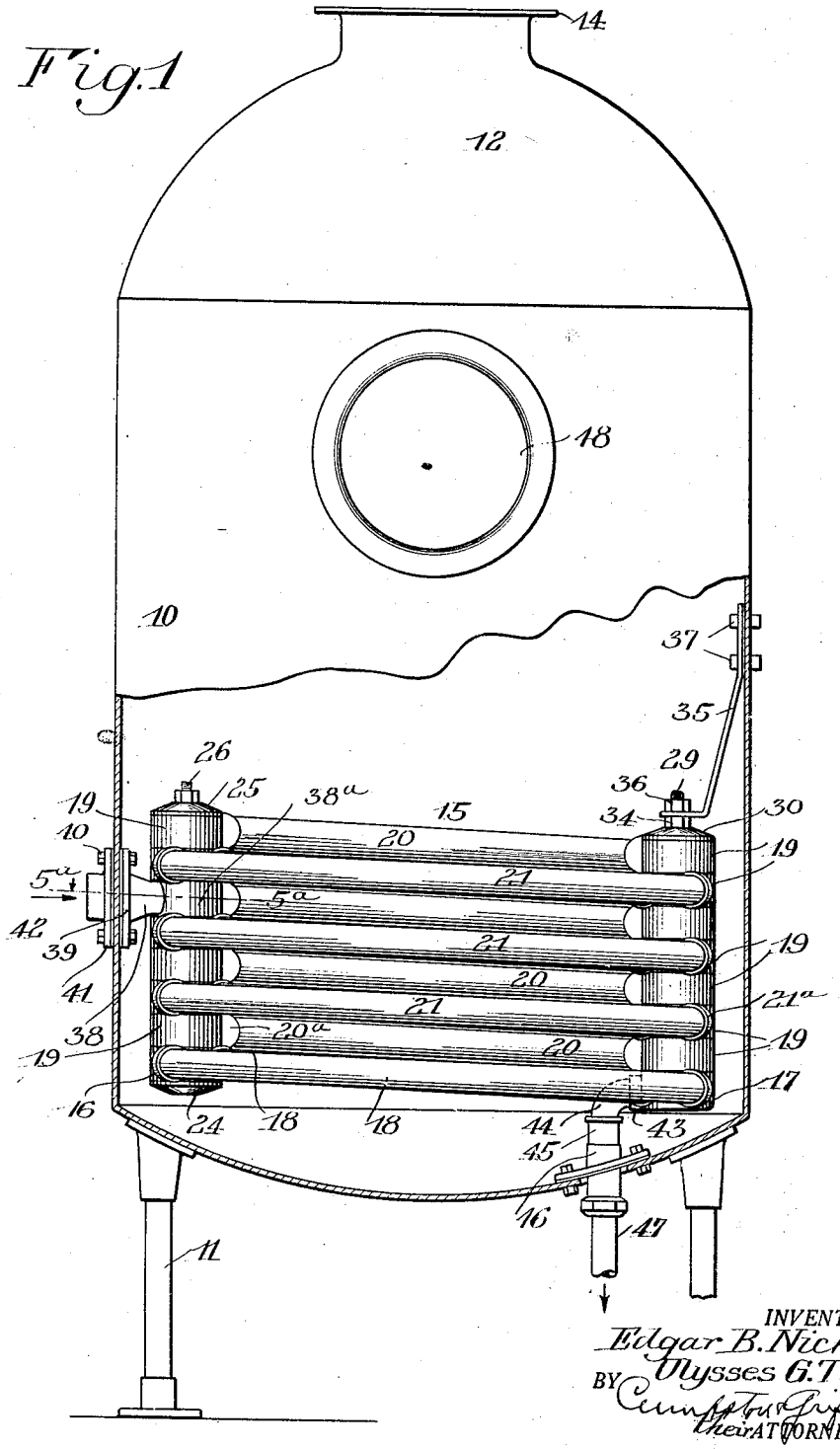
April 1, 1930. E. B. NICHOLS ET AL 1,753,062

