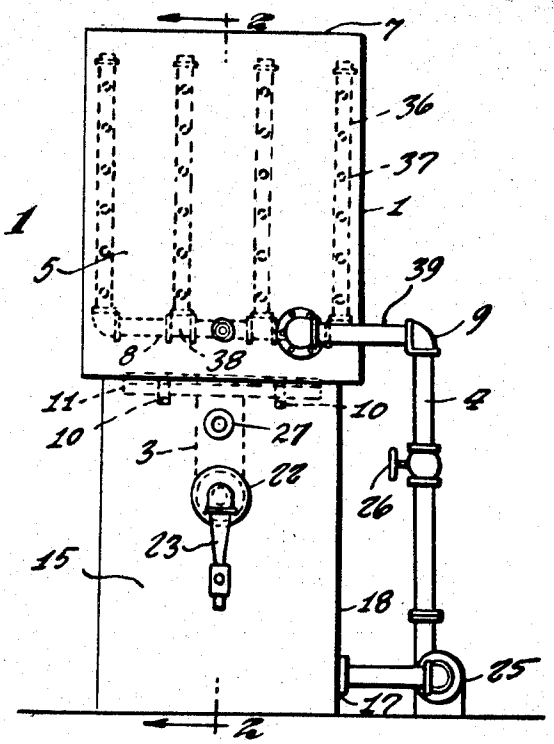
March 3, 1959 J. L. PETTIT ET AL 2,875,749

LIQUID HEATER

Filed May 25, 1956 2 Sheets-Sheet 1

Fig. 1



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Fig. 2

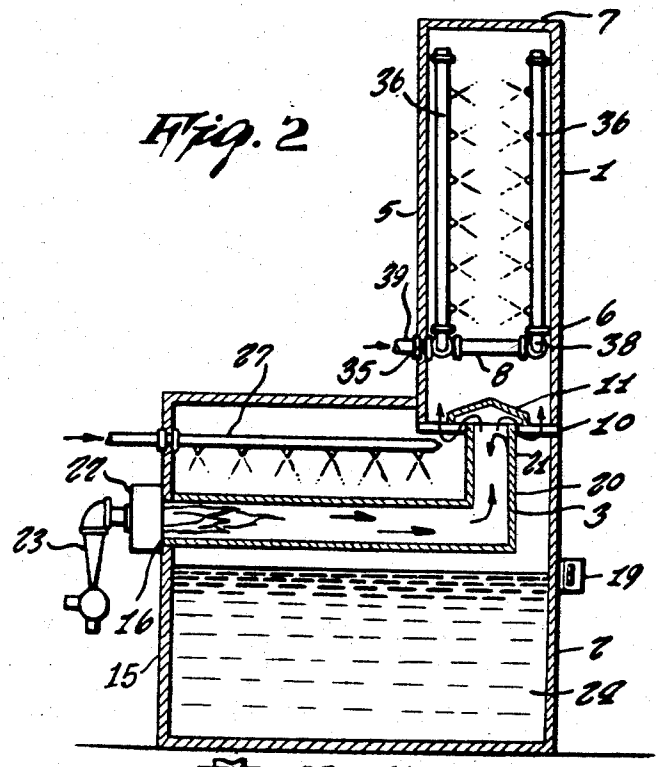


Fig. 3

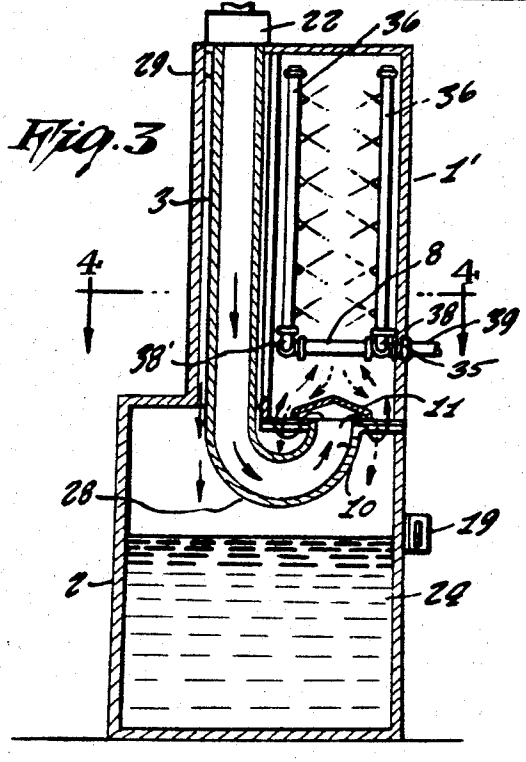
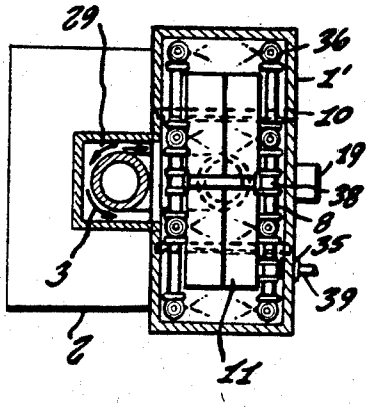


