June 14, 1955 M. DONIAK 2,710,908

PORTABLE ELECTRICALLY HEATED PREHEATER

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Fig. 1.

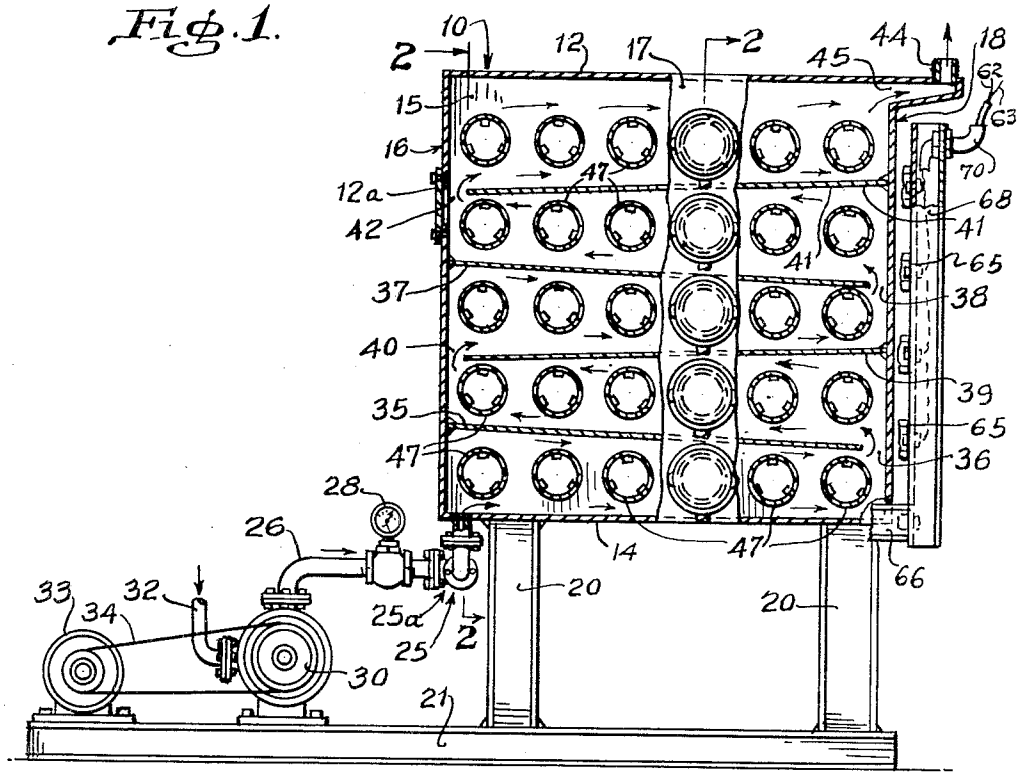


Fig. 6.

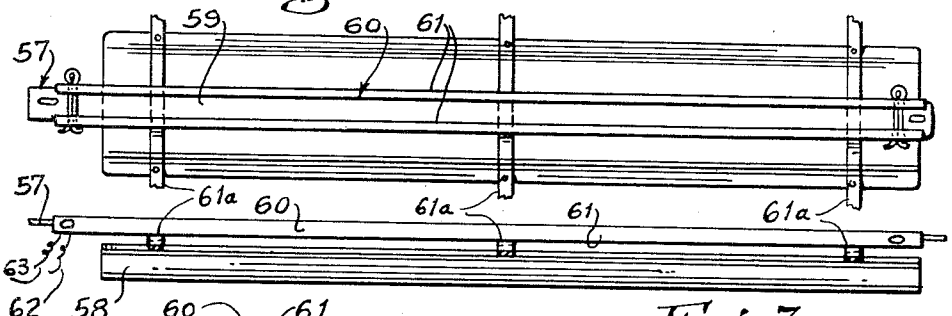


Fig. 7.

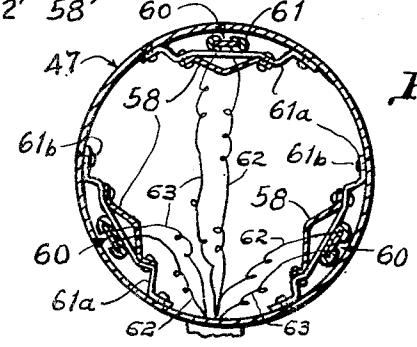


Fig. 5.

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Fig. 2.