LIQUID PROCESSING APPARATUS

Filed Jan. 27, 1926 2 Sheets-Sheet 1

Fig. 1



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LIQUID PROCESSING APPARATUS

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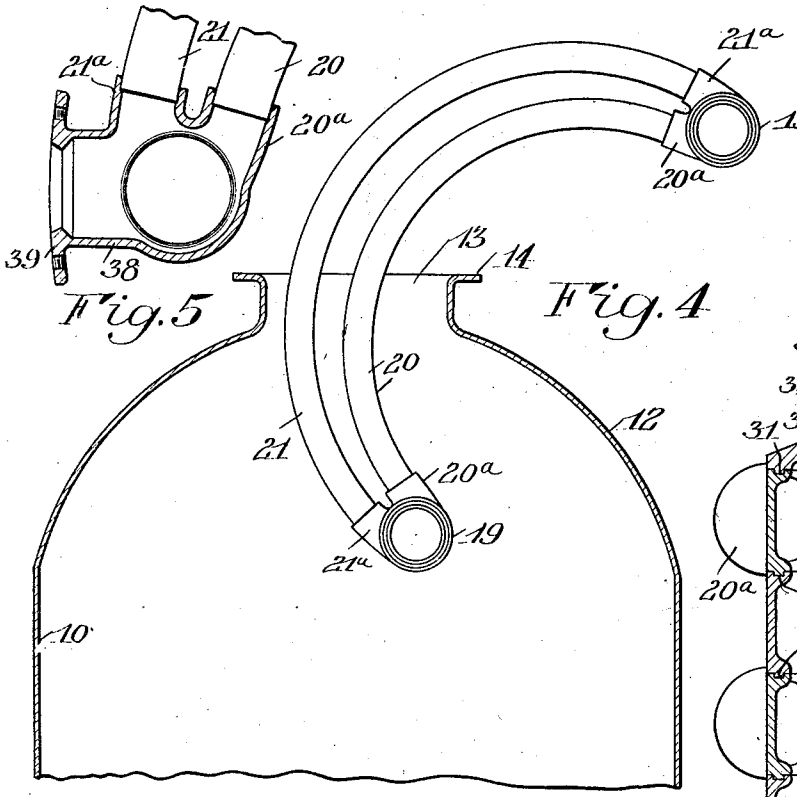


