May 14, 1940. A. CARLSON 2,200,668

METHOD OF AND MEANS FOR CLEANING THE CHECKER CHAMBERS OF OPEN HEARTH FURNACES AND THE LIKE

Filed Nov. 27, 1939

FIG. 1.

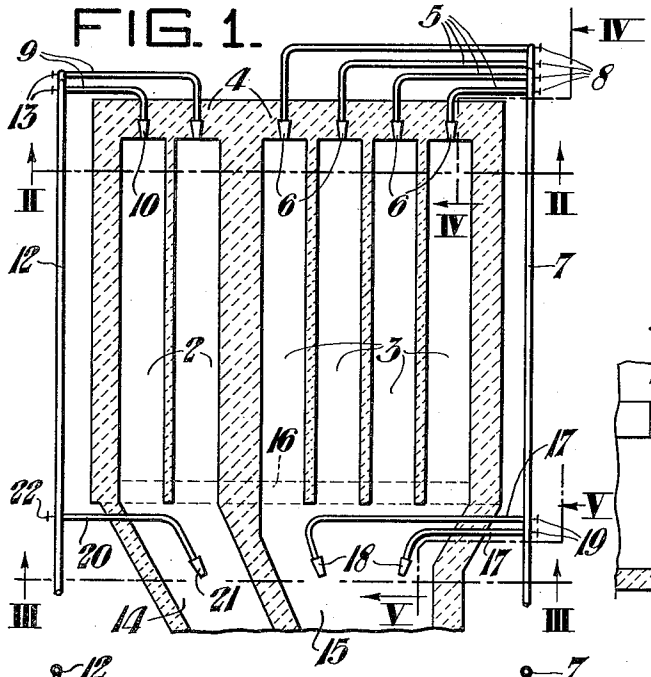
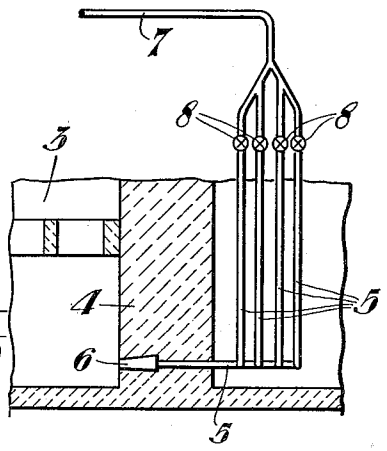


FIG. 4.



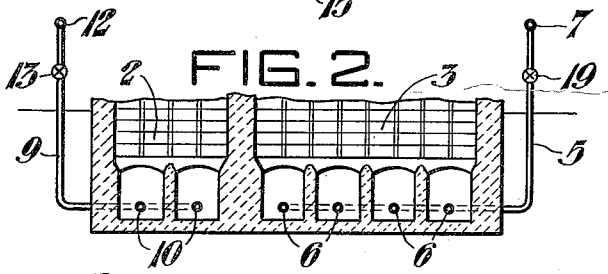
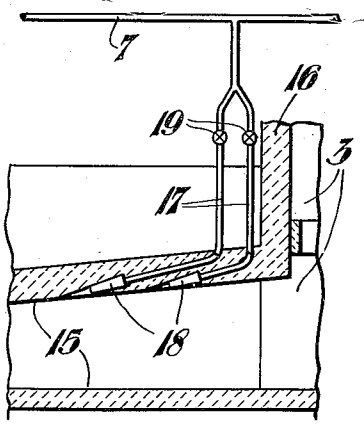


FIG. 2.

FIG. 5.



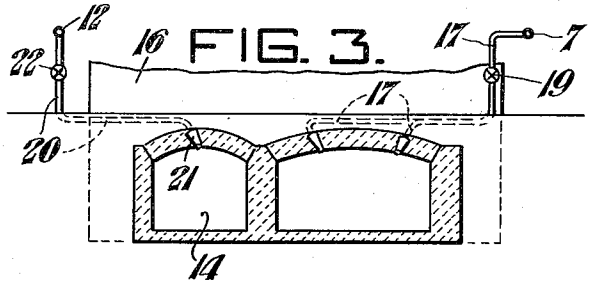


FIG. 3.