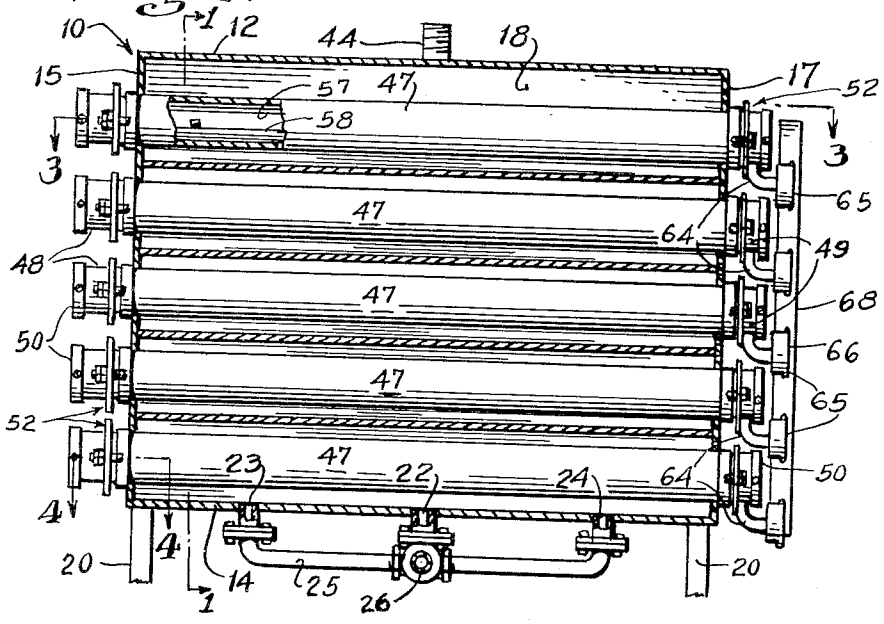


Fig. 3.

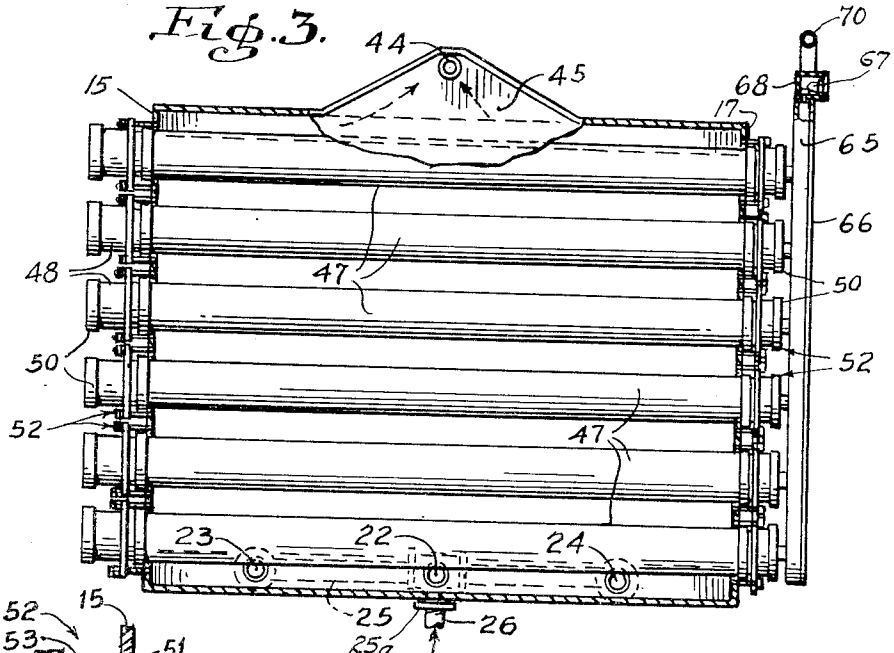
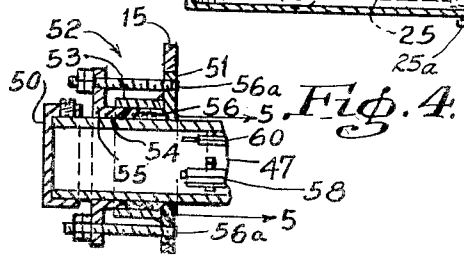


Fig. 4.



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United States Patent Office 2,710,908
Patented June 14, 1955

2,710,908

PORTABLE ELECTRICALLY HEATED PREHEATER

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Application February 23, 1954, Serial No. 411,636

6 Claims. (Cl. 219—39)

This invention relates to a portable preheater that may be used where oil, gas and like fuels are not available for providing heat, since my improved device is entirely electric with thermostatic controls.

My improved construction eliminates the need for masonry such as common fire brick with a resultant saving in manufacturing costs.

