June 17, 1941. E. J. McDONNELL 2,246,402

WATER-COOLING DEVICE FOR FURNACES

Filed Sept. 9, 1938

Fig. 2.

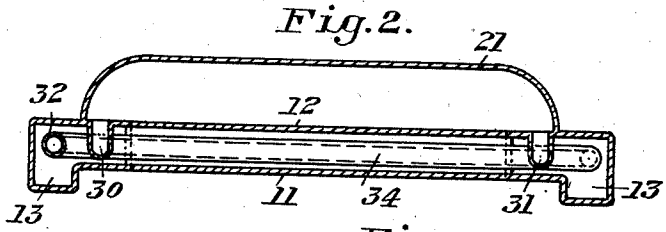


Fig. 4.

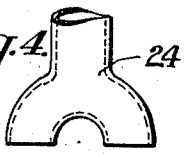


Fig. 1.

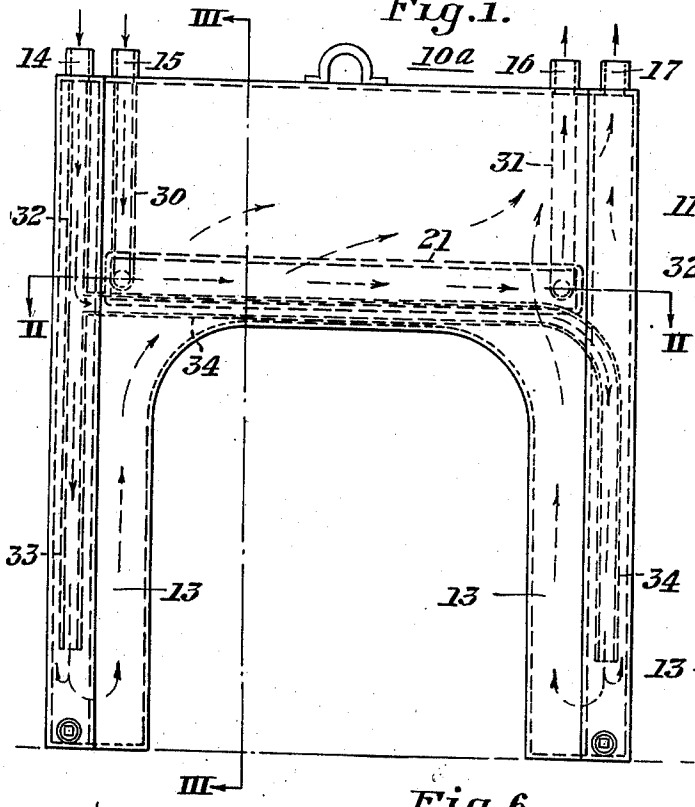


Fig. 3.

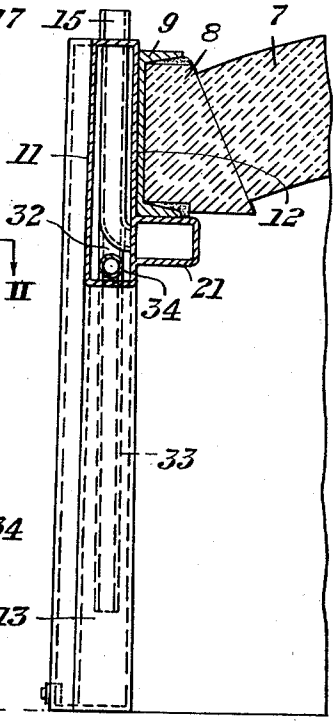
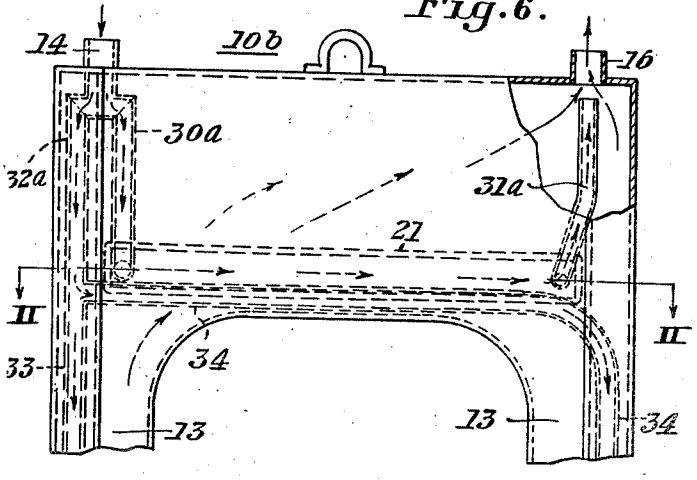


Fig. 6.



