Dec. 30, 1930. K. PRANTNER 1,787,019

WATER COOLED WALL

Filed March 21, 1930 2 Sheets-Sheet 1

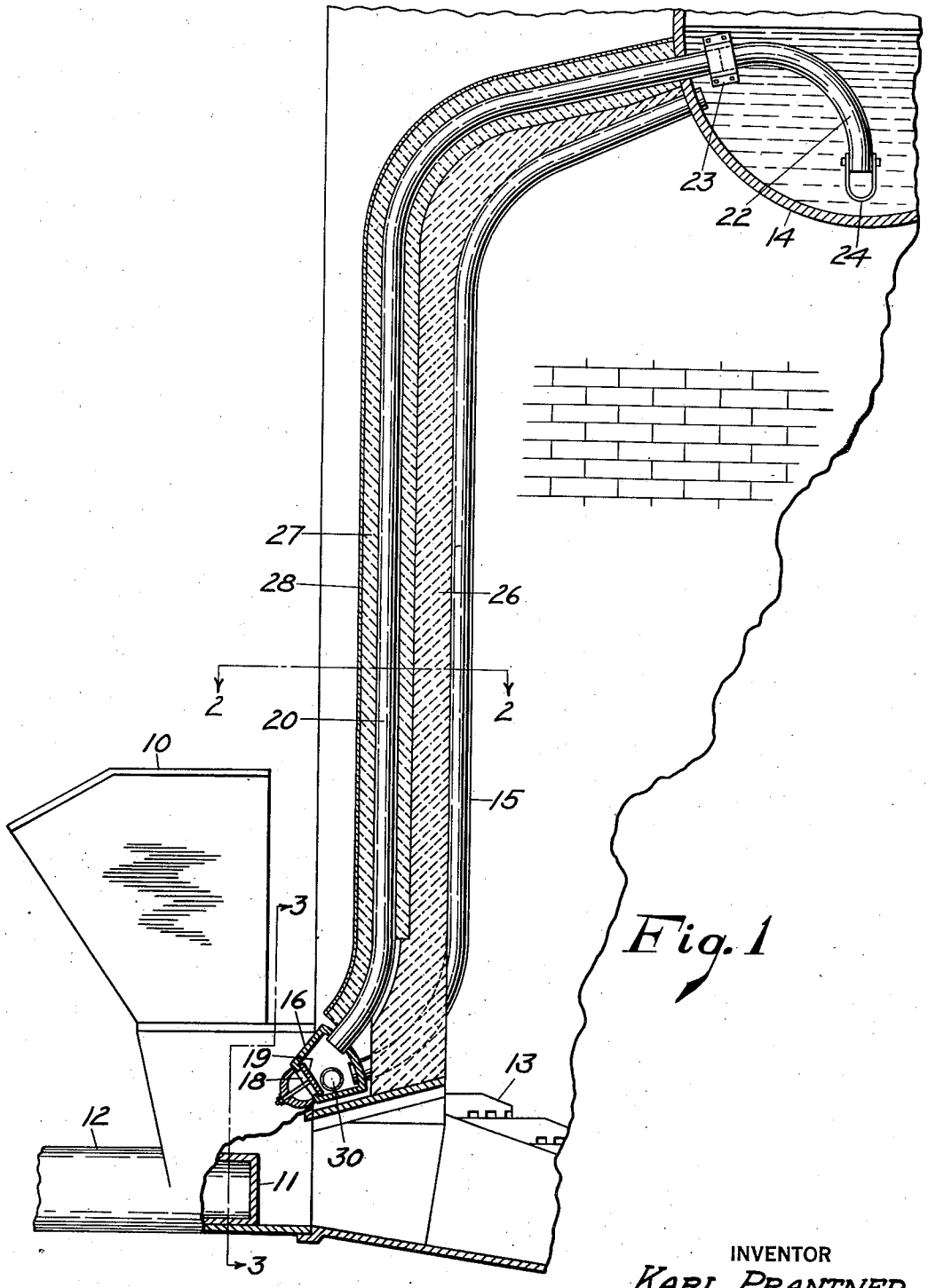


Fig. 1

WITNESS

A. G. Blodgett

INVENTOR

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WATER COOLED WALL

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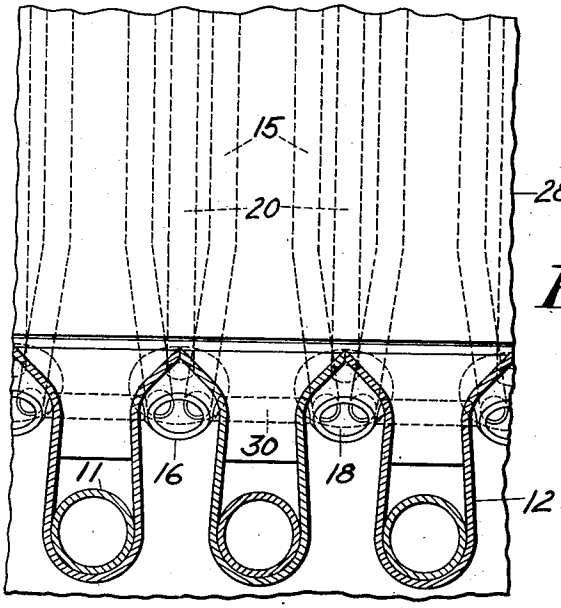


Fig. 3

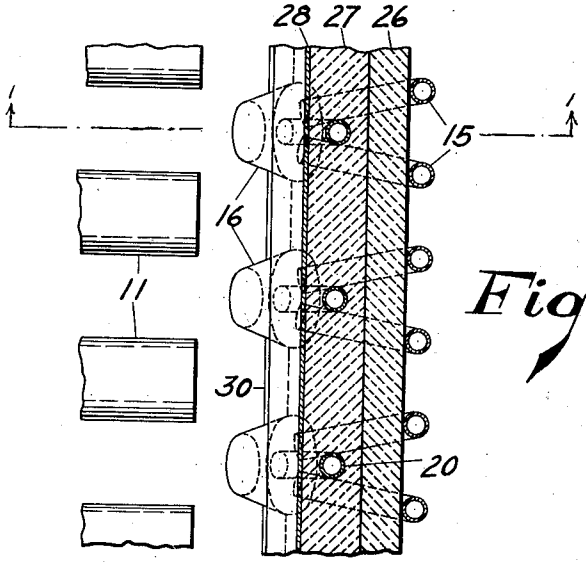


Fig. 2

WITNESS
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UNITED STATES PATENT OFFICE

KARL PRANTNER, OF BERLIN, GERMANY, ASSIGNOR TO RILEY STOKER CORPORATION, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

WATER-COOLED WALL

Application filed March 21, 1930, Serial No. 437,854, and in Germany July 12, 1928.

This invention relates to water cooled walls for furnaces, and more particularly to a construction utilizing water tubes in connection with the front wall of a furnace which is fired by a multiple retort underfeed stoker.

The advantages of water walls in reducing furnaces wall maintenance costs, preventing unduly high furnace temperatures, and providing efficient and rapid steam generation, are well known. When it is attempted, however, to apply such a construction to the front wall of an underfeed furnace, certain serious difficulties are encountered. If the water tubes are brought down a sufficient distance to effectively cool the lower portion of the wall, the header which is depended upon to supply water for the tubes is necessarily located in the rear of the coal hopper of the stoker. Under these conditions it is difficult and in some cases impossible to reach the header, for the purpose of cleaning or replacing the tubes, without first removing the coal hopper and perhaps other parts of the stoker. If, on the other hand, the header is placed above the coal hopper where it is accessible, the lower portion of the front wall of the furnace is fully exposed to the heat. As a matter of fact, this part of the wall really needs the protection of water tubes more than the upper part does.

It is accordingly the main object of my invention to provide a water wall construction for the front wall of a multiple retort underfeed furnace which will be effectively cooled substantially down to the grate surface and which is accessible for cleaning or replacement without the necessity of dismantling any part of the stoker.

A further object is to provide a water wall construction in which an adequate supply of water is ensured for each tube, and in which a rapid circulation is maintained so long as the furnace is in operation.