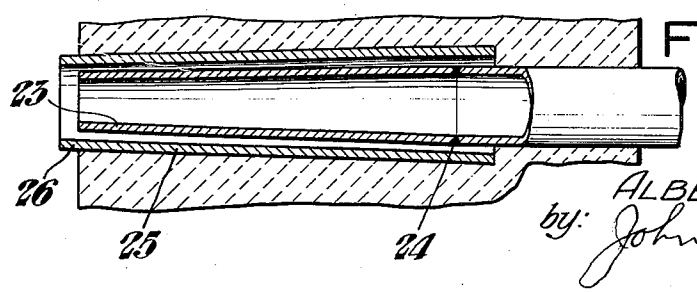


FIG. 6.

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Patented May 14, 1940 2,200,668

UNITED STATES PATENT OFFICE

2,200,668

METHOD OF AND MEANS FOR CLEANING THE CHECKER CHAMBERS OF OPEN HEARTH FURNACES AND THE LIKE

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Application November 27, 1939, Serial No. 306,380

6 Claims. (Cl. 263—19)

This invention relates to open hearth furnaces and the like and particularly to an improved means for cleaning the checker chambers thereof.

Various methods and means have been suggested and used for cleaning or removing the dirt, dust and other foreign matter from underneath the checker chambers and flues of open hearth furnaces. One of the most common methods employed consists of providing a series of pipes in the bottom of the flues and underneath the checker chambers with vertically arranged nozzles or jets attached to the ends thereof. The pipes were covered with fire brick for protection against the intense heat and the nozzles or jets extended upwardly therebetween. Steam under pressure was usually the cleaning medium employed and this was supplied to the series of pipes and directed into the chambers and flues by the nozzles or jets, thereby cleaning the same. While such an arrangement of pipes and nozzles usually satisfactorily cleaned the chamber and the flues, the intense heat therein would attack the pipes and nozzles deteriorating the same, thereby requiring the replacement of the pipes and nozzles practically after each furnace campaign which, of course, resulted in considerable expense and inconvenience.

In the present invention there is provided a method and means for cleaning and removing the dirt and other foreign matter from underneath the checker chambers and flues which is very satisfactory and effective in its use. In the proposed arrangement, the pipes are positioned outside of the chambers and flues and the nozzles are embedded in the walls thereof thereby eliminating the danger of the heat attacking the pipes and the nozzles are protected as much as possible from the intense heat, thereby prolonging the life thereof indefinitely.

Accordingly, it is one of the objects of the present invention to provide an improved means for cleaning the checker chambers and flues of open hearth furnaces and the like which is effective and efficient in its operation and use, and at the same time, one in which the maintenance and replacement costs are reduced to a minimum.

It is another object of the invention to provide an improved method and means for cleaning the checker chambers and flues of open hearth furnaces and the like which is simple and inexpensive in its construction and use, and at the same time one which will not interfere with the operation of the furnace.

Various other objects and advantages of this invention will be more apparent in the course of the following specification and will be particularly pointed out in the appended claims.

In the accompanying drawing there is shown, for the purpose of illustration, one embodiment which my invention may assume in practice.

In the drawing:

Figure 1 is a horizontal section through the checker chambers of an open hearth furnace, showing my invention incorporated therein;

Figure 2 is a section taken on line II—II of Figure 1;

Figure 3 is a section taken on line III—III of Figure 1;

Figure 4 is a section taken on line IV—IV of Figure 1;

Figure 5 is a section taken on line V—V of Figure 1; and,

Figure 6 is a longitudinal section through a nozzle preferably used in connection with the present invention.

Referring more particularly to the drawing, there is shown a gas checker chamber 2 and the air checker chamber 3 as employed in open hearth furnaces which are arranged in side by side relation. There is arranged outside of the bridge wall 4 at the inner end of the air checker chamber, a plurality of pipes 5 extending through the bridge wall with each having a nozzle or jet 6 arranged on the inner end thereof which is embedded in the inner side of the bridge wall in the air chamber. The nozzles 6 are positioned preferably at a distance of about twelve inches above the checker chamber flue floor level. The pipes 5 are connected to a steam supply pipe 7, and there is preferably positioned between each of the pipes 5 and the steam supply pipe 7, a valve 8 for controlling the passage of the steam through the pipes 5 to the nozzles 6.

There is also arranged outside of the bridge wall 4 of the gas checker chamber a plurality of pipes 9 extending through the bridge wall with each having a nozzle or jet 10 arranged on the inner end thereof which is embedded in the bridge wall on the inner side of the gas chamber. The pipes 9 are connected to a steam supply pipe 12 and there is preferably positioned between each of the pipes 9 and the steam supply pipe 12, a valve 13 for controlling the passage of the steam from the steam supply pipe through the pipes 9 to the nozzles 10. It will be understood that both the steam supply pipes 7 and 12 are connected to a main steam line header (not shown) for supplying steam under pressure thereto.

