L. L. KNOX.

WATER COOLED FURNACE DOOR FRAME.

APPLICATION FILED AUG. 4, 1911.

1,073,144. Patented Sept. 16, 1913

2 SHEETS—SHEET 1.

Fig. 1.

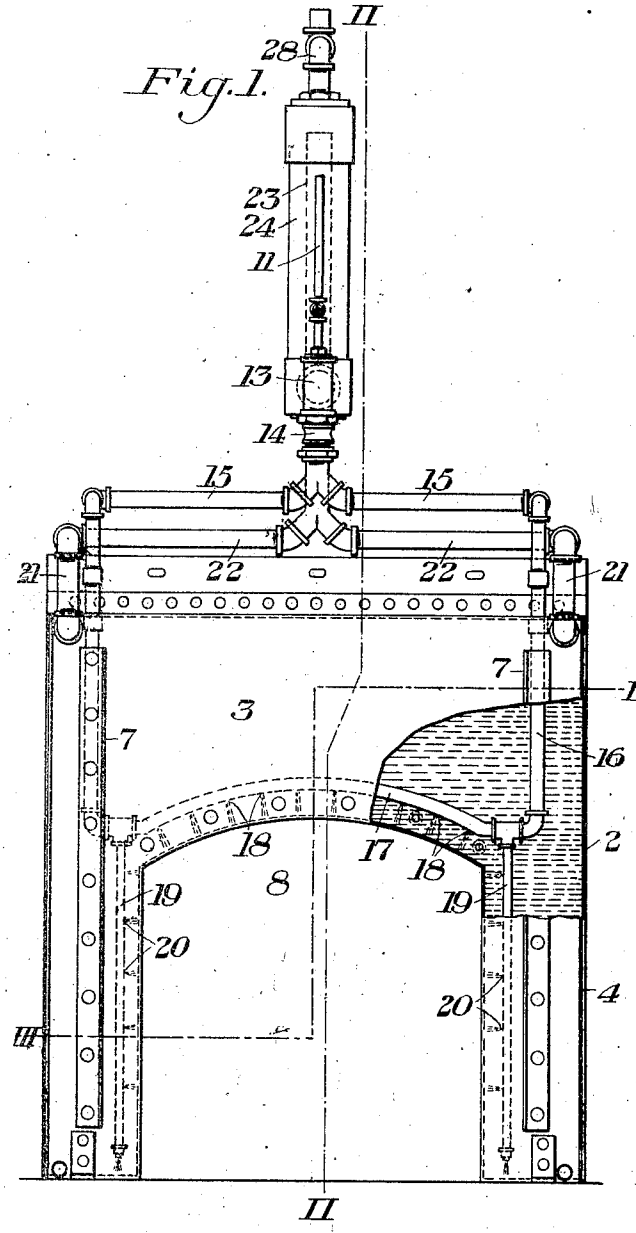



Fig. 2.

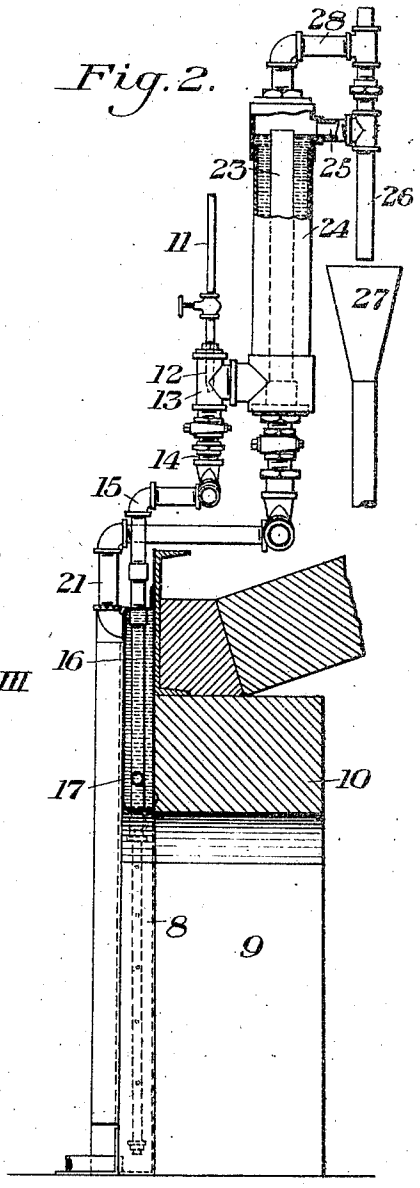
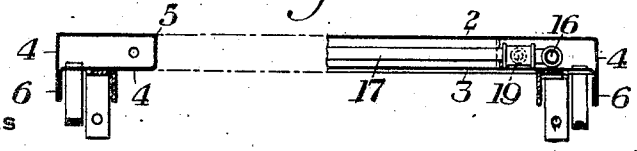



