Dec. 13, 1932. H. E. SMITH 1,891,058

HEAT TRANSFER DEVICE

Filed June 2, 1932 2 Sheets-Sheet 1

Fig. 1

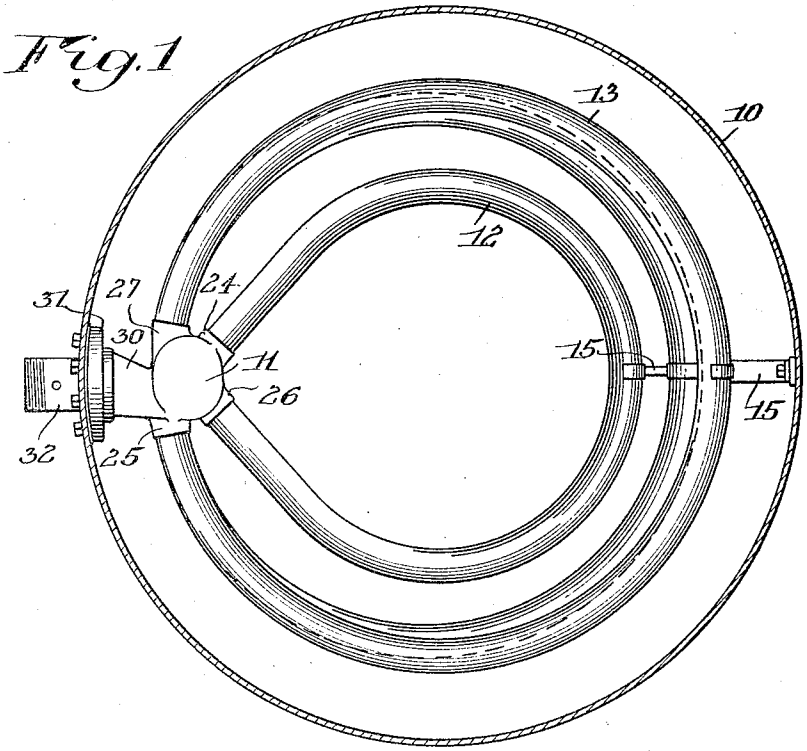
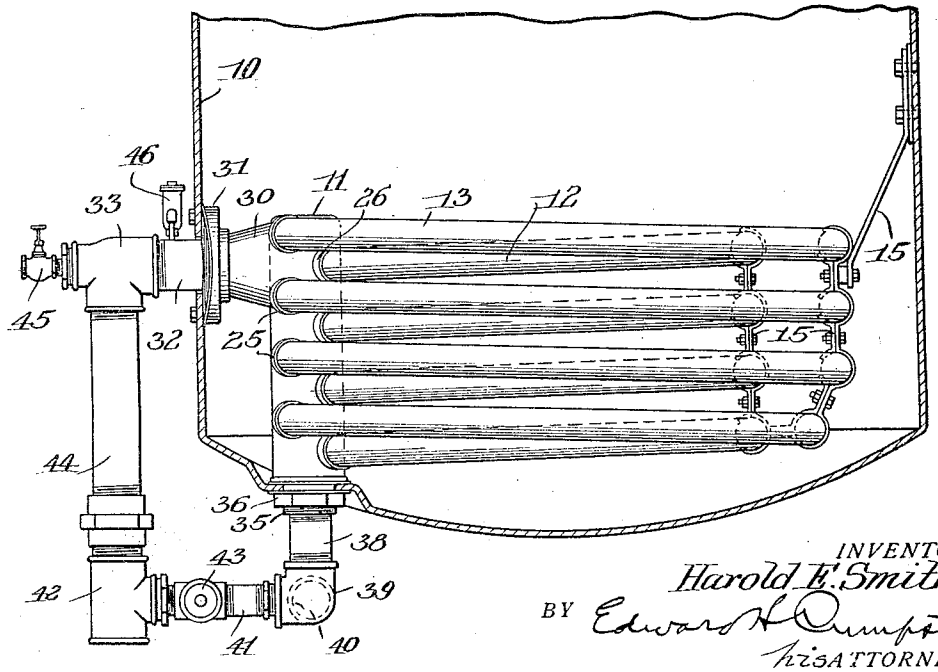


Fig. 2



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Filed June 2, 1932 2 Sheets-Sheet 2

