

Dec. 23, 1947.

H. J. LONG

2,433,134

LIQUID HEATER

Filed Jan. 5, 1944

Fig. 1.

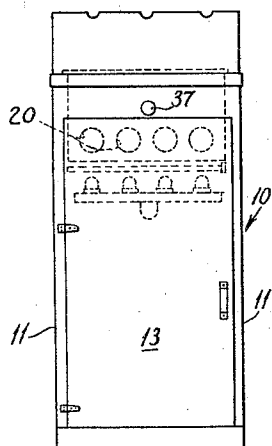


Fig. 2.

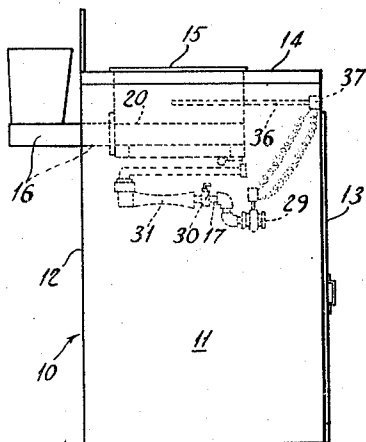


Fig. 3.

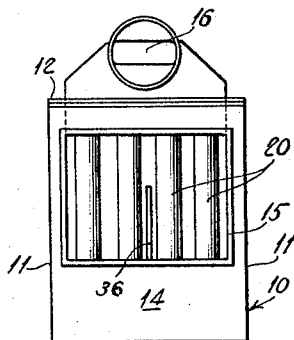


Fig. 4.

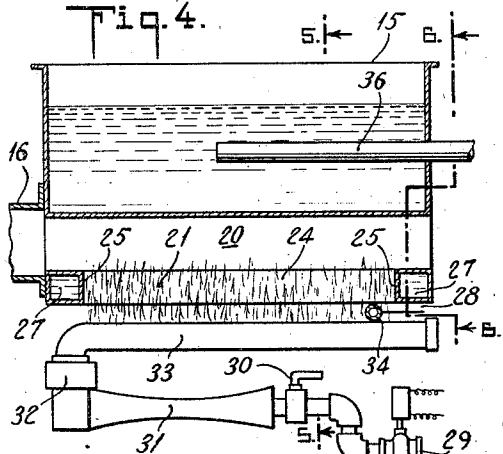


Fig. 5.

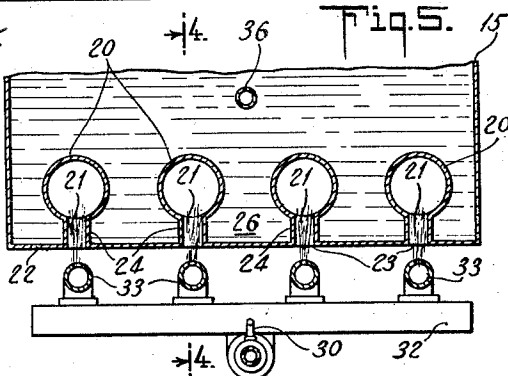


Fig. 6.

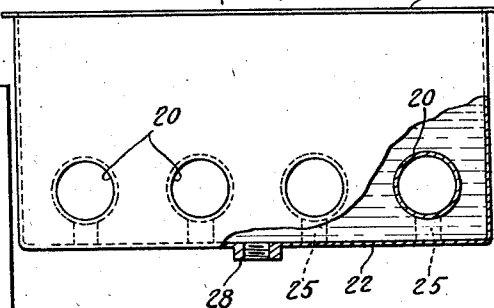
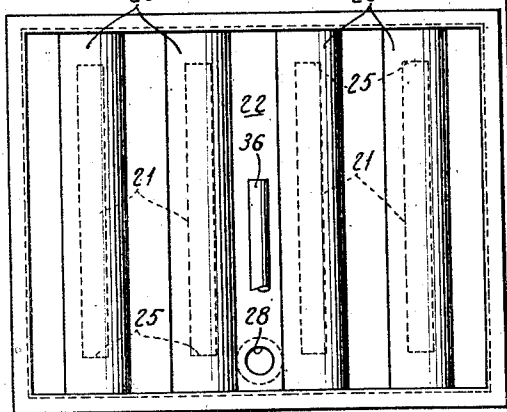


Fig. 7.