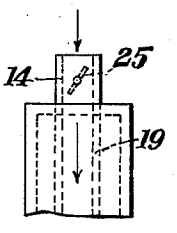


Fig. 5.

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2,246,402

WATER-COOLING DEVICE FOR FURNACES

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

Application September 9, 1938, Serial No. 229,117

6 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.

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;

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

Figure 5 is a front fragmental elevation of a modified inlet arrangement of cooler construction;

Figure 6 is a fragmental front elevation showing another embodiment of my invention.

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*a* 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 disclosed in Figures 1–4, inclusive, the frame is provided with a pair of inlets 14 and 15 and a pair of outlets 16 and 17. A primary or main lintel portion 21 is connected at one end by an inlet pipe 30 with the frame inlet 15 and is connected at its opposite end by a pipe 31 with the frame outlet 16. The main portion of the frame is provided with an inlet tube 32 that at one end connects to the inlet 14 and that at the other end branches into pipes 33 and 34 that extend downwardly into the leg portions 13 of the device. Flow from the inlet 15 is thus along the pipe 30, along the lintel 21, along the outlet pipe 31 and out through the frame outlet 16. Flow through the main portions of the frame starts at the inlet 14, follows along the inlet pipe 32, then downwardly along the branch pipes 33 and 34, and then upwardly along the legs and outwardly through the frame outlet 17.

As shown in Figure 3, 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. Where a common inlet, such as 24, is applied to the inlets 14 and 15, I preferably also provide a valve 25, see Figure 5, in the inlet pipe 19 in order to obtain a suitable proportioning of fluid flow through the various cooling parts involved.

In the embodiment of my invention shown in Figure 1, I have provided a simplified arrangement in which the auxiliary lintel portion shown in my copending application Serial No. 343,406 has been eliminated. I have obtained somewhat comparable results by providing the main lintel portion 21 with a separate circulatory system through which cooling water may flow in a parallel path with respect to the flow through the main frame portions of the device.

In the embodiment of my invention shown in Figure 6, I have provided a construction suitable for utilization in connection with a common or single supply of cooling water. However, the feature of parallel and/or independent flow is provided as in the case of the embodiment of Figure 1. As will be noted, the size, and thus, the effective fluid flow of the pipe portions is proportioned in accordance with the cooling liquid requirements of the particular parts in question. This is unnecessary where individual inlet and/or outlet connections are provided, since external and internal valves may be utilized. In addition, suitable pressure may be applied to either of the inlets 14 and 15 or suitable suction may be applied to the outlets 16 and 17.

In the embodiment of Figure 6, the inlet flow is downwardly through the inlet pipe 32*a* to the leg pipes 33 and 34, the same as in the above-described embodiment of Figure 1. In like manner, flow is from the inlet 14 to the inlet pipe 30*a* connected to one end of the lintel 21 and outwardly through the outlet pipe 31*a*. The outlet 31*a* is positioned in substantial alignment with, slightly below, and in a spaced relationship with the outlet 16. Dirty or sedimentary water from the lintel 21 is forced upwardly through pipe or jet 31*a* by the flow of incoming water through the pipe 30*a* and is additionally carried upwardly and outwardly through the frame outlet 16 by a substantially encircling or surrounding flow of water from the frame to and through the outlet 16. Sedimentary and corrosive deposits are positively carried outwardly through the outlet 16 without falling backwardly into the frame of the device, and particularly, without falling backwardly into the leg portions thereof.

It will be apparent that in the embodiments of my invention shown in Figures 1 and 3, 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 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.

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, legs 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, and connections for causing a parallel flow of water through said nose and body portions.

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 hollow 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, connections for causing a flow of water through said nose portion, and separate connections for causing a flow of water through the main body and leg portions of the frame.

3. A cooler as defined in claim 2 wherein means is provided for proportioning the flow of water through at least one of said portions relatively to the other of said portions.

4. A cooler as defined in claim 2 wherein the frame is provided with an inlet and outlet and wherein inlet connections to said nose and body portions of the cooler are connected to the same inlet in such a manner as to provide a segregated and independent flow of cooling water

through said nose and body portions of said cooler.

5. A cooler as defined in claim 2 wherein an outlet connection for said nose portion is positioned substantially in alignment with an outlet portion of the main frame and wherein an outlet flow from the main frame substantially surrounds an outlet flow from said nose portion.

6. In a hollow water-cooled furnace door frame and skewback channel cooler, a body portion forming the top of the frame, legs 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, connections for providing an independent flow of cooling water through said nose and main body portions of the cooler, and valvular means for proportioning the flow of cooling water through one of said portions with respect to the other of said portions.

EDWARD J. McDONNELL.