Fig. 3

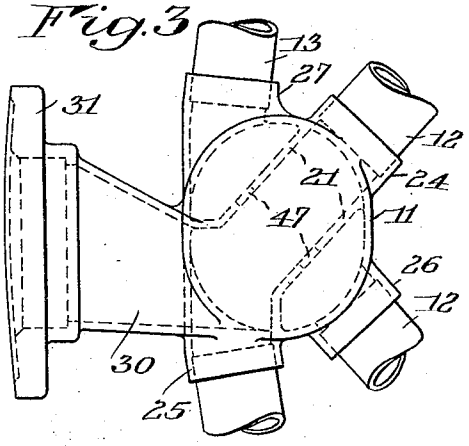


Fig. 5

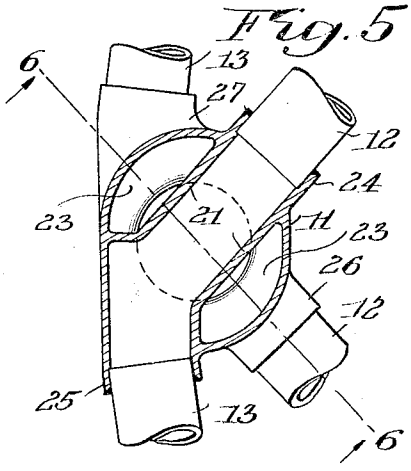


Fig. 4

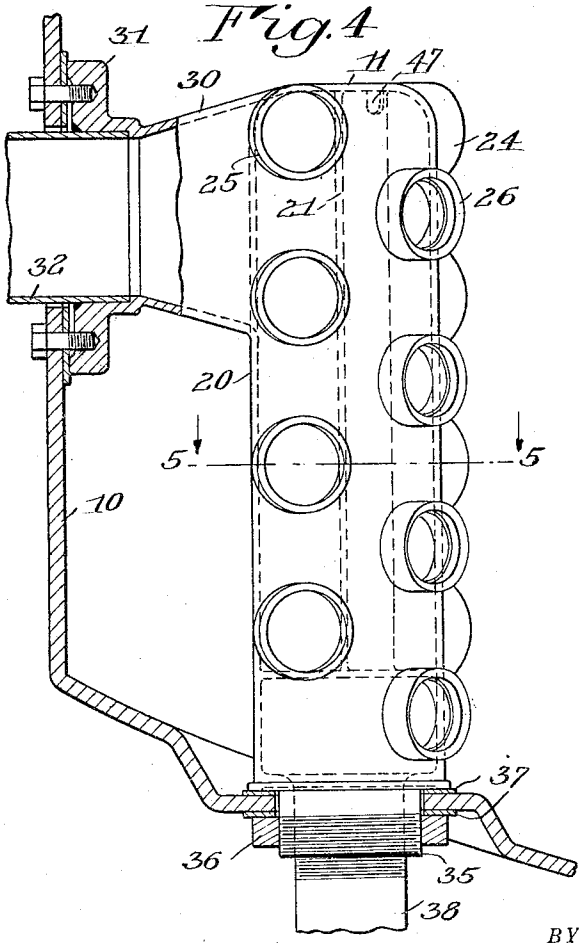
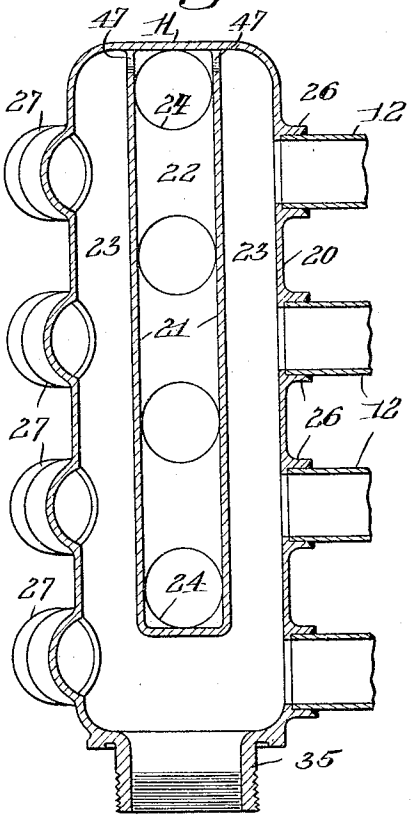


Fig. 6



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UNITED STATES PATENT OFFICE

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HEAT TRANSFER DEVICE

Application filed June 2, 1932. Serial No. 614,903.

This invention relates to heat transfer devices and particularly to heating or cooling coils for processing apparatus such as food cookers.