Fig. 5

Fig. 4

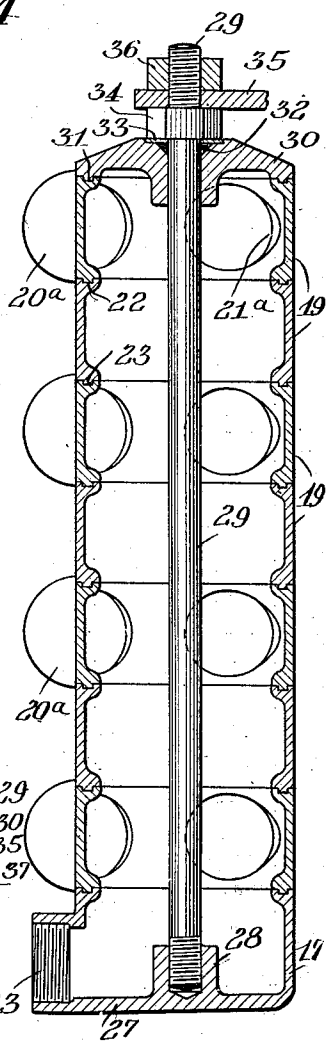


Fig. 3

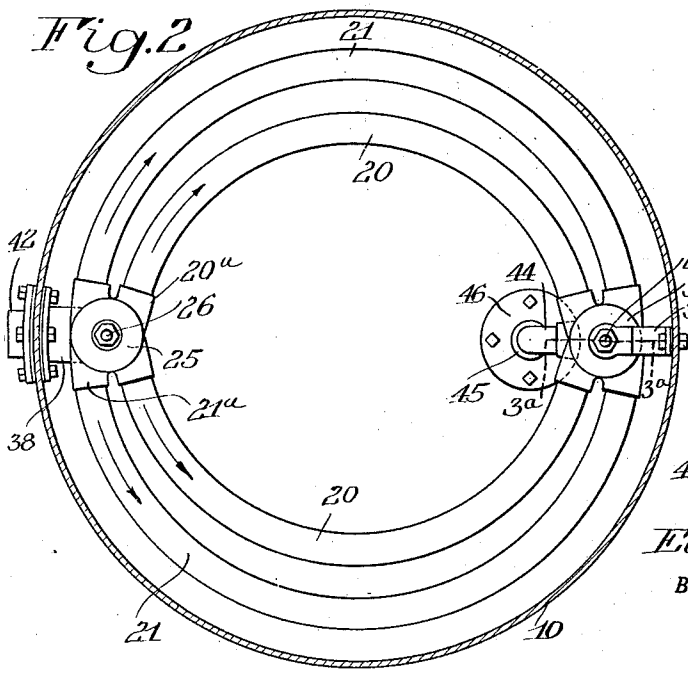


Fig. 2

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UNITED STATES PATENT OFFICE

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LIQUID-PROCESSING APPARATUS

Application filed January 27, 1926. Serial No. 84,048.

The present invention relates to liquid processing apparatus and has for its object to provide improvements in apparatus, such, for example, as employed in the processing of food and other substances by heating or cooling treatment, of this class and particularly in the conducting means or coils for the heating or cooling medium for the processing operations employed in the processing of food products and other substances.

A further object of the invention is to provide in combination with a liquid holding tank or container, an improved heating or cooling means by which the liquid to be treated can be brought to the desired temperature in a relatively short time without overheating or injuring the same.

A further object of the invention is to provide an improved heating or cooling coil for use in liquid processing tanks, which is formed of a plurality of sections so designed that the size of the coil may be readily increased or decreased by adding or subtracting the desired number of sections and replacements may be made for repairs with but little inconvenience.

A further object is to provide a sectional coil adapted for installation in a closed tank through a relatively small opening in the wall thereof and affording, when assembled in the tank, a compact coil of any desired size without complicating the construction of the tank or jeopardizing the enameled lining thereof.

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:—

Figure 1 is a part sectional elevation of an apparatus embodying one form of the invention.

Figure 2 is a sectional plan through the tank showing the manner of positioning the heating or cooling coil therein.

Figure 3 is an enlarged sectional elevation through the coil on the line 3^a—3^a of Figure 2.

Figure 4 is a vertical sectional view taken through the top of the tank and showing the manner of inserting the coil sections through the relatively small opening therein; and

Figure 5 is a sectional plan taken on line 5^a—5^a of Figure 1.

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

In the manufacturing or processing of food products, as for example, the pasteurizing of milk, it is necessary to construct processing units of varying capacities having heating or cooling coils of an area proportional to the particular batch or quantity of liquid to be treated as required by different users of equipment of this kind. The area of the heating or cooling surface should be proportional to the quantity of liquid to be treated and therefore it is of great advantage to have a standard form of coil, the size of which can be increased or decreased as desired by adding or removing one or more sections as may be found necessary to satisfy the needs of the different users. This feature is one of the principal objects of the present invention and the form of construction employed is one designed particularly with this idea in view. It is of a simple nature, permitting the sections to be quickly removed or applied with the least interruption of use and the least expense and without requiring any alterations in the tank or container in which the coil is disposed and without injury to its enameled lining. It further permits of a relatively large heating or cooling surface without complicating the construction of the tank, which can be made large enough to accommodate a maximum quantity of liquid, but which may be employed for treating smaller quantities, if desired.