Both the gas checker chamber 2 and the air

checker chamber 3 communicate with flues 14 and 15, respectively, arranged at the outer end of the furnace beyond the bulkhead 16, which in turn communicate with the furnace stack (not shown). There are arranged above the flue 15 of the air checker chamber 3, a plurality of pipes 17 extending down through the top of the flue, that is, through the flue arch or roof at an angle to the passage therethrough with each having a nozzle or jet 18 angularly arranged on the inner end thereof which is embedded in the flue arch or roof and communicates with the flue 15. The pipes 17 are preferably connected to the steam supply pipe 7 or any other suitable steam supply line and there is arranged between each of the pipes 17 and the steam supply pipe 7 a valve 19 for controlling the passage of the steam from the steam supply pipe through the pipes 17 to the nozzles 18.

There is likewise arranged above the flue 14 of the gas checker chamber 2 at least one pipe line 20 which extends through the top of the flue 14 at an angle thereto and has a nozzle or jet 21 angularly arranged on the inner end thereof which is also embedded in the flue arch or roof and communicates with the flue 14. The pipe 20 is preferably connected to the steam supply pipe 12 and there is arranged therebetween a valve 22 for controlling the passage of steam through the pipe 20 to the nozzle 21.

In Figure 6, there is shown the type of nozzle preferable for use with the cleaning means or apparatus of the present invention. This nozzle consists preferably of a frusto-conical shaped body member 23 which is preferably welded to the end of the pipe with which it is to be used as at 24. There is securely arranged and embedded in the wall where the nozzle is to be positioned in the chamber or flue, a frusto-conical shaped sleeve-like member 25 having an inner diameter slightly larger than the outer diameter of the body member 23 with the inner end thereof extending a slight distance, that is, into the chamber or flue as at 26. The body member 23 is disposed within the sleeve-like member 25 with the other end thereof terminating short of the end of the sleeve-like member 25 preferably substantially flush with the inner surface of the wall. Both the body member 23 and the sleeve-like member 25 are made of a heat resistant material, preferably stainless steel.

It will be understood that the cleaning fluid or medium to be used is preferably steam at approximately 250 pounds pressure per square inch or at least of a pressure of at least 150 pounds per square inch. The means or apparatus of the present invention for cleaning or removing the dirt, dust or other foreign matter from underneath the checker chambers and the flues operates in the following manner.

To remove the dirt or dust from underneath the gas checker chamber 2, the valves 13 are opened, thereby permitting steam to flow through the pipes 9 to the nozzles or jets 10 for directing an impinging flow of steam substantially horizontally into the gas checker chamber. The super-heated steam will then carry the accumulated dirt or dust in a sweeping manner through the gas checker chamber flues to a point just beyond the chamber bulkhead 16. The steam is permitted to flow through the nozzles or jets 10 into the gas checker chamber 2 until all of the dirt and dust has been removed therefrom and the valves 13 are then closed. The valve 22 is then opened thereby permitting the steam to flow through the pipe 20 to the nozzle 21 which directs an impinging flow of steam angularly into the flue 14 so that the steam will carry the dirt or dust which has been directed thereinto from the gas checker chamber in a sweeping manner through the flue and waste heat boiler and into and out through the furnace stack. After all of the dirt or dust has been removed therefrom, the valve 22 is closed.

To remove the dirt or dust underneath the air checker chamber 3, the procedure is similar to that as above described. The valves 8 are first opened thereby permitting the super-heated steam to flow through the pipes 5 to the nozzles 6 which direct an impinging flow of steam substantially horizontally into the air checker chamber. The steam will carry the accumulated dirt or dust therein as before in a sweeping manner through the air checker chamber flues to a point just beyond the chamber bulkhead 16. The steam is permitted to flow into the air checker chamber 3 until the dirt or dust has been completely removed therefrom and the valves 8 are then closed. The valves 19 are then opened thereby permitting steam to flow through the pipes 17 to the nozzles 18 which direct an impinging flow of steam angularly into the flue 15 and the steam will carry the dirt or dust which has been directed thereinto from the air checker chamber 3 in a sweeping manner through the flue and waste heat boiler and into and out through the furnace stack as before. After all of the dirt or dust has been removed from the flue, the valves 19 are closed.