An object of the invention is the provision of a generally improved and more satisfactory heat transfer device of this character, in which the heating or cooling effect is more uniform than in previous apparatus.

Another object is the provision of a single unitary header for supplying heating or cooling fluid to two separate series of coils, and one which is so arranged that fluid flows through certain coils in a direction opposite to that in which it flows through other coils, so that a more even or uniform heating or cooling effect is obtained.

A further object of the invention is the provision of a simplified one-piece coil header which is easy and comparatively inexpensive to manufacture, rugged in use, simple to install, and not liable to get out of order.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a horizontal section through a tank equipped with a preferred form of heat transfer device according to the present invention, showing the coils and header in plan;

Fig. 2 is a side elevation of the coils and header and piping connections, with parts of the tank in vertical section;

Fig. 3 is a plan of the header and fragments of the coils, on a larger scale than Fig. 1;

Fig. 4 is a side elevation of the header with parts of the tank and header in vertical section;

Fig. 5 is a horizontal section through the header substantially on the line 5—5 of Fig. 4, and

Fig. 6 is a vertical section taken substantially on the line 6—6 of Fig. 5.

The same reference numerals throughout the several views indicate the same parts.

Referring now to Figs. 1 and 2 of the drawings there is shown by way of example an embodiment of the invention specially designed for use in food processing apparatus, such as tomato cookers. A suitable receptacle or container, which may be a tank, vacuum pan, or the like, is indicated at 10, and within this container are two series of coils both connected to a single header indicated in general by the numeral 11. The coils of the inner series, shown at 12, may be of any desired number, four such oils being illustrated one above another. The coils of the outer series are shown at 13, and likewise comprise four separate coils in the present instance, although a greater or less number may be employed if desired. The outer coils 13 are preferably one above another, except that the lowermost coil of the outer series may be of smaller diameter, as plainly shown in Figs. 1 and 2, in order not to be too close to the dished bottom of the container 10. Suitable braces, standards, or supports, indicated in general by the numeral 15, may be provided for holding the coils in place.

The header 11 has suitable passageways for conducting heating or cooling fluid to and from the coils. In the tomato cooker illustrated by way of example, steam may be used for heating the coils to cook the tomatoes, while water may be introduced to cool off the coils when desired. Obviously other heating or cooling fluids may be used.

The header is preferably of a simple one-piece construction, and one of the important features of this invention is that it is so designed that the fluid circulated through certain coils flows in an opposite direction to the fluid flowing in other coils.

The construction of the header itself is best shown in Figs. 3 to 6 inclusive. It comprises a main body 20 of somewhat cylindrical shape, extending in a generally vertical direction when the coils are arranged approximately horizontally as in Fig. 2, although the axis of the header would naturally be placed in any other desired position if the coils were differently arranged. The body 20 is subdivided by the generally U-shaped partition 21, best shown in Fig. 6, which forms a cen-

tral chamber 22 and a U-shaped chamber 23 on each side of and across the bottom of the central chamber 22, so that the chamber 23 may be said to embrace or extend around the chamber 22. The central chamber 22 may conveniently be used as a passageway for supplying fluid to the coils, while the U-shaped chamber 23 may be used as a passageway for the discharge of fluid from the coils, or vice versa.

The chamber 22 is provided along one side with a series of external openings surrounded by flanges 24 and along the other side with a series of external openings surrounded by flanges 25, the coils being suitably connected to these flanges.

The U-shaped chamber 23 preferably has similar openings provided with flanges for suitable connection to the coils. As shown especially in Fig. 6, the right hand portion of the chamber 23 has a series of openings surrounded by flanges 26, while the left hand portion of the chamber has another series of openings surrounded by flanges 27.

Each coil is slightly inclined throughout its length, to provide for proper drainage. The higher end of each of the inner coils 12 is welded or otherwise suitably connected to a flange 24, while the lower end of the same coil is connected to the corresponding flange 26 at a slightly lower elevation. Likewise the higher end of each of the outer coils 13 is connected to one of the flanges 25, and their lower ends of the flanges 27. Hence if fluid be supplied to the inlet chamber 22 of the header, it will flow in a clockwise direction through the coils 12 of the inner series, and in a counterclockwise direction through the coils 13 of the outer series.