Fig. 3.




WITNESSES

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2 SHEETS—SHEET 2.

Fig. 6.

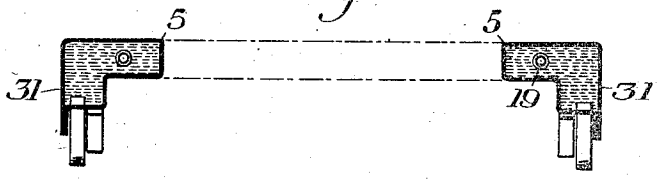



Fig. 4.

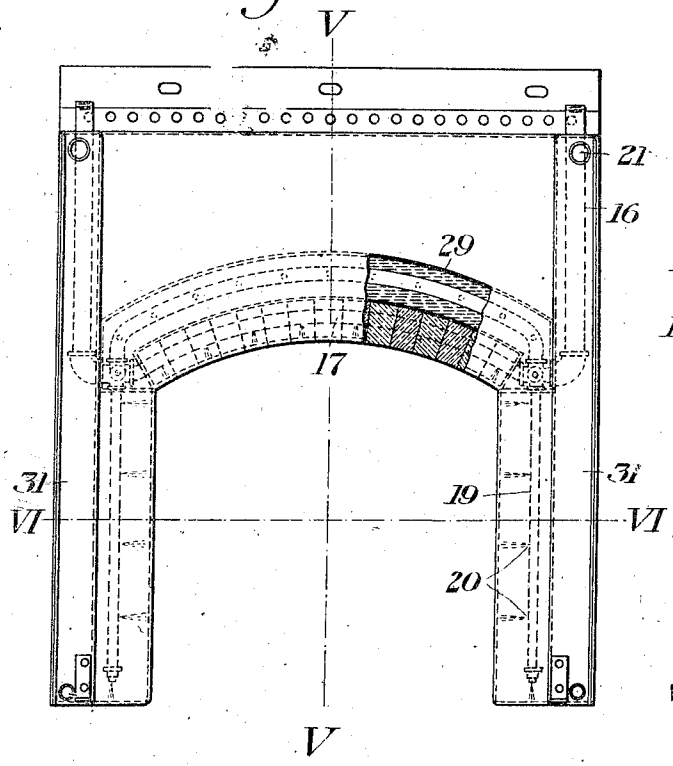
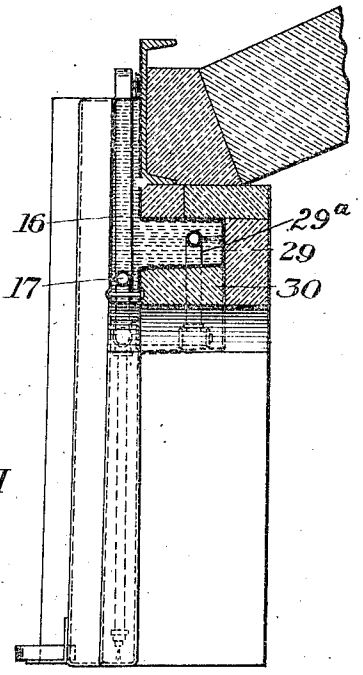



Fig. 5




WITNESSES

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# UNITED STATES PATENT OFFICE.

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## WATER-COOLED FURNACE-DOOR FRAME.