Referring to the drawings 10 represents a tank or container of any suitable form, which is adapted to be suitably supported preferably by the legs or standards 11 as shown in Figure 1. The tank is provided with a dome shaped top 12 terminating in a reduced or relatively small opening 13 surrounded by a flange 14 for the reception of a closure member not shown which may be constructed and secured in any suitable or desired manner.

The tank is provided with an enameled lining not shown to protect the food or other products to be treated therein, the lining being of any suitable or well-known material, preferably glass.

The coil, indicated generally at 15, is preferably placed near the bottom of the tank as shown in Figure 1 and comprises any desired number of superimposed sections, one of which is shown detached in Figure 4. The bottom section includes an inlet head 16 and an outlet head 17 connected preferably by two semi-circular tubes 18, corresponding in shape to the tubes of the detached section shown in Figure 4. The sections superimposed upon the bottom section are each similarly constructed, preferably with but one exception as will hereinafter appear. They each comprise oppositely positioned and similarly constructed heads 19 connected preferably by the inner and outer tubes or pipes 20 and 21 of semi-circular shape as shown in Figures 2 and 4. The heads 19 are of cast bronze or other suitable material, but may be in the form of pressings or stampings, if desired. They each embody laterally extending recessed portions 20^a and 21^a adapted to receive the ends of the tubes 20 and 21, which may be formed of copper or stainless steel, or any other suitable material and united with the heads preferably by welding. However, they may be connected with the heads in any suitable or desired manner other than by welding. Each of the heads is provided at its opposite sides with annular grooves and projections 22 and 23, respectively, the projections being adapted to form a close fit within the grooves of the next succeeding section and the groove at the opposite side of the head being adapted to receive the projection of the next succeeding head, whereby to form fluid tight joints between the heads. These joints or seats furthermore permit of a slight turning movement of one of the sections or heads upon another which, together with the curved or arcuate shape of the sections or pipe lengths accommodates the expansion and contraction of the latter. This eliminates excessive stresses and bending at the points of connection of the pipe lengths with the heads which is apt to be the weakest point in a tubing construction. This feature together with the fact that the pipe lengths are preferably welded to the heads affords a strong and durable arrangement. The head 16 of the bottom section is provided with an end closure member 24 and the head 19 of the top section, in registry therewith, is provided with a closure member 25, said closure members being connected by a rod or bolt 26 extending through the heads and adapted to clamp the sections together. The bottom head 17 is provided with an end closure 27, preferably integral therewith and having a boss 28 on the inner face thereof adapted to receive the threaded end of a bolt or rod 29 extending upwardly through the heads and through an end closure member 30 having an annular projection 31 adapted to fit snugly within the groove of the uppermost head, as shown in Figure 3. The closure member 30 is recessed to receive suitable packing material 32, over which is disposed a washer 23, beneath the nut 34 of the rod. It will be understood that the lengths of the rods 26 and 29 are such as to correspond to the height of the coil, as determined by the number of sections employed.

Any suitable means may be provided for supporting the coil within the tank, but we prefer to support it at one side by a connection 35, having one end connected with the rod 29 and clamped upon the nut 34 by another nut 36, the opposite end of the connection being secured to the tank by means of the bolts 37. The coil is supported at its opposite side through an extension 38 projecting outwardly from the inlet head 38^a to one of the coil sections as shown in Figure 1, said extension having a flange 39 secured upon the inner face of the tank by bolts 40, which are preferably extended through the tank wall to secure upon the outside thereof the flange 41 of a coupling 42 for a pipe not shown by which steam or a cooling medium may be supplied to the coil through the extension 38, in communication with the head 38^a of one of the coil sections. This section is located at a predetermined point above the bottom section and preferably adjacent the top of a coil of minimum height whereby additional sections may be added without disturbing the inlet connection.