With these and other objects in view, as will be apparent to those skilled in the art, my invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

Referring to the drawings illustrating one embodiment of my invention, and in which like reference numerals indicate like parts,

Fig. 1 is a vertical section taken on the line 1—1 of Fig. 2, certain parts being broken away;

Fig. 2 is a plan section taken on the line 2—2 of Fig. 1, all stoker parts except the rams being omitted; and

Fig. 3 is a front elevation, partly in section, on the line 3—3 of Fig. 1, the hand hole covers being removed.

The embodiment illustrated in the drawings comprises a stoker of the well known multiple retort underfeed type having a fuel hopper 10 and fuel feeding rams 11. The rams 11 are reciprocated in ram cases 12 by any suitable power operated mechanism and serve to deliver fuel to a furnace for combustion, the necessary air being supplied through grates or tuyères 13. A boiler having the usual boiler tubes and an upper header, such as a steam and water drum 14, is provided for the purpose of generating steam by absorbing the heat liberated in the furnace.

In accordance with my invention, I provide a water wall which is located at the front end of the furnace and arranged to absorb radiant heat therefrom. This water wall comprises substantially vertical tubes connected to the upper header 14 which extend downwardly to a position close to the stoker grates so as to absorb heat near the opening of the ram casing, and thence outwardly through the furnace wall. These tubes connect at their lower ends to headers, and these headers are so located relative to the ram cases and the other external stoker parts, that access to the headers may be readily had without serious interference, and preferably without having to remove parts of the stoker. The lower header may be suitably located and arranged to satisfy this purpose, but in the drawings it has been illustrated as comprising a series of short headers located between the ram cases, each of which connects to one or more of the vertical steam generating tubes.

As illustrated, the front water wall of the furnace, with which the present invention is

principally concerned, may comprise a series of vertical steam generating tubes 15 which are preferably spaced equally across the width of the furnace. The upper ends of the tubes are bent rearwardly and expanded into the drum 14. The tubes extend downwardly as far as possible without interfering with the iron parts of the stoker, and at their lower ends bend forward, as shown particularly in Fig. 1, to meet headers 16 into which they are expanded. Each of these headers consists of a small hollow casting or forging located between a pair of ram cases 12, and provided with an opening 18 which is normally closed by a removable elliptical hand hole cover 19. These covers 19 are readily accessible.

Since it is usually desirable to space the water wall tubes 15 somewhat more closely than the rams 11, I preferably supply a group of two or more tubes with water from the same header 16. As shown in Figs. 2 and 3, the lower ends of the tubes may converge in pairs toward the headers, thus permitting equal spacing of the tubes.

In the preferred embodiment illustrated, I utilize a down-comer tube 20 for each header, in order to ensure an adequate water supply for the steam generating tubes 15. Each down-comer 20 is located between the corresponding pair of generating tubes, but spaced therefrom in a direction away from the furnace so as to be in a cooler zone. At their lower ends the tubes 20 may bend forwardly to connect with the headers, and at their upper ends they may bend rearwardly to connect with the drum 14. Where, as in the construction shown in the drawings, the upper ends of the tubes 20 are near the water line, I prefer to provide extension tubes 22 which are fastened to the tubes 20 by suitable clamps 23 and which bend downwardly to a point near the bottom of the drum. With this arrangement, fluctuations in water level will not endanger the water wall tubes. A shield in the form of a U-shaped strap 24 bolted to the lower end of each tube 22 prevents the entrance of steam bubbles into the tube.

Since the tubes 15 are spaced apart and do not in themselves form a complete wall, some additional construction is necessary. One suitable means comprises a layer of firebrick masonry 26 adjacent to the tubes 15 and preferably so arranged as to leave these tubes fully exposed to the heat of the furnace and in a position to absorb heat at a very high rate. The flow of water in the tubes 20 is downwardly, and any appreciable amount of heat absorption by these tubes would interfere with this circulation. I therefore prefer to enclose these down-comers in heat insulating refractory material 27, such as kieselguhr or any suitable cement. An outer sheet metal covering 28 protects and holds this insulation in place and renders the whole wall gas and air tight.

There is a possibility of a certain amount of sediment collecting in the headers 16, and it is desirable that means be provided whereby this matter may be removed during the operation of the furnace. For this purpose I preferably connect the spaced headers 16 by short straight tubes 30. By connecting a valve and blow off pipe (not shown) to any one of the headers, the whole water wall can be blown down at the same time. These tubes may however be omitted.