An important object of my invention is to provide an improved preheater comprising a self-contained unit that is simple in construction and compact in form, so as to take up a minimum of space.

Another object is to provide a preheater which includes a tank, preferably steel, which has inlets for fluid at several places in the bottom so that the fluid may be thoroughly distributed at its inlet points.

A further object is to provide inlets at the bottom of the tank so that the fluid may be forced to circulate upwards in the tank.

Another object of the invention is to provide a series of equally spaced tubes in the tank which have means for permitting the tubes to expand or contract without distorting the tank.

A further object is to provide electric heating elements within the closed tubes so that the periphery of the tubes may be heated for the purpose of heating the fluid, gradually and mildly as it is pumped upwardly through the tank.

Another object is to provide baffles on the inside of the tank, between each row of tubes, with staggered openings, so that the fluid will thoroughly contact the entire surface of the heated tubes in each row before passing upwards to the next row of tubes, the capacity of the tank being much greater than the supply line to insure slow passage of the fluid through the tank.

A further object is to provide a pumping system which may be reversed for completely draining the tank, the draining being facilitated because the baffles are installed at a downward angle toward the openings which extend across the entire width of the tank.

Further objects and advantages will be brought out in the following specification and the accompanying drawing, in which:

Fig. 1 is an assembly view of my improved portable, electrically heated preheater, shown partly in elevation and partly in section on line 1—1 of Fig. 2.

Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a horizontal sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a sectional detail view on line 4—4 of Fig. 2.

Fig. 5 is a vertical sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a plan view of the elongated, electric heating element shown in Fig. 5.

Fig. 7 is a side elevational view of the structure shown in Fig. 6.

Referring to the drawings in detail, the main structure comprises a tank 10, preferably made of metal, having a top wall 12, a bottom wall 14, a front wall 16, a back wall 18 and side walls 15 and 17. The tank 10 has a plurality of upright supports 20, resting on and connected to ground beams 21.

The tank 10, as shown in Figs. 1 and 2, is provided in the bottom wall 14, along its front edge, with a central inlet 22 and added inlets 23 and 24, for connection with the manifold 25. The manifold is provided centrally with a T fitting 25a to receive a supply pipe 26 with a pressure gage 28 at an intermediate point.

A suitable pump 30 is connected to the supply pipe 26, the pump having an inlet pipe 32. A drive means, shown as an electric motor 33, but not limited thereto, is connected by a belt 34 or the like to the pump 30.

The tank 10, as shown in Fig. 1, is furnished with a series of baffle plates which have three edges welded or otherwise fastened to the inside faces of the tank, the baffles being alternately fastened to the front wall 16 and the back wall 18, and sloping gently downwardly toward the opposite wall, but ending short thereof to leave a wall to wall opening. The bottom baffle 35 is welded to the walls 16, 15 and 17, and slopes gently down towards the wall 18, but being short thereof as shown at 36.

Spaced above the baffle 35 is a similar baffle 37 having an opening 38. Midway between the baffles 35 and 37 is a baffle 39 having an opening 40, and equally spaced above the baffle 39 is a similar baffle 41 having an opening 42. The slope of the baffle plates facilitate draining of the tank when the pump is reversed.

The top wall 12 of the tank 10 is provided with an outlet pipe 44 which leads upwardly from the narrow end portion of a funnel shaped structure 45 formed in the top wall adjacent to the back wall 18. Said structure 45 underlies a part of said top wall which projects rearwardly of said rear wall. The tank is provided with a plurality of heating tubes 47 which extend through the side walls 15 and 17, between the top and bottom tank walls 12 and 14, and between the baffles 35, 37, 39 and 41, in equally spaced, horizontal and vertical rows. As shown in Figs. 2 and 3, the tubes 47 extend beyond the walls 15 and 17 at 48 and 49, so that their ends may be closed off by the caps 50. Fixed to the walls 15 and 17 are flanges 51 bored to receive tubes 47. The packing gland 52 is provided with a sleeve 53 having an internal diameter adapted to receive the flange 54 of the pressure plate 55, and packing material 56 and bolts 56a complete the gland 52.

Since the glands 52 are used at both ends of the tubes, it is clear that the tubes may be permitted to expand or contract without distorting the tank 10. The caps 50 prevent the escape of heat from the tubes 47, and prevent dust particles from settling in the tubes around the heaters from the atmosphere.

As shown in Figs. 1, 5, 6 and 7, the tubes 47 are provided with elongated electric heaters of the bar type, and having insulated heated elements. The heaters 57 are located within the tubes 47, adjacent to the inside walls and coextensive therewith, and equally spaced around said walls; a total of three heaters being used in this instance, although any suitable number may be used.

