Dec. 2, 1947. F. W. HOLDERLE ET AL 2,431,753

COMBUSTION TUBE HEATER FOR COOKING CONTAINERS

Filed April 16, 1945 2 Sheets-Sheet 1

Fig. 1

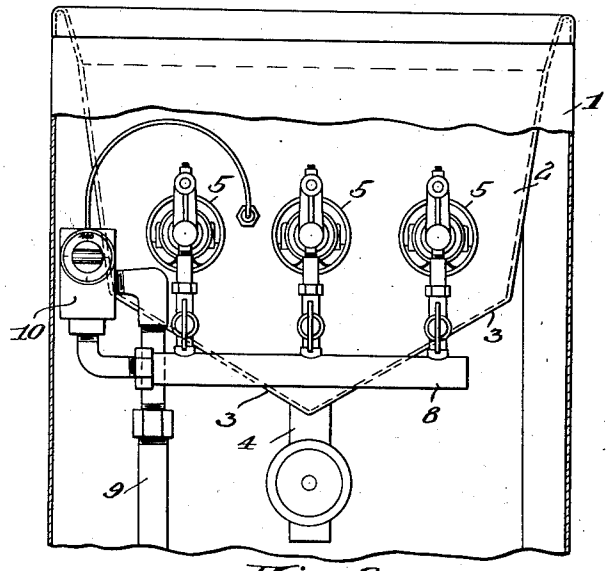


Fig. 2

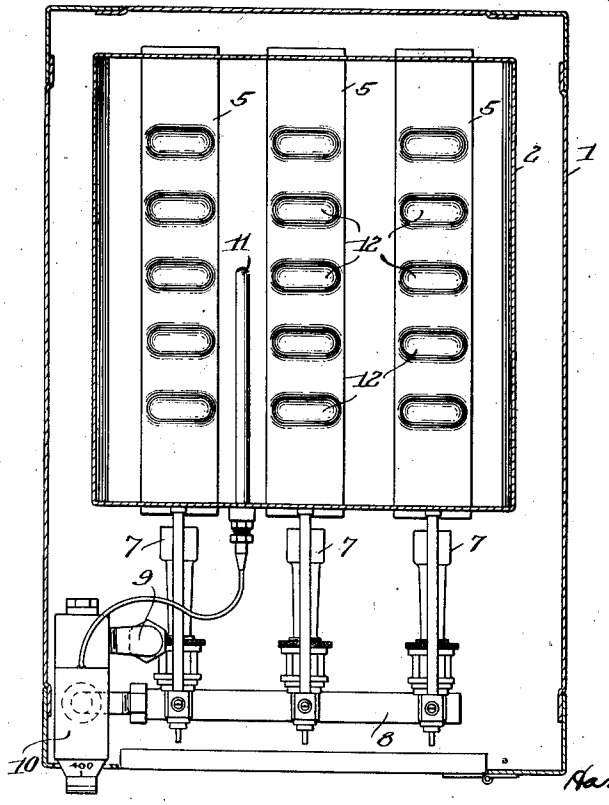


Fig. 6

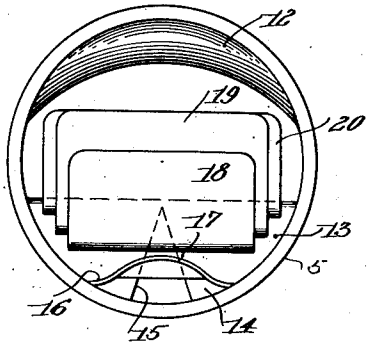
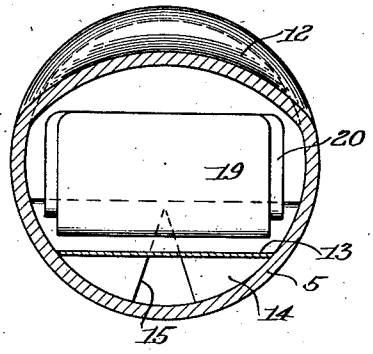