Fig. 4



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LIQUID HEATER

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7 Claims. (Cl. 126—350)

The present invention relates to an improved liquid heater of the direct heating type having particular utility in industrial spray washers.

In industrial spray washing it is conventional practice to convey the "work" to be washed through a washing chamber where it is sprayed with hot washing solution. The washing solution is then carried to a heater for reheating and then returned to the washing chamber.

Industrial washers having heaters of the direct heating type are known in the art. They have been found to be quite useful and very efficient in their transfer of heat to the washing liquid. However, these heaters are limited in their manner of use by virtue of their construction.

It is an object of the present invention to provide a novel direct fire heater.

It is a further object of the present invention to provide a heater wherein washing solution is in contact with the housing surrounding the burner to effect heat transfer from the housing to the solution whereby the housing is prevented from burning.

It is also an object of the present invention to provide means whereby the washing solution in the spray chamber is commingled with the hot gases from the heater to effect the heating of said solution.

It is another object of this invention to provide a heater for industrial washing that is inexpensive to manufacture and simple to maintain.

Other and more detailed objects of the invention will become more apparent from a consideration of the following specification, the appended claims and the accompanying drawings, wherein:

Figure 1 is a front view of a washer embodied in the present invention;

Figure 2 is a cross section of Figure 1 taken through line 2—2;

Figure 3 is a cross section of still another modification of a washer embodied in the present invention; and

Figure 4 is a horizontal section taken through Figure 3 at line 4—4.

Referring now to the drawings, wherein the same numerals designate the same structure in the various views, a preferred embodiment of the invention is shown in Figures 1 and 2. This comprises a washing chamber 1, and heating and storage tank 2 disposed beneath chamber 1, a heating tube 3 located within storage tank 2, and a conduit 4 connecting tank 2 with chamber 1. Conduit 4 serves to convey heating washing liquid from tank 2 to the spray system contained in chamber 1.

More particularly, washing chamber 1 comprises a generally rectangular box having a front wall 5, a top wall 7, a back wall 6 and side walls (not shown). Closeable openings (not shown) are provided in the side walls of chamber 1 to allow for the conveyance of the "work" to be washed.

Two rows of vertically extending spray pipes 36 having spaced spray holes or nozzles 37 are disposed within

chamber 1. Spray pipes 36 are connected to conduit 4 through manifold 8 and pipe sections 39 by right angle pipe joint 9. Manifold 8 comprises a series of pipe sections connected to each other by pipe joints 38 to form an H-shaped system. Manifold 8 may be disposed horizontally near the bottom of chamber 1 and in a plane which is parallel to roof 7 and the short axis of chamber 1. Pipe joints 38 may also be provided with openings to receive spray pipes 36 and to preferably although not necessarily maintain them in a vertical position. The spray system is supported in wall 5 at joint 35.

Two right angle braces 10 are spaced apart and secured at the bottom of chamber 1 to front wall 5 and back wall 6, as illustrated in the drawing. Hood 11 is secured to braces 10 in any suitable manner to provide a tortuous passageway between heating tube 3 and washing chamber 1 for the conveyance of hot gases therethrough. A tortuous passageway is also thus provided between heating tube 3 and tank 2.

Washing chamber 1 is disposed above and at the back of storage and heating tank 2 and is secured thereto in any suitable manner. Washing chamber 1 may be made integral with tank 2 as illustrated in Figure 2.

Storage and heating tank 2 may have a rectangular box-like construction and is preferably of larger volume than washing chamber 1. It is provided with an opening in the rear of its roof which communicates with washing chamber 1. Tank 2 is also provided with an opening 16 in its front wall 15 to accommodate heating tube 3. In the side wall 18 an opening is provided to receive conduit 4. A liquid level indicator 19 may be secured to a wall of tank 2 or any other convenient place to advise the operator as to the level of washing liquid in tank 2.