The operation of the invention will be apparent from the above disclosure. Steam is generated in the tubes 15 and the mingled steam and water flows upwardly under a natural convection circulation and is discharged into the drum 14. Water from the drum flows through tubes 22 and downwardly through tubes 20 to headers 16, thus entering the lower ends of the generating tubes. There is always an adequate supply of water for each tube and rapid circulation is ensured. The hand hole covers 19 can be removed and the tubes cleaned or replaced without disturbing the coal hopper or any other part of the stoker. The tubes 15 extend downward substantially to the grate surface 13, and serve to prevent overheating of the refractory 26.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In combination with a furnace fired by a multiple retort underfeed stoker having a grate surface within the furnace and spaced ram cases for fuel feeding rams near and outside of the front wall of the furnace, a water wall comprising steam generating tubes adjacent to the front wall extending downwardly substantially to the stoker grate surface, and means to supply water to the lower ends of the tubes which is located exterior of the furnace and so constructed that access may be had to the tubes between the stoker ram cases without disturbing any part of the stoker.

2. In combination with a furnace fired by a multiple retort underfeed stoker having a grate surface within the furnace and spaced ram cases for fuel feeding rams near and outside of the front wall of the furnace, a water wall comprising steam generating tubes adjacent to the front wall extending downwardly substantially to the stoker grate surface, headers at the lower ends of the tubes and exterior of the furnace having openings accessible between the stoker ram cases, and means to supply water to said headers.

3. In combination with a furnace fired by a multiple retort underfeed stoker having a grate surface within the furnace and spaced ram cases for fuel feeding rams near and outside of the front wall of the furnace, a water wall comprising steam generating

tubes adjacent to the front wall extending downwardly substantially to the stoker grate surface and grouped at their lower ends, a header connected to the lower ends of each group of tubes, each header being located exterior of the furnace and having an opening therein which is accessible between the stoker ram cases, and means to supply water to each header.

4. In combination with a furnace fired by a multiple retort underfeed stoker having a grate surface within the furnace and spaced ram cases for fuel feeding rams near and outside of the front wall of the furnace, a water wall comprising steam generating tubes adjacent to the front wall extending downwardly nearly to the stoker grate surface and substantially equally spaced apart, the lower ends of the tubes bending toward the front and converging together in groups, a header connected to the lower ends of each group, each header being located exterior of the furnace and having an opening accessible between the stoker ram cases, and a down-comer tube arranged to supply water to each header, the down-comer tubes being located in a cooler zone than the steam generating tubes.

5. In combination with a furnace fired by a multiple retort underfeed stoker having a grate surface within the furnace and spaced ram cases for fuel feeding rams near and outside of the front wall of the furnace, a water cooled wall comprising a vertical wall of refractory material above said ram cases, vertical steam generating tubes substantially equally spaced along the furnace side of the wall and exposed to the furnace heat, the lower ends of the tubes bending toward the front through the refractory material and converging together in groups, a header connected to the lower ends of each group, each header being located exterior of the furnace and having an opening accessible between the stoker ram cases, a vertical down-comer tube arranged to supply water to each header, and insulating material surrounding the down-comer tubes.

6. In combination with a stoker-fired furnace having a fuel grate and spaced fuel feeding devices arranged adjacent to the front of the furnace, a water wall comprising vertical steam generating tubes arranged adjacent to the inner front furnace wall which extend downwardly to a position near the grate, the lower ends of said tubes passing outwardly through the furnace wall, a header readily accessible between said devices which is connected to said tubes, and means for supplying water to the header whereby water and steam may circulate upwardly in the tubes.

7. In combination with a furnace having a front wall, a fuel grate within the furnace, and a series of spaced fuel feeding devices outside the front furnace wall, a water wall comprising an upper header arranged near the top of the front furnace wall, a series of substantially vertical tubes extending downwardly from the header and passing outwardly through the front furnace wall at their lower ends, a set of lower headers outside of the front furnace wall which are readily accessible between the fuel feeding devices and which are each connected with sets of said tubes, and a return pipe for each lower header which is not exposed to radiant heat connecting said upper header therewith and serving to aid in convection circulation of the water.

Signed at Berlin, Germany, this 3rd day of March, 1930.

KARL PRANTNER.