Fig. 7



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COMBUSTION TUBE HEATER FOR COOKING CONTAINERS

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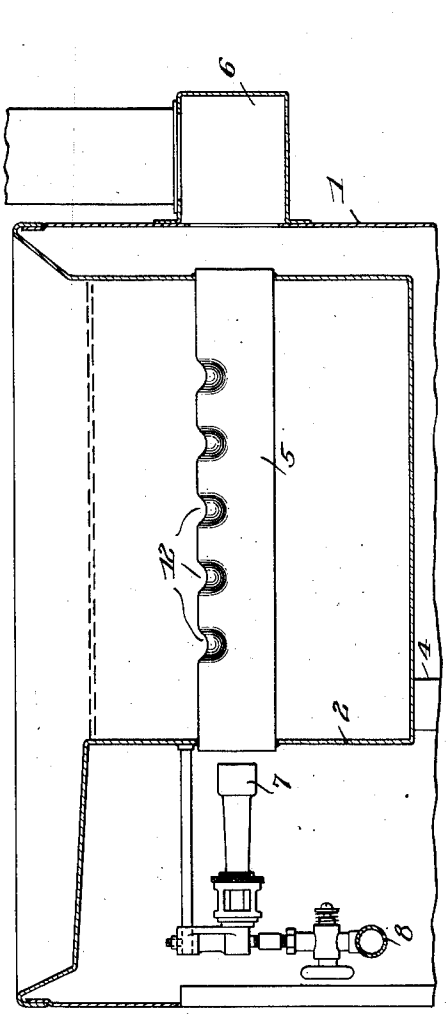


Fig. 3

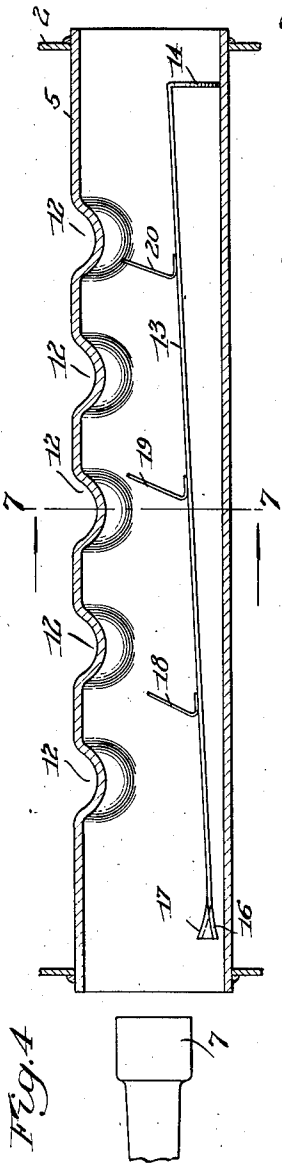


Fig. 4

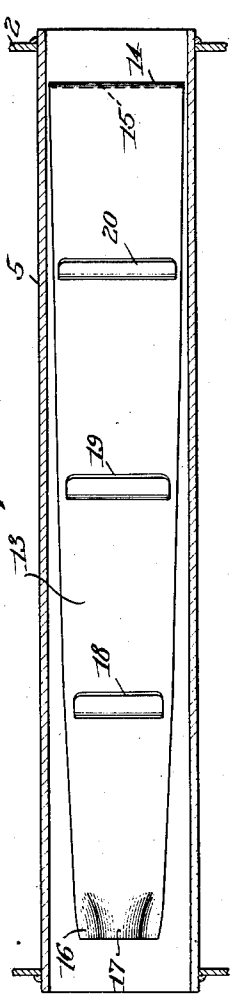


Fig. 5

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COMBUSTION TUBE HEATER FOR COOKING CONTAINERS

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11 Claims. (Cl. 126—391)

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This invention relates to a cooking apparatus, with particular reference to the type of construction employed for frying doughnuts, potatoes, and the like, including a container for a liquid cooking medium such as grease or oil in which the articles to be cooked are submerged, and one or more heating tubes extending through the container below the normal liquid level for heating the cooking liquid, and it has for its object to afford a structure that is more economical, more efficient, and susceptible of closer temperature control than structures heretofore available for the purpose.

More particularly, the invention has for its purpose to afford means for increasing the relative intensity of the heat above the heating tubes and for decreasing the relative intensity of the heat below the heating tubes, so as to afford a much cooler body of liquid below the tubes, at the same time increasing the heating efficiency of the fuel by diverting a maximum amount of heat upwardly into contact with the top walls of the heating tubes, and permitting a minimum amount of heat to be carried off through the exhaust flue.

Still another object of the invention is to afford a simple, practical and economical construction that functions to cause cold air from around or below the burner to travel through the lower part of the heating tube while the flame and products of combustion travel through the upper part of the tube, and are diverted toward the top wall of the tube as they pass through to the exhaust flue.

An additional purpose is to afford an improved form of heating tube whereby the area of heating surface at the top of the tube is increased in conjunction with means for diverting the hot products of combustion toward the greater heating surface at the top of the tube, as a consequence of which the increased heating surface acts to heat the cooking liquid to a maximum degree.