INVENTOR
HERBERT J. LONG

BY
John M. Cole
ATTORNEY

UNITED STATES PATENT OFFICE

2,433,134

LIQUID HEATER

Herbert J. Long, New York, N. Y., assignor to
Harry Bramson and Maurice Bramson, copart-
ners doing business under the name and style
of Acme Laboratory Equipment Co., New York,
N. Y.

Application January 5, 1944, Serial No. 517,012

5 Claims. (Cl. 126—391)

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The present invention relates to gas fired, immersion tube liquid heaters, and is more especially directed toward deep fat fryers.

Where deep fat fryers are fired with atmospheric burners it has been customary to provide the fat container with submerged heater tubes, each provided with an atmospheric gas burner at the front to produce a hot flame directed into the tube, and a spiral or other baffle for retarding escape of the products of combustion, improving heat transfer and reducing flue gas temperature. The control for such burners is of the snap action type with full on and off control, for such burners cannot be throttled. All the immersion tubes were connected to a common flue.

Owing to the limited dimensions of the parts, the need of baffling and the necessity of having quick recovery, the overall efficiency of these tubes is comparatively low, and the noise level is likely to be objectionably high. Furthermore it has been impossible to maintain these deep fat fryers at their initial efficiency without frequent cleaning. The tendency of baffles subjected to such flames to become burnt out or distorted and to accumulate soot is ever present and the sooting is likely to be accelerated on account of the intermittent operation caused by the thermostatic control. To get at the tubes for cleaning them it has been necessary to disconnect the burners and remove them from the tubes.

The present invention contemplates the absence of baffles in the immersion tubes so that loss of efficiency from burning out or clogging of baffles is eliminated and no baffles need be removed for cleaning.

The invention also contemplates that the immersed tubes will be connected to vertical flame inlets whereby the heat produced from burners placed below the grease container or pot may enter the tubes. In this manner the front of the tubes may be open and unoccupied and the gas is consumed in quiet operating burners of the high efficiency type, and the flame and products of combustion can enter the tubes, heat them, and the flue gases pass into the flue at low velocities suitable for efficient heat transfer.

The accompanying drawings show, for purposes of illustrating the present invention, an embodiment in which the invention may take form, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In these drawings:

Figures 1, 2 and 3 are front, side and top plan

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views, respectively, illustrating a deep fat fryer incorporating the invention;

Figure 4 is a vertical sectional view through the liquid container and burner taken on the line 4—4 of Figure 5;

Figure 5 is a cross sectional view taken on the line 5—5 of Figure 4;

Figure 6 is an elevational view with parts in section on the line 6—6 of Figure 4; and

Figure 7 is a top plan view of the liquid container.

The deep fat fryer illustrated in Figures 1, 2 and 3 has a more or less conventional casing 10 with sides 11, 11, back 12 and front door 13. The top of the fryer is indicated at 14, the grease container at 15 and the flue at 16. The gas supply is indicated at 17.

The grease container 15 may be made of one piece construction, as usual in this art, and is here shown as having four immersion tubes 20 which extend from front to rear. These tubes have slots or openings 21 which are slightly shorter than the length of the tubes 20. The bottom wall 22 of the container is provided with slots 23 directly below the slots 21 in the tubes, and these slots are connected by side walls 24, 24 and end walls 25, 25 so as to provide flame passages leading downwardly from the tubes 20, comparatively cool sediment zones 26 below the level of the tubes so that the bottom of the liquid container can remain comparatively cool for collection of sediment and communicating passages 27 so that the liquid can be drained out of the bottom of the container whenever desired. The drainage connection is indicated at 28.