The head 17 of the lower section is provided with a threaded extension 43 constituting an outlet for the steam or cooling medium and has connected therewith a discharge pipe comprising preferably the upper and lower sections 44 and 45, the latter being carried by a flanged member 46, resting upon and suitably secured to the bottom of the tank whereby a support is formed for the coil in addition to the support 35 at the top thereof. A discharge pipe 47 is suitably connected with the flanged member 46 as shown in Figure 1 whereby the heating or cooling medium is carried off after passing through the several sections of the coil.

If desired, an additional opening 48 may be provided in the side of the tank as shown in Figure 1 to facilitate installation of the coil and cleaning of the tank and through which the liquid to be treated may be supplied.

The completed coil is spaced from the tank and is entirely open at its center, thus permitting free and easy circulation of liquid within the tank under the influence of an agitator not shown which may be located

at any desired point therein, either above or below the coil or within the same.

An important feature of the invention is the provision of a relatively large coil for insertion in a closed tank through a relatively small opening. In moving the coil sections through the opening 13 they are simultaneously moved inwardly and transversely of the axis of the tank, the lower end being carried outwardly or to the right as viewed in Figure 4, by an advancing or turning movement of the section until it is moved entirely below the opening 13 when it is turned and lowered to the desired horizontal position.

Another important feature is the construction of the coil sections so that each embodies separate tubes whereby relatively large heating surfaces are afforded to quickly and effectually convey heat to the liquid with great efficiency. By introducing steam or a cooling medium into the intake heads, and dividing and passing it through the two tubes of each section to the opposite heads, a highly efficient arrangement is afforded. In the manufacture of a number of food products time is an important factor and by providing a large surface proportionate to the particular batch to be heated or cooled, a more satisfactory product is insured, the construction of the present coil being such as to permit the desired variation in its heating or cooling area to take care of the needs of the different manufacturers. It will be noted that all of the pipe sections communicate directly with the common supply and discharge passages so that the heat supply is transmitted quickly and uniformly throughout the apparatus, so that there is no tendency to excessive heating or boiling at any one point.

A further advantage in the present construction is the provision of a coil, which can be added to or reduced in size with but little inconvenience or expense and which will afford the same relative efficiency as afforded by the original coil. In making the change it is necessary to use longer or shorter bolts for connecting the sections as the size of the coil may require. Thus a relatively small or large heating or cooling surface may be provided in a given size tank without complicating or changing its construction, which is particularly important since the enameled lining of the tank is not jeopardized by such changes. Furthermore this form of tank lends itself well to enameling, since its inner walls are substantially free from parts interfering with the application of the enamel coating.

We claim as our invention:—

1. In a heat exchange apparatus, a plurality of curved pipe sections having their ends provided with lateral openings and with seats about said openings, said ends being superposed upon one another with said seats in contact to form inlet and outlet headers at the opposite ends of said sections, external inlet and outlet connections for said headers, closure means for the outer openings of the outer sections, and tie rods engaging said closure means to detachably clamp said sections together, certain of said sections extending in laterally spaced relation to other sections.

2. A liquid processing apparatus comprising a liquid container, a series of elongated pipe sections in said container having openings through the ends thereof, means for detachably securing said sections together with said openings in communication with one another to form a header, and an external connection communicating with said header and extending through a wall of said container.

3. A liquid processing apparatus comprising a liquid container, a series of horizontal curved pipe lengths in the lower portion of said container and having openings through the ends thereof, certain of said pipe lengths being curved in opposite directions from certain other pipe lengths, means for detachably securing said pipe lengths together with said openings in communication with one another to form headers at opposite ends of said pipe lengths, said pipe lengths being connected in multiple between said headers, and supply and discharge connections communicating with said headers, respectively.

