Feb. 1, 1938. L. R. McAFOOS 2,107,185

WATER COOLER FOR FURNACES

Filed April 14, 1937

Fig. 1.

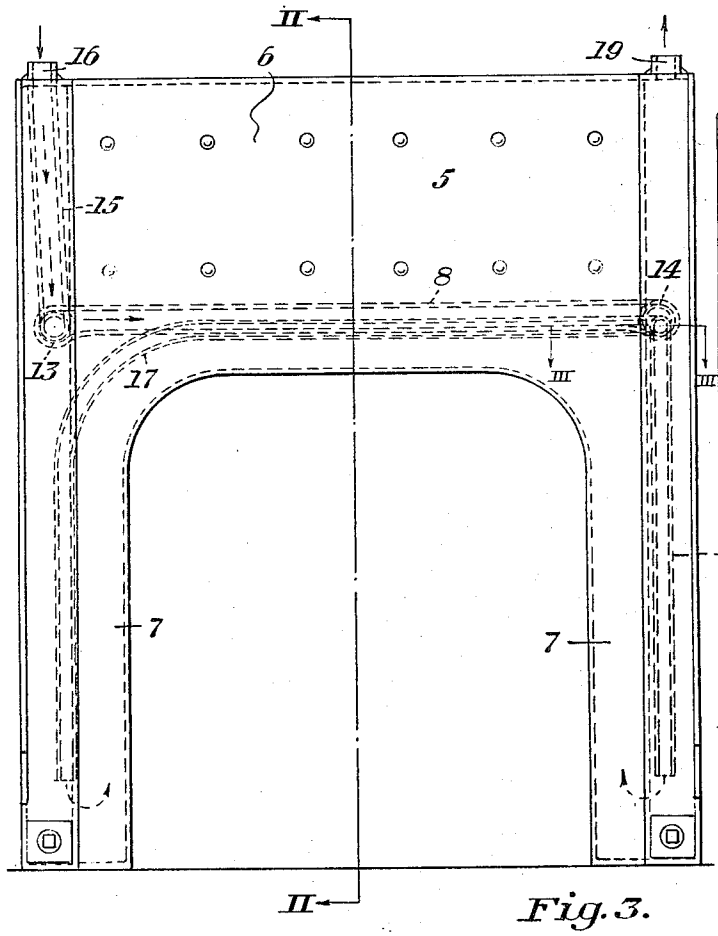


Fig. 2.

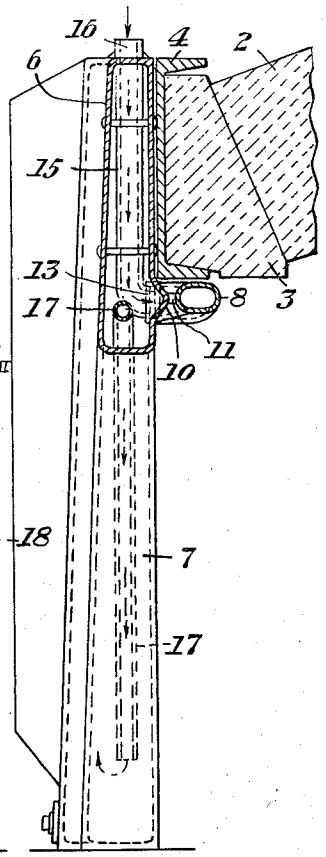
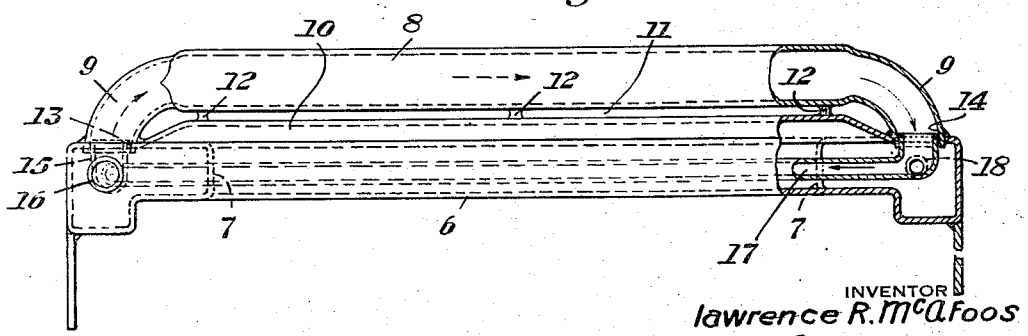


Fig. 3.