This flow in different directions through different coils is an important feature of the present invention, since it enables a more uniform heating or cooling effect to be secured. When a heating fluid, for example, is flowing through the coils, it obviously cools off to some extent as it flows. With the opposite directional flow in the two series of coils, the parts of one series of coils in which the fluid is hottest will be adjacent the parts of the other series in which the fluid is coolest. Thus the drop in temperature throughout the length of one coil is counterbalanced to a considerable extent by the temperature drop in the opposite direction in an adjacent coil of the other series, so that a more uniform heat transfer effect is secured throughout all parts of the product surrounding the coils.

Near the top of the inlet chamber 22 is a lateral extension 30 (Figs. 3 and 4) preferably formed integrally with the body of the header, which constitutes an inlet passageway for flow of fluid to the header. The extension 30 preferably terminates in a flange 31 suitably secured in a watertight manner to the side of the container 10 and receiving the end of an inlet conduit 32 connected to a T fixture 33 (Fig. 2).

At the bottom of the U-shaped chamber 23 is a discharge orifice surrounded by a flange 35 (Figs. 4 and 6) threaded both internally and externally, which flange extends through a suitable opening in the bottom of the container 10. A nut 36 screwed on to the outside of the flange 35 draws the header down tightly against the bottom of the container 10 and makes a water tight joint with the container, with the aid of suitable gaskets 37. A discharge conduit 38 is screwed into the flange 35 and extends downwardly, as shown in Fig. 2, to an elbow T 39 from which point a discharge conduit may extend laterally in one direction, as indicated at 40. Where steam is used as a heating fluid it may also be desirable to extend a condensate conduit 41 from the elbow T 39 to a T 42 in the steam inlet conduit, so that some of the condensate may be mixed with the entering steam to temper this steam if desired, the flow of condensate through the conduit 41 being controlled by the valve 43. The bottom of the T 42 may be connected to any suitable source of steam supply, and a conduit 44 extends upwardly from the top of the T 42 to the bottom of the T 33.

For cooking apparatus such as is here illustrated by way of example, it is desirable to have means for cooling the coils when desired. To this end, a supply of cold water may be arranged to enter the inlet through the valve 45 attached to one branch of the T 33.

An air vent 46 of suitable construction may be provided at the top of the inlet conduit 32 if desired, and small vent openings 47 (Figs. 4 and 6) are provided in the partition 21 in the header so that air trapped at any part of the header can escape to and through the air vent. Preferably a small tube within the members 30 and 32 leads from the top portion of the header to the air vent.

The external connections leading to and from the coil header may be varied as desired, depending on the position of the header within the container and on the character of the heating or cooling fluid which is to be employed.

In use, assuming that the apparatus is to be used for cooking food products, steam enters from a suitable connection at the bottom of the T 42, and flows upwardly through the conduit parts 44 and 33 into the parts 32 and 30 and into the inlet chamber 22 of the header. There it spreads to the inlet ends of all of the coils, and flows clockwise through the inner coils 12 and counterclockwise through the outer coils 13, so that a relatively even or uniform heating effect is secured. The mixture of used steam and condensate flows back into the U-shaped chamber 23 of the header, and is discharged

through the conduits 38 and 40. Part of the condensate may be by-passed through the conduit 41 to mix with the incoming steam to temper this steam if desired.

The entire header, being preferably of a single integral piece, is of durable and rugged construction, comparatively easy to manufacture and install, and stands up well in service.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is therefore not to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the spirit of the invention or the scope of the appended claims.

I claim:

1. A heat transfer device comprising two series of coils, and a single header for the coils of both series, said header having a substantially central inlet passage for certain of said coils and discharge passages for certain coils of both series on opposite sides of said inlet passage.

2. A heat transfer device comprising two series of coils, one series being substantially inside the other series, and a common header to which the coils of both series are connected, said header having inlet and outlet passages so arranged that fluid circulates through one series of coils in a direction opposite to that in which it circulates through the other series of coils.

3. A coil header comprising a body having two series of coil inlet openings spaced from each other, and a series of coil outlet openings between the two series of coil inlet openings.

4. A coil header comprising a body having two series of coil outlet openings spaced from each other, and a series of coil inlet openings between the two series of coil outlet openings.

5. A coil header comprising a body having a coil inlet opening for one coil and a coil outlet opening for another coil on one side of a plane passing substantially centrally through said header, and a coil outlet opening for the first coil and a coil inlet opening for the other coil on the opposite side of said plane.

6. A coil header comprising a chamber provided with coil outlet openings and another chamber provided with coil inlet openings, one of said chambers being substantially U-shaped and embracing the other of said chambers.

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