1,073,144. Specification of Letters Patent. Patented Sept. 16, 1913.

Application filed August 4, 1911. Serial No. 642,339.

*To all whom it may concern:*

Be it known that I, LUTHER L. KNOX, of Niles, in the county of Trumbull and State of Ohio, have invented a new and useful Improvement in Water-Cooled Furnace-Door Frames, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a front view, partly broken away, of one form of water cooled furnace door frame embodying my invention. Fig. 2 is a section on the line II—II of Fig. 1, with portions broken away. Fig. 3 is a section on the irregular line III—III of Fig. 1. Fig. 4 is a view similar to Fig. 1, with the water circulating pipes omitted, and showing a modified construction. Fig. 5 is a section on the line V—V of Fig. 4, and Fig. 6 is a section on the line VI—VI of Fig. 4.

My invention has relation to water cooled furnace door frames, and is designed to provide a durable frame which can be cheaply and rapidly manufactured.

A further object of my invention is to provide means of novel character for supplying the water or cooling fluid thereto in a highly efficient and economical manner.

The nature of my invention will be best understood by reference to the accompanying drawings, in which I have shown two preferred embodiments thereof, and which will now be described, it being premised that various changes may be made in the details of construction and arrangement of the parts without departing from the spirit and scope of my invention, as defined in the appended claims.

In the drawings, the numerals 2 and 3 designate the two plate or sheet members of which my improved door frame is preferably constructed. These two plates or sheet members are of complementary form. The portions thereof which form the body of the frame have their edges bent outwardly to form the flanges 4 and 6. The flanges 4 on the back plate are deeper than the flanges 4 on the front plate, and form the end walls of the structure; and in assembling, the front plate is set between the flanges 6 with its flanges 4 abutting against the flanges 6, as clearly shown in Fig. 3. The abutting flanges are then riveted or otherwise secured to each other. The leg-forming portions of the front plate have their inner edges bent rearwardly at substantially right angles, and are secured to the inner edge 5 of the adjacent portion of the rear plate, preferably by welding, as shown at the left-hand side of Fig. 3. The abutting flanges 4 and 6 extend down throughout the length of the legs.

Suitable vertical angle strips 7 may be riveted to the plate or sheet 3 before the two plates or sheets are assembled and secured to each other, these angle strips forming guides for the usual vertical sliding door (not shown). The plates or sheets are cut away centrally at their lower portions to form an arched opening 8 corresponding to the door opening 9 of the furnace, a portion of which is shown at 10; and the edge portions of the sheets at the top of this opening are brought together and preferably welded to form the top wall or arch of the opening. The structure thus formed, consists of an upper, hollow body portion and depending side legs at each side of the opening 8, with a flat outer surface between the guide strips 7 over which the vertically movable door can slide in being opened and closed.

11 designates a water supply pipe of relatively small diameter, terminating in a jet nozzle 12 within a chamber 13, to the lower end of which is connected a feed pipe 14 having lateral branches 15. From each lateral branch 15, a pipe leg 16 depends into the hollow upper portion of the door frame structure. The two legs 16 are preferably connected a short distance above the arched top of the opening 8 by a curved pipe 17 having therein a plurality of downwardly directed spray openings 18. The pipe 17 is also preferably provided with a leg 19, extending downwardly into each of the legs of the frame and having a plurality of spray openings 20, whereby water may be directed against the inner sides of the walls of said opening.

21 designate outlet pipes leading from the extreme upper portion of the interior of the frame structure and connected by the laterally extended branches 22 with an upwardly extending outlet pipe 23. This outlet pipe 23 extends upwardly into a chamber 24 connected at its lower portion

with the chamber 13 and having an overflow pipe 25 near its upper end, terminating in a downwardly extending discharge leg 26, arranged to discharge into a funnel 27 or other suitable waste receptacle. The pipe 26 is open to the atmosphere, or vented at its upper end, and the chamber 24 also has a vent pipe 28 connected to its upper end.