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WATER COOLER FOR FURNACES

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4 Claims. (Cl. 122—499)

This invention relates generally to water-cooling devices for furnaces, and more particularly to a combined water-cooled furnace door frame and skew-back channel cooler. It provides a structure which obviates difficulties which have been experienced hitherto in structures of this kind.

It is well known in the art to provide a horizontally projecting lintel or nose portion which extends from a convenient point on the door frame into the furnace chamber. The object of the lintel is to cool the skew-back channel which is positioned immediately thereabove and to protect it from the great heat to which the channel would be exposed in the absence of some form of protection. This type of furnace frame is known as "archless" as it is unnecessary to provide a protecting arch over the doorway and under the skew-back channel.

In the type of construction shown, for example, in the Robinson Patent No. 1,864,762, the lintel, in effect, comprises a channel-shaped member having closed ends, both of the legs and the ends of the channel being welded along their whole lengths to the furnace door frame. It has been found in practice that it is difficult to prevent the lintel from warping and twisting out of shape, due to the length of weld, and the long weld is difficult to fabricate properly and to maintain in a water-tight condition. Furthermore, when the lintel has to be replaced, it is a job of considerable magnitude due to the amount of welding involved.

I have found that a more satisfactory arrangement can be made by forming the lintel from a section of seamless metal pipe or tubing, the end portions being offset and welded only at the ends to the door frame. The tube is preferably flattened horizontally so as to form a wider shield for the skew-back channel and to reduce the cross sectional area of the lintel and thus exert a greater cooling effect for the same amount of cooling water. Stresses due to expansion and contraction are minimized and the lintel lasts for a longer period of time. When it is necessary to replace the lintel, the amount of labor involved and the consequent expense are greatly reduced since there is only a very small length of welding to be accomplished.

I also find it preferable to corrugate the door frame plate along the surface thereof opposite the lintel for a distance substantially equal to the length of the lintel. This serves to somewhat stiffen the frame at that point, to reduce the space between the frame and the lintel, and more effectively shields the skew-back channel from the intense heat of the furnace chamber.

In the accompanying drawing, I have shown for purposes of illustration only the present preferred embodiment of my invention. In the drawing:

Figure 1 is a front elevation of the cooler;

Figure 2 is a vertical section on the line II—II of Figure 1; and

Figure 3 is a plan view of the cooler showing a portion thereof broken away along the line III—III of Figure 1.

In the drawing, there is shown a portion 2 of a furnace roof and a skew-back 3. The skew-back is supported by a skew-back channel 4 according to well known practice.

A cooler indicated generally by the reference numeral 5 has a body portion 6, forming the top of the frame, and extending downwardly from each end of the body portion is a leg 7, forming the sides of the furnace door frame. Projecting inwardly into the furnace chamber from a position on the door frame adjacent the bottom of the body portion 6 is a horizontally extending hollow offset or lintel 8, which acts, as a cooler and protector for the lower portion of the skew-back channel.

The lintel or nose portion 8 is formed from a suitable length of steel or iron tubing or pipe, preferably seamless. The lintel has curved or offset ends 9 long enough to permit the lintel to extend a sufficient distance into the furnace to protect the exposed lower portion of the skew-back channel. The lintel is flattened for the greater portion of its length. The deformation is so performed that the circular ends and the top flattened portion are substantially in one horizontal plane. The length of the lintel is slightly less than the width of the frame and the projecting ends of the lintel are welded to the rear plate of the frame. I prefer to corrugate a portion 10 of the frame opposite the lintel so as to partly close the space between the inner side of the lintel and the frame and thus form a comparatively narrow passage 11 between the frame and the lintel. This arrangement protects the skew-back channel from the highly heated gases and radiant heat of the furnace chamber.

The corrugation 10 and the nose portion 8 may be welded together at various points, as indicated at 12. These small welds help to support the lintel and make the structure somewhat more rigid, but it will be understood that such welding is not necessary.