To these and other ends, the invention consists in the construction and arrangement of parts that will appear clearly from the following description when read in conjunction with the accompanying drawings, the novel features being pointed out in the claims following the specification.

In the drawings:

Fig. 1 is a view in front elevation, partially in section, of a cooking apparatus constructed in accordance with a preferred embodiment of the invention;

Fig. 2 is a plan view;

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Fig. 3 is a vertical sectional view taken centrally of Fig. 1, with parts in elevation;

Fig. 4 is a longitudinal vertical sectional view taken centrally of one of the heating tubes;

Fig. 5 is a horizontal sectional view taken centrally of Fig. 4, showing the partition in elevation;

Fig. 6 is a view in front end elevation of the heating tube and partition illustrated in Figs. 4 and 5, and

Fig. 7 is a transverse vertical sectional view on line 7—7 of Fig. 4, looking in the direction indicated.

Referring more particularly to the drawings in which like reference numerals refer to the same parts throughout the several views, 1 designates the main wall or casing of the cooking apparatus within which is supported a container or receptacle 2 for the cooking liquid such as grease or oil, it being understood that the articles to be cooked are submerged within the liquid in the container 2 while supported within a suitable basket which constitutes no part of the invention and is not shown.

The liquid container 2 is provided with inclined bottom walls 3 affording a sediment chamber and terminating in an outlet controlled by a suitable drain valve 4, while 5 designates heating tubes extending through the walls of the liquid container 2 from front to back thereof and located somewhat above the bottom of the container 2 and below the normal level of liquid in the container, so that when the articles to be cooked are positioned within the liquid in the container above the heating tubes 5, they can be cooked quickly at a temperature that is susceptible of close, accurate control. The heating tubes at their rear ends connect with an exhaust flue 6 through which the smoke and burned products are carried off.

Heat is supplied to the heating tubes by means of conventional gas burners 7, as usual in this type of construction, the burners 7 being supplied with gas through connections from a gas supply pipe 8, to which gas is fed from an inlet pipe 9, after passing through a temperature controlled valve 10. The valve 10 is governed by a thermostat 11 suitably mounted within the container 2 and preferably located parallel to the heating tubes in slightly spaced relation thereto and on a level with or slightly below the top walls of the heating tubes so that as the temperature of the cooking liquid rises or falls, it closes or opens the valve 10 respectively, to control the supply of gas to the burners, the flames of which are di-

rected into the heating tubes. The thermostatic valve 10 can be set to any desired temperature and will maintain the temperature of the cooking liquid very nearly constant with but slight variations owing to the heating efficiency and extreme sensitivity of the heating tubes, as will be described presently.

Each heating tube is constructed as shown in Figs. 4 to 7 inclusive, and since they are identical, it will be necesary to describe in detail only one of them. In order to increase the efficiency and heating surface of the tube and to increase the relative intensity of the heat generated in the liquid above the tube while maintaining a relatively cooler area in the liquid below, each tube is provided in its top wall with transverse corrugations 12, see Figs. 4 and 7, the top surface of each corrugation being convexly curved transversely, as shown in Fig. 7, so that any particles of food matter falling thereon will not be held but will readily fall off and be carried downwardly into the sediment chamber at the bottom of the container 2. The bottoms of the corrugations 12 are convexly curved to nearly the same extent as the outer periphery of the heating tube, thus avoiding any flat surfaces on which food particles might lodge and thereby reduce the heating efficiency of the apparatus.

In order to obtain a maximum effect from any given amount of heat generated by a burner, it is desirable to divert the flame and combustion products toward the top wall of the heating tube and the transverse corrugations 12, while causing the cold air around and below the burner to travel through the heating tube at the bottom thereof. In order to accomplish this, there is provided a generally horizontal partition extending longitudinally through the heating tube and dividing the tube into upper and lower chambers forming passages through which the combustion products and cold air respectively travel.

In the construction shown, the partition is designated at 13 with its front end resting at points near the bottom of the heating tube, and its rear end slightly elevated to give an upward inclination to the partition from front to rear. This is accomplished by providing the rear end of the partition with a depending supporting wall 14, the bottom edge of which conforms to and rests on the bottom of the heating tube, while 15 is a central opening in the wall through which the cold air passes outwardly to the flue.