It will be understood that the dirt and dust which accumulates in the flues and underneath the checker chamber of the open hearth furnace can be removed therefrom while the furnace is in full operation by means of the apparatus of the present invention, and that any particular furnace can be cleaned as many times during a furnace campaign as is necessary to maintain a clear passage for the gases and air in the chambers and flues thereby obtaining the most economical operation of the furnace.

As a result of my invention, it will be seen that the checker chambers and flues of open hearth furnaces and the like can be quickly and conveniently cleaned in a minimum amount of time, and that the cleaning means or apparatus is not exposed to the intense heat of the furnace, thereby providing a cleaning equipment which will last indefinitely.

While I have shown and described one embodiment of my invention, it will be understood that this embodiment is merely for the purpose of illustration and description, and that various other forms may be devised within the scope of the invention, as defined in the appended claims.

I claim:

1. In an open hearth furnace, the combination of means for cleaning and removing foreign matter from the checker chambers thereof, means arranged in the bridge wall at the inner end of the chambers of the furnace for directing a cleaning fluid under pressure into and through said chambers, means for supplying a fluid under pressure to said last mentioned means, means arranged in the top of the flue just outside of the bulkhead of the chambers for directing a cleaning fluid under pressure into and through said flue, and means for supplying a cleaning fluid under pressure to said last mentioned means.

2. In an open hearth furnace, the combination of means for cleaning and removing foreign mat-

ter from the checker chambers thereof, a plurality of nozzles arranged in the bridge wall at the inner end of said chambers of the furnace for directing steam under pressure into and through said chambers, a plurality of pipes arranged outside of said chambers for supplying steam under pressure to said nozzles, a plurality of nozzles arranged in the top of the flue just outside of the bulkhead of the chambers for directing steam under pressure into and through said flue, and means for supplying steam under pressure to said last mentioned nozzles.

3. In an open hearth furnace, the combination of means for cleaning and removing foreign matter from the checker chambers thereof, a plurality of nozzles arranged in the bridge wall at the inner end of said chambers of the furnace for directing steam under pressure into and through said chambers, said nozzles being arranged substantially horizontally so as to direct an impinging flow of steam into the chambers in substantially a horizontal plane, a plurality of pipes arranged outside of said chambers for supplying steam under pressure to said nozzles, a plurality of nozzles arranged in the top of the flue just outside of the bulkhead of the chambers for directing steam under pressure into and through said flue, each of said last mentioned nozzles being angularly arranged so as to direct an impinging flow of steam outwardly through said flue, and a plurality of pipes arranged outside of said chambers and said flue for supplying steam under pressure to said last mentioned nozzles.

4. In an open hearth furnace, the method of cleaning and removing foreign matter from the checker chambers thereof which comprises directing a cleaning fluid under pressure into the chambers through the bridge wall at the inner end thereof so that the cleaning fluid will carry the foreign matter in a sweeping manner out of said chambers into the flue of the furnace, and directing a cleaning fluid under pressure into the flue through the top thereof at a point just beyond the bulkhead so that the cleaning fluid directed thereinto will carry the foreign matter directed thereinto from the checker chambers in a sweeping manner outwardly therethrough.

5. In an open hearth furnace, the method of cleaning and removing foreign matter from the checker chambers thereof which comprises directing steam under pressure into said chambers through the bridge wall at the inner end thereof in substantially a horizontal plane so that the steam will carry the foreign matter in a sweeping manner out of said chambers into the flue, and directing steam under pressure into the flue through the top thereof at a point just beyond the bulkhead at an angle to the horizontal so that the steam directed thereinto will carry the foreign matter directed thereinto from the checker chambers in a sweeping manner outwardly therethrough.

6. In an open hearth furnace, the method of cleaning and removing foreign matter from the checker chambers thereof which comprises directing steam under at least 150 pounds per square inch pressure into the chambers through a plurality of nozzles horizontally arranged in the bridge wall at the inner end of the chambers so that the steam will carry the foreign matter in a sweeping manner out of said chambers into the flue of the furnace, and directing steam under at least 150 pounds per square inch pressure into the flue through a plurality of angularly arranged nozzles positioned in the top of the flue at a point just beyond the bulkhead so that the steam directed thereinto will carry the foreign matter directed thereinto from the checker chambers in a sweeping manner outwardly therethrough.

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