The nose portion 8 is provided with an inlet 13 adjacent one end thereof, and an outlet opening 14 adjacent the other end. The inlet 13 is connected by an inlet pipe or conduit 15 to an inlet 16 of the door frame. Connected to the outlet 14 are two pipes or conduits 17 and 18. The pipe 17 runs across and through the furnace frame and extends downwardly into the leg 7 and terminates at a point near the bottom of the leg. The pipe 18 extends into the other leg to a point near the bottom thereof.

The cooling water enters through the inlet 16 and is delivered by the pipe 15 to the inlet 13 of the nose portion 8. It then flows through the nose portion 8 to the outlet 14 and thence into the pipes 17 and 18, by which it is delivered to points near the bottom of the legs 7 of the frame. The water then passes upwardly and escapes through an outlet 19 in the frame.

The pipe 15 need not be secured to the nose portion 8 with a water-tight fit. As a matter of fact, I prefer to make this a somewhat loose fit. So also, the connection between the outlet 14 of the nose portion and the pipes 17 and 18 makes a somewhat loose fit. Such loose fits permit any steam which may be formed in the nose portion to escape into the body of the frame. It is understood, however, that if desired the inlet pipe 15 and the outlet pipes 17 and 18 may be welded in position. If the latter construction is adopted, it is advisable to provide openings from the upper part of the ends 9 of the nose portion 8 to the body of the cooler to allow any steam which may be formed in the nose portion to escape into the body of the cooler.

The lintel is subjected to the highest temperature of any portion of the frame, and in my invention the cooling water is passed through the lintel 8, thence to the legs 7 and thence through the remainder of the frame. The cross sectional area of the water passage through the lintel is such as to provide adequate protection and rate of flow of the cooling fluid for the amount of water employed. The invention provides for a positive flow of water through the lintel rather than leaving the circulation to chance, and the water which flows through the lintel exerts its maximum cooling effect where most desired. Since the coldest part of the water is passed through the lintel, there is less danger of the lintel warping and the strains imposed on the structure will be lessened and its life prolonged.

It is apparent that I have provided a structure which is relatively inexpensive to construct and one that may be expeditiously and economically repaired should the occasion arise. The amount of welding in a structure of this character is reduced to a minimum and the zones of weakness are also reduced to a minimum. The structure has a comparatively long life.

While I have illustrated and described the present preferred embodiment of my invention, it will be understood that it is not limited to the construction shown and described, as it may be otherwise embodied within the scope of the following claims.

I claim:

1. In a hollow water-cooled furnace door frame and skew-back channel cooler, a body portion forming the top of the frame, legs forming the sides of the frame, a hollow horizontal offset adapted to project into the furnace chamber beneath the skew-back channel and forming a lintel, the lintel comprising a separate structure spaced apart from the frame and connected at its ends to the frame, and connections for causing flow of water through the lintel and then through the frame.

2. In a hollow water-cooled furnace door frame and skew-back channel cooler, a body portion forming the top of the frame, legs forming the sides of the frame, a horizontal lintel projecting into the furnace chamber beneath the skew-back channel comprising a tubular water conduit connected at its ends to the furnace frame and spaced therefrom for the rest of its length, and connections for allowing the water to flow through the lintel.

3. In a hollow water-cooled furnace door frame and skew-back channel cooler, a body portion forming the top of the frame, legs forming the sides of the frame, a horizontal lintel adapted to project into the furnace chamber beneath the skew-back channel, said lintel comprising a separate tubular structure connected at its ends to the frame and separated from the frame for its intermediate length, a fluid inlet on the frame, a fluid inlet on the lintel, a conduit connecting said inlets, an outlet connected to the lintel and conduits leading from the outlet to points near the bottom of the legs.

4. In a hollow water-cooled furnace door frame and skew-back channel cooler, a body portion forming the top of the frame, legs forming the sides of the frame, a hollow horizontal offset adapted to project into the furnace chamber beneath the skew-back channel and forming a lintel, the lintel comprising a structure spaced apart from the frame and connected at its ends to the frame, and connections for enabling water to flow through the lintel, said frame having an outward projection thereon opposite the lintel so as to reduce the space between the lintel and the frame.

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