Heating tube 3 comprises an elongated tubular member which may be of any desired cross section. The illustrated embodiment is circular in cross section. It is made of any suitable material, preferably of steel or cast iron which is readily replaced. In a preferred embodiment shown in Figures 1 and 2 the terminal portion 20 of tube 3 is disposed at right angles to the long axis of the tube. The open end 21 of heating tube 3 is located beneath and adjacent hood 11 so that flame and gases issuing from heating tube 3 through opening 21 are deflected around hood 11 and wash liquid descending from chamber 1 is deflected away from opening 21.

Heater 3 is connected to any suitable fuel source by collar 22. The assembly for providing a jet flame to heater 3 is generally represented at 23. The necessary construction and the nature of the fuel necessary to provide the jet flame used in the present invention are of any known type and do not form part of the present invention.

As noted above conduit 4 is used to convey washing liquid 24 from heater and storage tank 2 to washing chamber 1. For this purpose pump 25 is provided in conduit 4 which pumps liquid from tank 2 to washing chamber 1. The capacity of pump 25 is preferably such that the liquid is quickly recycled. Conduit 4 is also provided with valve 26 to cut off the flow of wash liquid from tank 2 to washing chamber 1 if this flow is ever not desired.

In this modification of the invention heating tube 3 is disposed above the washing liquid level in tank 2. There is also provided a spray tube 27 connected to pump 25 which sprays washing liquid onto heating tube 3 to insure that the tube does not become burned out.

A further modification of the present invention is illustrated in Figures 3 and 4. In this modification the spray system and most of the heating tube is disposed in a

common upper chamber 1'. The heating tube 3 is located in chamber 1' in a substantially vertical position. It is arranged substantially parallel and horizontally spaced from the spray system. The lower end of heating tube 3 as it enters tank 2 is bent upwardly so that the entire tube assumes an inverted J shape. The opening in the tube is disposed within tank 2 so as to be below and adjacent hood 11.

As is to be noted from Figures 3 and 4, a space 29 immediately surrounds heating tube 3 and is in direct lateral communication with that portion of chamber 1' that encloses the spray system. Space 29 communicates below with tank 2. Because of this arrangement liquid sprayed into chamber 1' enters space 29 and is splashed about heating tube 3 as it descends to tank 2. In this manner the heating tube is cooled and the washing liquid is heated by contact with heater 3.

In operation, tank 2 is filled with washing liquid to any desired level. Valve 26 is opened and pump 25 is started. Washing liquid is thus rapidly conveyed through conduit 4 to spray pipes 36 and spray holes or nozzles 37 maintained within the washing chamber. The "work" inside the washing chamber is bathed by the spray of washing liquid. The burner of heating tube 3 is turned on and the hot gases issuing from its open end are deflected around hood 11 and ascend into washing chamber 1. Here the gases are intimately commingled with the spray of washing liquid. By this intimate contact and commingling the washing liquid is heated very effectively and efficiently. The gases continue to rise through the washing chamber and are finally vented through a vent (not shown) in said chamber.

The washing liquid descends through washing chamber 1 to tank 2. Much of the washing liquid strikes hood 11 and is filmed over the inclined surface of the hood as it descends into tank 2. The washing liquid is then rapidly recycled to washing chamber 1 through pump 25 and conduit 4. For this purpose, as mentioned above, pump 25 is a high capacity pump.

The heating tube and their associated hoods of the present invention are prevented from burning out by using the washing liquid as a coolant.

In the embodiment of this invention illustrated in Figures 1 and 2, the heating tube is cooled by a spray of washing liquid conveyed from tank 2 by means of pump 25 to spray pipe 27. This also effectively prevents the heating tube from burning out.

The heating tube in the modification illustrated in Figures 3 and 4 is cooled by the wash liquid that is sprayed into space 29 and is splashed around heating tube 3.

In each of the modifications illustrated hood 11 is cooled by the washing liquid that descends through the washing tank and is filmed over the inclined surfaces of the hood.

Although the coolant function of the washing liquid as it contacts various parts of the heating tube and hood have been emphasized above, it is to be understood that there also results a corresponding heating of the washing liquid. There is thus provided auxiliary heating means for heating the washing liquid.

The operation of the present invention may proceed either intermittently or continuously. Preferably it is operated in a continuous manner as the work is being conveyed through the apparatus.

Structures embodied in the present invention may be used in any washing process. However, they are of particular benefit in processes wherein the washing liquids contain substances which tend to coat the heating tubes, such as a phosphate solution. Where a heating tube becomes coated with these materials there results a poor heat transfer through the heater walls and a very inefficient use of the heat generated within the tube. The present invention avoids this inefficiency by the intimate commingling of the gases issuing from the end of the

heating tube of this invention with a spray of washing liquid.