4. A liquid processing apparatus comprising a liquid container, a series of horizontal curved pipe lengths in the lower portion of said container and having openings through the ends thereof, certain of said pipe lengths being curved in opposite directions from certain other pipe lengths, seats formed about said openings, means comprising a tie rod passed through said openings for detachably securing said pipe length seats together with said openings in communication with one another to form headers at opposite ends of said pipe lengths, and supply and discharge connections communicating with said headers respectively, and extended through the walls of said container.

5. In a heat exchange apparatus, a plurality of curved pipe sections having ends provided with lateral openings and with seats about said openings, each of said pipe sections having a length substantially greater than its maximum dimension in a transverse direction, so that each of said sections may be passed individually through an opening whose diameter is substantially less than the length of said section, said plurality of pipe sections being assembled with their ends superposed upon one another and with said seats in contact, certain of said sections extending in opposite directions and in laterally spaced relation to other sections, each of the intermediate sections communicating at each end with the sections both above and below it, and the top and bottom sections communicat-

ing at each end with the adjacent sections below and above them respectively.

6. In a heat exchange apparatus, a plurality of sets of curved pipe sections, each set comprising a plurality of curved pipes joined together at each end in a head formed with lateral openings and with seats about said openings, each of said pipe sets having a length substantially greater than its maximum dimension in a transverse direction, so that each of said sets may be passed individually through an opening whose diameter is substantially less than the length of said set, said plurality of sets being assembled with the heads at each end of one set superposed upon the heads of another set and with the seats in contact, each of the plurality of pipes forming certain sets extending in the opposite direction from and being laterally spaced from each of the pipes in certain other sets the head at each end of each intermediate set opening into the heads of the sets both above and below it, the heads of the top and bottom sets opening into the heads of the adjacent sets below and above them, respectively, and an inlet opening in the head at one end of one of the intermediate sets.

7. A unit section for a heat exchange apparatus, said section comprising a pipe having its axis curved substantially in an arc, said pipe opening at each end into a chamber having a lateral opening on each of two opposite sides thereof, and a seat surrounding each of said lateral openings, so that one seat of one chamber may be brought into cooperation with a seat of another similar chamber on another unit section, the total length of said unit section being substantially greater then its maximum dimension in a transverse direction, so that said section may be passed through an opening whose diameter is substantially less than the length of said section.

8. A liquid processing apparatus comprising a liquid container substantially circular in cross section, an opening in said container having a maximum dimension less than half the diameter of said liquid container, and a substantially circular built-up coil within said container and of a diameter nearly equal to the diameter of said liquid container, said built-up coil including a plurality of curved pipe sections having ends provided with lateral openings and with seats about said openings, each of said pipe sections having a length substantially greater than the diameter of said opening in the container, and having a maximum dimension in a transverse direction less than the diameter of said opening in the container, so that each of said sections may be passed individually through said opening in the container, said plurality of pipe sections being assembled with their ends superposed upon one another and with said seats in contact to form headers, certain sections extending from their headers in opposite directions from certain other sections to form said built-up coil.

9. A liquid processing apparatus comprising a liquid container having an opening of relatively small area compared to the cross sectional area of the container, and a built-up sectional coil within said container, said coil comprising a plurality of elongated curved pipe sections having lateral openings at the ends thereof, the sections being detachably secured together with the openings in communication with each other to provide a coil whose height may be readily increased or decreased in accordance with variations in the intended liquid level of the container, certain of said curved pipe sections extending in one direction and other sections extending in an opposite direction to form a coil covering an area substantially larger than the area of said opening, the individual sections of said coil when disassembled being passable freely through said opening into or out of the container.

10. A liquid processing apparatus comprising a liquid container having an opening of relatively small area compared to the cross sectional area of the container, and a built-up sectional coil within said container, said coil comprising a plurality of elongated curved pipe sections having lateral openings at the ends thereof, the sections being detachably secured together with the openings in communication with each other to provide a coil whose height may be readily increased or decreased in accordance with variations in the intended liquid level of the container, the individual sections of said coil when disassembled being passable freely through said opening into or out of the container.

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