitable temperature or coldness in both passages is preferable, and valves may be employed to regulate the quantity in each passage in such a manner as to get the most economical results in the furnace as a whole. It is known that cooling should be just sufficient to prevent excessive deterioration of the furnace lining and that excessive cooling lowers the furnace efficiency by lowering the temperature unduly. It is also apparent that various portions of the door frame and the furnace construction are subjected to different temperatures, and thus, should have different cooling temperatures than other portions thereof. It is believed that the present invention meets the problems thus presented and constitutes a substantial improvement in the art in question.

I also contemplate using a common inlet and separate outlets for regulating the flow through the two circulatory systems; that is, one outlet may be provided with suction pressure or with a higher suction pressure than the other.

In accordance with the present invention, I am thus able to provide an independent flow of water through a lintel 18 or 21 which is ordinarily subjected to the highest temperature, of a slightly warmer temperature than the flow through other portions of the device, while at the same time limiting and carrying off sedimentary and rust deposits.

When I speak of parallel flow between the nose portions herein, I contemplate both unidirectional and counter-directional flow that is in substantially parallel courses.

Although for the purpose of illustration, I have shown suitable embodiments of my invention, it will be apparent to those skilled in the art that many others may be employed, including adaptations, additions, and omissions to the structures shown. It is also apparent that many suitable arrangements of the present invention may be obtained without departing from the scope thereof as indicated by the appended claims.

I claim:

1. In a hollow water-cooled furnace door frame and skewback channel cooler, a body portion forming a top of the frame, leg portions forming sides of the frame, a substantially horizontal offset separated from the main body of the frame by a wall and adapted to project into the furnace chamber beneath a skewback channel and forming a nose portion, an auxiliary hollow horizontal offset separated from the main body portion of the frame and adapted to project into the furnace chamber beyond the first-mentioned offset portion, connections for causing a flow of cooling water through said last-mentioned offset portion, and connections for causing a flow of water in series through said first-mentioned offset portion and said leg and body portions of the cooler.

2. In a hollow water-cooled furnace door frame and skewback channel cooler, a body portion forming a top of the frame, legs forming sides of the frame, a pair of hollow horizontally offset portions separated from a main body portion of the frame by wall portions and adapted to project into the furnace chamber beneath a skewback channel and wall portions thereof and forming a pair of nose portions, and connections for causing a flow of water through the main portion of the frame including said legs and through said pair of nose portions.

3. In a hollow water-cooled furnace door frame and skewback channel cooler, a body portion forming a top of the frame, leg portions forming sides of the frame, a substantially horizontal offset separated from the main body of the frame by a wall and adapted to project into the furnace chamber beneath a skewback channel and forming a primary nose portion, a hollow horizontal offset separated from the main body portion of the frame and adapted to project into the furnace chamber and forming a secondary nose portion, said secondary nose portion being adapted to project into the furnace chamber beyond the primary nose portion, connections for causing a flow of water in series through one of said nose portions and said leg and body portions of the cooler, and connections for causing a flow of cooling water through the other of said nose portions in parallel with the flow of water through the series-connected nose portion.

4. In a hollow water-cooled furnace door frame and skewback channel cooler, a body portion forming a top of the frame, legs forming sides of the frame, a pair of hollow substantially horizontally-offset portions separated from the main body of the frame by wall portions and adapted to project into the furnace chamber beneath a skewback channel and forming a pair of nose portions, connections for causing a flow of cooling water through one of said offset portions and through said leg and body portions, and independent connections for causing a flow of cooling water through the other of said offset portions.

5. In a hollow water-cooled furnace door frame and skewback channel cooler, a body portion forming a top of the frame, legs forming sides of the frame, a pair of hollow horizontally-offset segregated wall portions separated from a main body portion of the frame by wall portions and adapted to project into the furnace chamber beneath a skewback channel and wall portions thereof, said pair of offset portions providing a pair of nose portions, one of which is spaced inwardly of the frame and is subjected to a higher operating temperature than the other, and connections for causing a flow of water through said nose portions and said leg and body portions.

EDWARD J. McDONNELL.