In operation, the entire interior of the hollow frame structure is kept filled with water discharged from the spray openings, the spray being directed against those portions of the structure which are subject to the greatest heat. The heated water rises to the top of the structure and out to the pipes 21 and 22 and into the pipe 23. From the pipe 23, this heated water is discharged into the chamber 24. The incoming cold water discharged from the nozzle 12 of the pipe 11 acts as an injector to draw into the chamber 13 a portion of this water which is mixed with the incoming cold water and returned to the structure through the pipes 14, 15 and 16 for further circulation. Any excess of water in the chamber 24 will be discharged at 26. The hot air and steam rising from the water will escape through the upper ends of the pipes 26 and 28.

In the modification of my invention, shown in Figs. 4, 5 and 6, the upper portion of the frame structure is provided with a rearwardly projecting extension 29 formed by bending the plate 4, this extension projecting into the refractory arch 30 over the furnace door opening and acting as a protector for said arch or roof. In this form I have also shown the frame structure formed by the two plates or sheets, as having the forwardly, projecting hollow edge portions 31, between which the door is arranged to slide and which act as guides for the door. I preferably provide another water discharge pipe $29^a$ within the inward extension 29 and adapted to discharge water against the inner wall of said extension. This pipe $29^a$ is connected with the supply pipe 16.

My invention provides a furnace door frame which is simple and durable in its construction, and in which the cooling water is introduced in a highly effective manner. It also provides means whereby the heated water, after circulating through the door, is partially cooled and mixed with cooler water, and then returned for further circulation.

It will be obvious that various changes can be made in the details of construction and arrangement of the several parts, thus the furnace structure may be formed in other ways not described, the arrangement of water circulating pipes may be varied, and various other changes may be made within the scope of my invention, as defined in the appended claims.

What I claim is:

1. A furnace door frame whose body portion is formed of two sheet metal plates, each of said plates having its edges bent forwardly at substantially right angles to the flat portions of the plates, the flanges on the rear plate being deeper than those on the front plate, and the front plate sitting between said deeper flanges with its own flanges parallel with and secured to the deeper flanges, and the leg portions of the frame at the sides of the door opening being formed by extensions of said plates, the said extensions of the two plates being united to each other by continuations of the said flanges, and also by joints at the corners of the legs diagonally opposite the said flanges; substantially as described.

2. In a furnace, the combination with a hollow water cooled door frame having a water inlet pipe and a water discharge pipe, of means for mixing the water delivered by the discharge pipe with the incoming water of the supply pipe and returning the same to the said door frame, substantially as described.

3. In a furnace, a hollow water cooled door frame having a supply pipe and a discharge pipe, a chamber into which the discharge pipe extends, a chamber into which the supply pipe extends, and a connection between the said chambers; substantially as described.

4. In a furnace, a water cooled door frame having a supply pipe and a discharge pipe, the supply pipe having a jet nozzle, a chamber into which the jet nozzle discharges, an inlet pipe leading from said chamber to the water cooled door frame, a chamber into which the outlet pipe discharges, and a connection between the two chambers; substantially as described.

5. In a furnace, a water cooled door frame having a supply pipe and a discharge pipe, the supply pipe having a jet nozzle, a chamber into which the jet nozzle discharges, an inlet pipe leading from said chamber to the water cooled door frame, a chamber into which the outlet pipe discharges, and a connection between the two chambers, the last named chamber having venting and overflow means; substantially as described.

6. A furnace door frame comprising a hollow structure having an arched door opening extending therethrough, a spray-pipe extending transversely within the structure adjacent to the arch-wall thereof and arranged to direct jets of water downwardly against the same, and supply pipes extending to both ends of said pipe; substantially as described.

7. A furnace door frame comprising a hollow structure having an arched door

opening extending therethrough, a spray-pipe extending transversely within the structure adjacent to the arch-wall thereof and arranged to direct jets of water downwardly against the same, and supply pipes extending to both ends of said pipe, and other pipes connected with the supply pipes and extending downwardly within the leg portions of the structure at opposite sides of said opening; substantially as described.

In testimony whereof I have hereunto set my hand.

LUTHER L. KNOX.

Witnesses:

JESSE B. HELLER,

H. M. CORWIN.