The front end of the partition 13 has side portions 16 that engage and rest on the adjacent surface of the heating tube, while the central portion of the partition is curved upwardly as shown at 17, to afford an enlarged throat providing a cold air inlet which facilitates entrance of cold air to the passage underneath the partition, whence it moves rearwardly and through opening 15, while the flame, hot gases, and combustion products travel rearwardly above the partition 13 and are diverted toward the top of the heating tube into contact with the corrugated portions and the portions of the top wall of the tube between the corrugations 12.

In order to insure entrance of the gas flame and hot products above the partition 13, and entrance of cold air beneath the partition, each burner 7 is arranged slightly above the top of the throat 17, or above the front end of the partition 13, as shown in Fig. 4. It is desirable to retard travel of the hot products of combustion through the heating tubes so as to obtain a maximum heating effect on the top wall of the heating tube,

and to attain this end, the partition 13 is provided with baffles or deflectors spaced endwise from each other and preferably inclined upwardly, as shown at 18, 19 and 20. These baffles may consist of metal plates bent to the desired shape to afford base portions welded or otherwise attached to the partition, the baffles extending laterally across the partition and approximately as wide as the partition, as indicated at Fig. 5.

The baffle 19 preferably extends a somewhat greater distance from the partition than baffle 18 in order to divert a maximum volume of the combustion products upwardly at the center of the heating tube while the slightly reduced height of the first baffle 18 permits the flame of the burner to project well into the tube and toward the top wall thereof. The partition 13 with its baffles may rest loosely in the heating tube or may be fastened therein if preferred, and has outwardly curving side edges as shown in Fig. 5 so that when positioned in the heating tube in the desired upwardly inclined position, the side edges of the partition engage and are in substantial contact with the adjacent surfaces of the heating tube, so that there is no space or opening between the edges of the partition and the adjacent surfaces of the heating tube, and the upper chamber is effectively separated from the lower chamber.

In operation, the jet of flame from the gas burner enters the front end of the heating tube and is diverted upwardly over the first baffle 18 toward the top wall of the heating tube and corrugations 12, while the cold air from around and under the burner enters under the throat 17. The hot products of combustion passing over baffle 18 are diverted further upwardly into contact with the top wall of the heating tube and against the transverse corrugations 12 by the intermediate baffle 19, and continue on over baffle 20 and outwardly to the exhaust flue 6, all the hot products of combustion traveling from the front end of the heating tube to the rear end thereof through the passage above the partition, while any cold air passes under the throat 17 and travels rearwardly through the passage beneath the partition, thence through opening 15 in the supporting wall 14 at the back end of the partition and to the flue outlet.

With this arrangement, the cooking liquid above the heating tubes is kept intensely hot while the liquid below the heating tube is relatively cooler and particles of food falling into the sediment zone will not be burned but can be drawn off through the discharge outlet at suitable intervals. With the construction described, considerably greater heating efficiency is obtained because less heat is permitted to pass to the exhaust flue 6 and more heat is diverted to the top wall of the heating tube. As a result of this arrangement and the corrugations 12, the cooking liquid is heated from a cold temperature to the required cooking temperature in much less time than with prior structures for the same purpose. The structure permits closer and more accurate control and enables a more nearly constant cooking temperature, due to the fact that the thermostat is located in the portion of the cooking liquid adjacent to the top walls of the heating tubes where the heat is most intense, whereas the cooking liquid below the cooking tubes is relatively cooler. The temperature changes where the thermostat is located are quicker than with prior structures, consequently there is less lag between the opening and closing operations of the controlling valve, and the tem-

perature of the liquid can be maintained more nearly constant for any given setting of the thermostatic valve.

While the invention has been described with relation to a particular embodiment, it is not restricted to the details shown, and this application is intended to cover such changes or modifications as may come within the purposes of the improvement or the scope of the following claims.

We claim:

1. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, of a generally horizontal partition extending longitudinally through the heating tube with its side edges substantially in contact with the side walls of the tube affording upper and lower passages through which the combustion products and cold air respectively travel, and a burner in front of the heating tube located above the front end of the partition.

2. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, of a generally horizontal partition extending longitudinally through the heating tube with curved side edges substantially in contact with the side walls of the tube, said partition being inclined upwardly from a point near the bottom of the tube at its forward end toward the rear end thereof affording upper and lower passages through which the combustion products and cold air respectively travel, and a burner in front of the heating tube located above the front end of the partition.

3. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, of a generally horizontal partition extending longitudinally through the heating tube with its side edges substantially in contact with the side walls of the tube affording upper and lower passages through which the combustion products and cold air respectively travel, a plurality of baffles extending upwardly from the partition toward the top of the heating tube, said baffles being spaced from the top of the tube and from each other, and a burner in front of the heating tube located above the front end of said partition.

4. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, of a generally horizontal partition extending longitudinally through the heating tube with curved side edges substantially in contact with the side walls of the tube, said partition being inclined upwardly from a point near the bottom of the tube at its forward end toward the rear end thereof affording upper and lower passages through which the combustion products and cold air respectively travel, a plurality of baffles extending upwardly from the partition toward the top of the heating tube, said baffles being spaced from the top of the tube and from each other, and a burner in front of the heating tube located above the front end of said partition.

5. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, of a generally horizontal partition extending longitudinally through the heating tube with curved side edges substantially in contact with the side walls of the tube, said partition being inclined upwardly from a point near the bottom of the tube at its forward end toward the rear end thereof affording upper and lower passages through which the combustion products and cold air respectively travel, the forward end of said partition having a centrally arranged upwardly curved throat forming a cold air inlet, a plurality of baffles extending upwardly from the partition toward the top of the heating tube, said baffles being spaced from the top of the tube and from each other, and a burner in front of the heating tube located above said throat in the front end of said partition.

6. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, of a generally horizontal partition extending longitudinally through the heating tube with curved side edges substantially in contact with the side walls of the tube, said partition having its forward end in close proximity to the bottom of the heating tube and its rear end spaced a greater distance above the bottom of the tube, the forward end of said partition having a centrally arranged upwardly curved throat forming a cold air inlet and the rear end of the partition having a depending supporting wall with an opening therein affording a cold air outlet, a plurality of rearwardly inclined baffles extending upwardly from the partition toward the top of the heating tube, said baffles being spaced from the top of the tube and from each other, and a burner in front of the heating tube located above said throat in the front end of said partition.

7. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, said heating tube having a series of transverse corrugations in its top wall, the outer surfaces of said corrugations being convexly curved transversely, of a generally horizontal partition extending longitudinally through the heating tube with its side edges substantially in contact with the side walls of the tube affording upper and lower passages through which the combustion products and cold air respectively travel, and a burner in front of the heating tube located above the front end of the partition.

8. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, said heating tube having a series of transverse corrugations in its top wall, the outer surfaces of said corrugations being convexly curved transversely, of a generally horizontal partition extending longitudinally through the heating tube with its side edges substantially in contact with the side walls of the tube, said partition being inclined upwardly from a point near the bottom of the tube at its forward end toward

the rear end thereof affording upper and lower passages through which the combustion products and cold air respectively travel, and a burner in front of the heating tube located above the front end of the partition.

9. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, said heating tube having a series of transverse corrugations in its top wall, the outer surfaces of said corrugations being convexly curved transversely, of a generally horizontal partition extending longitudinally through the heating tube with its side edges substantially in contact with the side walls of the tube affording upper and lower passages through which the combustion products and cold air respectively travel, a plurality of baffles extending upwardly from the partition toward the top of the heating tube, said baffles being spaced from the top of the tube and from each other, and a burner in front of the heating tube located above the front end of the partition.

10. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, said heating tube having a series of transverse corrugations in its top wall, the outer surfaces of said corrugations being convexly curved transversely, of a generally horizontal partition extending longitudinally through the heating tube with curved side edges substantially in contact with the side walls of the tube, said partition being inclined upwardly from a point near the bottom of the tube at its forward end toward the rear end thereof affording upper and lower passages through which the combustion products and cold air respectively travel, a plurality of baffles extending upwardly from the partition toward the top of the heating tube, said baffles being spaced from the top of the tube and from each other, and a burner in front of the heating tube located above the front end of the partition.

11. In a cooking apparatus, the combination with a container for a liquid cooking medium, and a heating tube extending horizontally through said container at a point above the bottom of the container and below the normal liquid level therein, said heating tube having a series of transverse corrugations in its top wall, the outer surfaces of said corrugations being convexly curved transversely, of a generally horizontal partition extending longitudinally through the heating tube with curved side edges substantially in contact with the side walls of the tube, said partition being inclined upwardly from a point near the bottom of the tube at its forward end toward the rear end thereof affording upper and lower passages through which the combustion products and cold air respectively travel, a plurality of baffles extending upwardly from the partition toward the top of the heating tube, said baffles being spaced from the top of the tube and from each other, the forward end of said partition having a centrally arranged upwardly curved throat forming a cold air inlet, and a burner in front of the heating tube located above said cold air inlet.

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