Any suitable material may be used to construct the various parts of the equipment embodied in the present invention. Those skilled in the art are well advised as to the requirements of the various parts and the details as to the kinds of materials to be used are available.

Although two specific embodiments of the present invention have been illustrated and described in detail, it will be readily appreciated by those skilled in the art that numerous modifications and changes may be made without departing from the spirit of the present invention. For example, although the spray system has been illustrated as comprising two parallel rows of vertically extending pipes mounted on an H-shaped manifold a single row of pipes or several rows of pipes mounted on manifolds of various shapes may be substituted therefor. Furthermore, hoods of various construction may be substituted for the hood specifically shown in the drawings. A hood comprising a single inclined member properly placed could be substituted for the hood specifically illustrated.

The general shape of the various tanks and conduits may be changed without departing from the spirit of the invention. The shape of the heating tube may be changed so that it is rectangular or square in cross sections.

It is obvious therefore, that the changes noted above and many others may be made without departing from the spirit of the present invention.

We have described what we believe to be the best embodiments of our invention. We do not wish, however, to be confined to the embodiments shown, but what we desire to cover by Letters Patent is set forth in the appended claims.

We claim:

1. An industrial washer comprising a spray chamber, vertically extending, first spray pipes in said chamber, a solution storage tank disposed below said spray chamber and in communication therewith, a pump connected at the lower portion of said tank, a conduit connecting said pump with said spray chamber whereby liquid may be circulated from said tank to said chamber, an elongated tubular heater extending substantially horizontally across said storage tank above the liquid level therein and terminating in the lower portion of said chamber, means for providing a flame jet extending within said heater, a second spray pipe disposed within said storage tank and extending horizontally across said storage tank, a second conduit connecting said pump with said second spray pipe whereby liquid in said storage tank is conveyed to the second spray pipe and sprayed on said heater, and a hood disposed above and adjacent said termination of said heater, said hood being provided with inclined surfaces so that liquid accumulating thereon runs down said surfaces into said tank.

2. An industrial washer comprising an upper housing, a storage tank disposed beneath said housing and in communication therewith, a washing chamber disposed in said housing and provided with vertically extending spray pipes, a vertically extending elongated tubular heater disposed in said housing and in lateral communication with said washing chamber, said heater also partially extending into said storage tank and terminating in the bottom of said washing chamber, said heater being provided with means for supplying a flame jet extending within said heater, a hood disposed above and adjacent said termination in said heater, said hood being provided with inclined surfaces so that liquid accumulating thereon runs down the surfaces into said storage tank, a pump connected at the bottom of said tank, and a conduit connecting said pump and said spray pipes whereby liquid may be rapidly pumped from said tank to said spray pipes.

3. In an apparatus having a spray chamber, spray means in said spray chamber, a solution storage tank in communication with said spray chamber, pump means to

circulate liquid from said solution storage tank to said spray means in said spray chamber, an elongated tubular heater extending into said solution storage tank above the liquid level thereof, the extremity of said elongated tubular heater being turned upwardly substantially vertical and terminating in the lower portion of said spray chamber, means disposed above and adjacent to said termination of said elongated tubular heater to prevent entrance of liquid into said heater and means for providing a liquid spray directed over the outer surface intermediate the length of said elongated tubular heater to cool same.

4. In an apparatus as set forth in claim 3, said elongated tubular heater extends substantially vertically and in communicating relationship with said spray chamber, whereby spray from said spray chamber cools the outer surface of said elongated tubular heater.

5. In an apparatus as in claim 3, wherein said liquid spray means includes a spray tube horizontally extending into said solution storage tank above the liquid level thereof.

6. In an apparatus having a spray chamber, spray means in said chamber, a solution storage tank in communication with said spray chamber, pump means to circulate liquid from said tank to said storage means, a

liquid heater comprising an elongated tubular heater extending into said storage tank above the liquid level, the extremity of said tubular heater being turned upwardly substantially vertical terminating in the lower portion of said spray chamber, means for providing a flame jet extending within said elongated tubular heater, a hood disposed above and adjacent to said termination of said elongated tubular heater, and spray cooling means adapted to spray liquid over the outer surface of said elongated tubular heater to cool same.

7. In an apparatus as set forth in claim 6, said elongated tubular heater extends substantially vertically and in communicating relationship with said spray chamber and said spray cooling means includes spray from said chamber spray means to cool the outer surface of said elongated tubular member.

References Cited in the file of this patent

UNITED STATES PATENTS

893,084	Loomis	July 14, 1908
1,527,740	Lipshitz	Feb. 24, 1925
2,677,368	Janecek	May 4, 1954