The gas line 17 is connected through thermostatically controlled by-passing valve 29 to a control valve 30 of suitable type to deliver a jet of gas into the venturi 31 of the atmospheric gas burner. This venturi connects with a manifold indicated at 32 under the rear of the grease container, and this manifold is connected to burner tubes 33, preferably of the ribbon type, which extend forwardly and are spaced slightly below the openings or passageways 21. A pilot burner 34 extends across the top of these tubes to facilitate lighting the gas. The atmospheric gas burner is designed to burn a sufficient amount of gas to send flames up through the slots 21 and into the tubes 20. As each of the tubes 20 is connected to the flue 16, draft will carry the flame and products of combustion rearwardly so that there is no tendency for products of combustion to come out through the front ends of the tubes

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20. In fact the front ends are open and this provides a small amount of secondary air to provide clean combustion.

During the operation of the device above described the gas is burned in a very efficient manner, the flame enters into the tubes 20, draws in some secondary air through the passageways 21 and the flame mushrooms out inside the tubes 20 so as to provide for an efficient transfer of heat without involving any baffles or introducing any elements on which soot is likely to accumulate.

Instead of using a snap action valve as necessary where the burner flame is directed horizontally, it is preferable here to use a solenoid operated by-passing valve whereby the gas is throttled rather than cut off completely. The solenoid valve 29 is under the control of the usual thermostat indicated at 36 with the knob at 37. As the gas is consumed vertically in an open flame without baffles and soot collectors it is possible to regulate the flame up and down depending upon conditions and yet avoid fouling of the flues or other passages. It is also possible to clean the flues should occasion arise without in any way disturbing the burner. It is merely necessary to open the door 13 and brush out the flues.

The present construction is readily adaptable for use where electric heating is desired instead of gas. The same chassis, casing and electric thermostat may be used whether electric or gas heating is desired, it merely being necessary to omit the gas burner valves and piping and substitute electric heaters, power wiring and switch. These electric heaters may be readily inserted from the front of the device.

Since it is obvious that the invention may be embodied in other forms and constructions within the scope of the claims, I wish it to be understood that the particular form shown is but one of these forms, and various modifications and changes being possible, I do not otherwise limit myself in any way with respect thereto.

What is claimed is:

1. A gas fired, liquid heater having side walls and having open ended submerged horizontal heater tubes with vertical flame inlets extending longitudinally of the tubes but slightly shorter, burners under the inlets for discharging products of combustion and flame therethrough and into the heater tubes, and a common stack connection for one end of each of the heater tubes.

2. A gas fired, deep fat fryer having a fat container provided with open ended submerged horizontal tubes with vertical flame inlets extending longitudinally of the tubes but slightly shorter than the spacing of the container walls between which the tubes extend so as to provide transverse drainage passages in the container below the ends of the tubes, burners under the inlets for discharging products of combustion and flame therethrough and into the heater tubes, and a common stack connection for one end of each of the heater tubes.

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3. In combination, a liquid container having open ended, horizontal, normally submerged, heater tubes extending from one side wall to the opposite side wall and spaced above the bottom of the container, a discharge flue to which the common open ends of the tubes are connected, a horizontally elongated passage extending from the bottom of each heater tube through the bottom of the container, the passages being shorter than the spacing of the side walls of the container so as to provide transverse drainage passages in the container below the ends of the tubes, and a gas burner under the passage, the burner flames entering into the passages and drawing in secondary air to complete combustion whereby the hot products of combustion are discharged into the tubes for heating the contents of the container.

4. In a deep fat fryer, a fat container provided with a bottom and side walls, open ended, horizontal, normally submerged, heater tubes extending from one side wall to the opposite side wall and spaced above the bottom of the fat container, the bottoms of the tubes having slots shorter than the spacing of the side walls, the bottom having slots directly below the slots in the tubes, the sides and ends of the corresponding slots being connected by imperforate walls which provide both elongated, relatively cool sediment zones between the tubes and drainage passageways below the ends of the tubes.

5. A deep fat fryer comprising a casing having side and rear walls and a front door, an upwardly opening liquid container at the top of the casing, heater tubes extending from front to rear of the liquid container, a flue at the rear of the casing to which all the tubes are connected, burners underneath each heater tube and below the bottom of the container, and flame inlets extending from the bottom of the tubes through the bottom of the container, the tubes having open front ends opposite the door accessible for cleaning when the door is open and without disturbing the burners.

HERBERT J. LONG.

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