The heater 57 includes a bar 59 which is enclosed almost completely by a sheath 60, said sheath being channel shaped in cross section, with each flange having an inwardly directed lip 61. The lips 61 overlie the bar 59 to aid in keeping the bar and contained heating element in place. Each group of reflector plates 53 cooperates with one of the electric heating elements 57, as shown in Fig. 5. The heaters are supported by straps 61a which are fixed to the inner surface of the tubes 47 by rivets 61b or the like. Suitable conductor wires

62 and 63 are provided for each heater, the wires being threaded through the elbow fittings 64 into enclosed conduit boxes 65, and having cover plates 66. As shown in Fig. 2, one conduit box is furnished for each horizontal row of tubes 47, the boxes in turn being connected by means of hollow connectors 67 to a collector box 68 which is constructed similarly to the conduit box 65. The box 68 is furnished with a fitting 70 which guides the lead in wires from the source of current and the thermostatic control means to the collector box 68, and thence to the conduit box 65 and finally to the heaters 57.

The broad portion of the aforesaid funnel shaped structure 45 extends across and communicates with substantially the mid-length third of the upper part of said receptacle, thus adding considerably to the extent to which flowing liquid is brought into contact with those heating tubes which are above the uppermost baffle.

In the use of my improved portable electrically heated preheater, the inlet pipe 32 is connected to a suitable source of fluid which is forced by a pump 30 through the supply pipe 26 and manifold 25 into the inlets 22, 23 and 24 of the bottom wall 14 of the tank, adjacent to the front wall 16. The plurality of inlets in the bottom of the tank insures that the fluid will be thoroughly distributed, and that the density of the fluid will be uniform.

As shown in Fig. 1, the baffles 35, 37, 39 and 41 will hold the fluid in contact with the tubes 47 until the fluid reaches the openings 36, 38, 40 and 42, at which time the fluid will slowly circulate upwardly in a back and forth movement which is retarded by the upward slope of the baffles to insure maximum efficiency. As the fluid passes the tube 47*a*, which is the last tube to be contacted, it passes into a funnel shaped structure 45, which leads the fluid to the outlet pipe 44, said pipe being connected to any suitable storage tank or the like.

This preheater can also be equipped with a reservoir of liquid or oil that can be pumped through the preheater to be heated and then circulated through the storage tank, not shown, which is equipped with heating coils.

From the foregoing it is apparent that I have designed an improved portable, electrically heated preheater that is simple and practical in construction, and one that will give a maximum of efficiency with a minimum of initial and maintenance cost.

I reserve the right to make numerous changes in the size, shape and arrangement of the parts so long as I do not depart from the spirit of the invention or the scope of the claims.

What I claim is:

1. In a portable preheater, a tank, said tank having top and bottom walls, front and back walls and side walls, a plurality of superimposed baffles alternately connected to all but one wall of the tank, the baffles alternately terminating short of the free wall to form coextensive, alternate openings, heating tubes extending between the baffles and the top and bottom walls of the tank and parallel to the coextensive openings of the baffles, the bottom wall having a plurality of inlets, a rearwardly tapered funnel shaped structure formed by the back and top walls, and the top wall having an outlet communicating with the narrow part of said funnel shaped structure rearwardly of said receptacle.

2. The subject matter of claim 1, and the baffles sloping upwardly from the coextensive openings toward the opposite walls, whereby the upward flow of the fluid may be retarded and the drainage of the tank facilitated.

3. The subject matter of claim 2, and heating elements extending axially and interiorly adjacent the walls of the heating tubes.

4. The subject matter of claim 3, and a manifold connected to the inlets, a pump having an inlet, and a supply line connecting the pump and the manifold, whereby fluid may be pumped into the tank under pressure.

5. The subject matter of claim 1, and said funnel shaped structure extending across and communicating with substantially the mid-third of the width of the upper part of said receptacle.

6. A device of the kind described comprising a receptacle having top, bottom and side walls, baffles in said receptacle coextensive with three side walls thereof and terminating short of the fourth wall to form an opening coextensive with the latter wall, and a series of heating tubes having closed ends, extending parallel with the coextensive openings between the baffles and the top and bottom walls of said receptacle, said bottom wall having inlets, and said top wall having a rearwardly extending part which forms the upper side of a rearwardly tapering funnel which communicates with said receptacle, said outlet leading from the rear part of said funnel, the uppermost of the aforesaid baffles having a front edge portion spaced away from the front wall of said receptacle.

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