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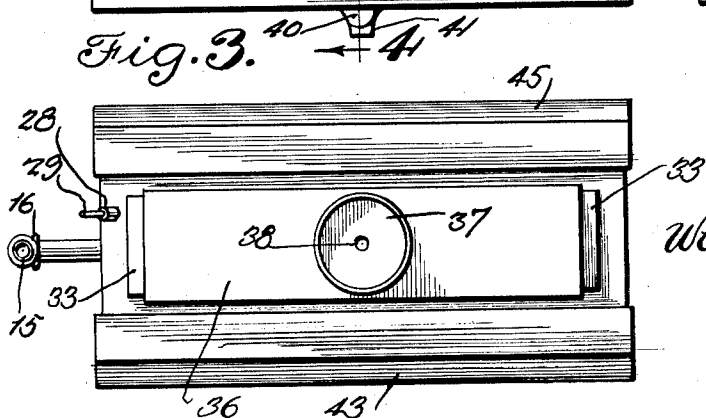
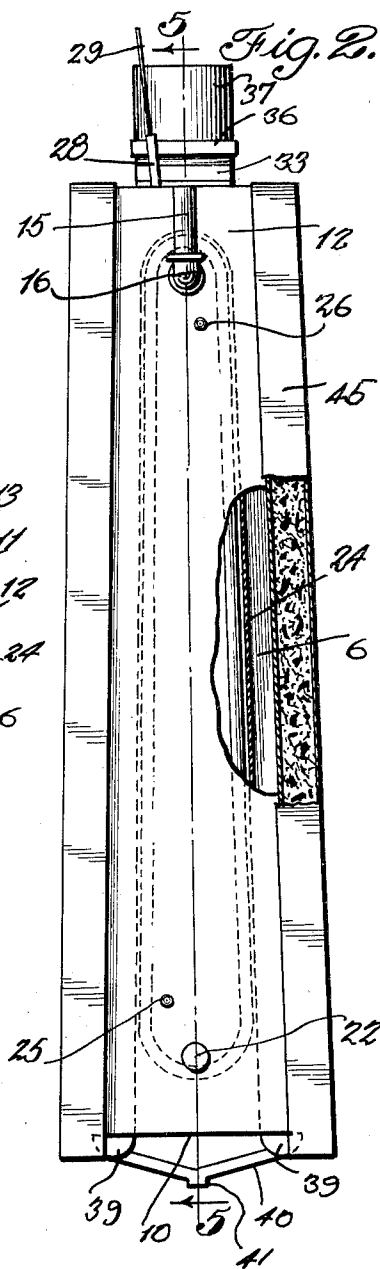
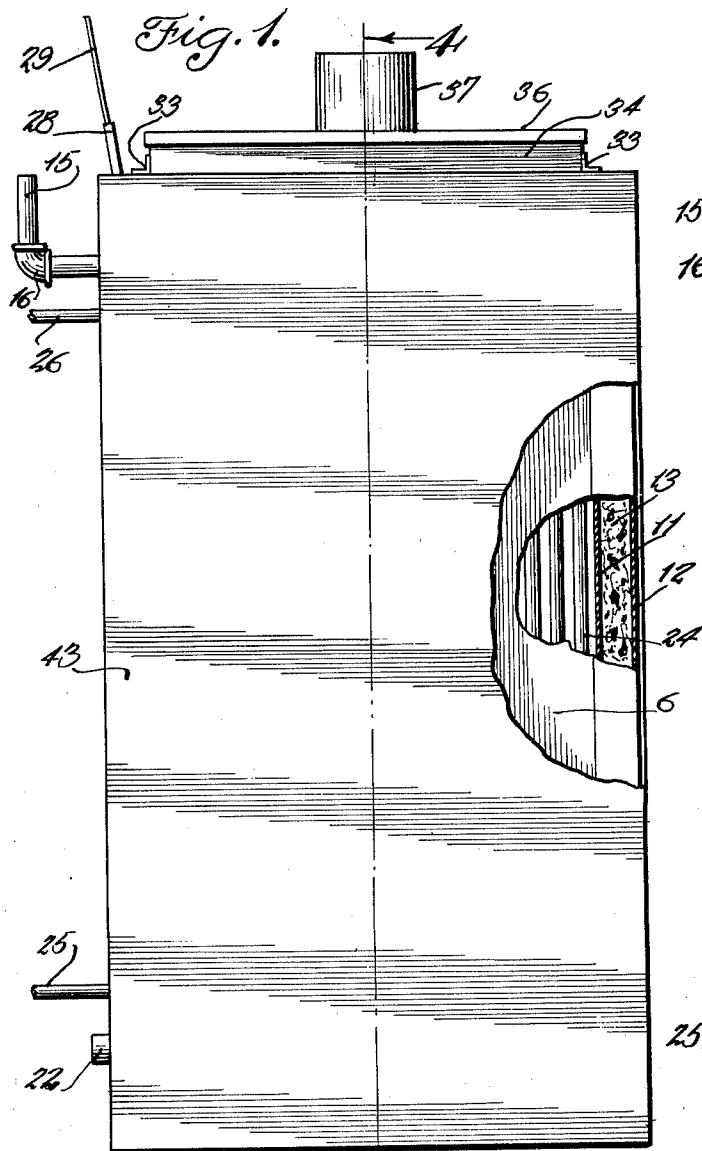
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1,937,804

HEAT EXCHANGER

Filed Nov. 16, 1932

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

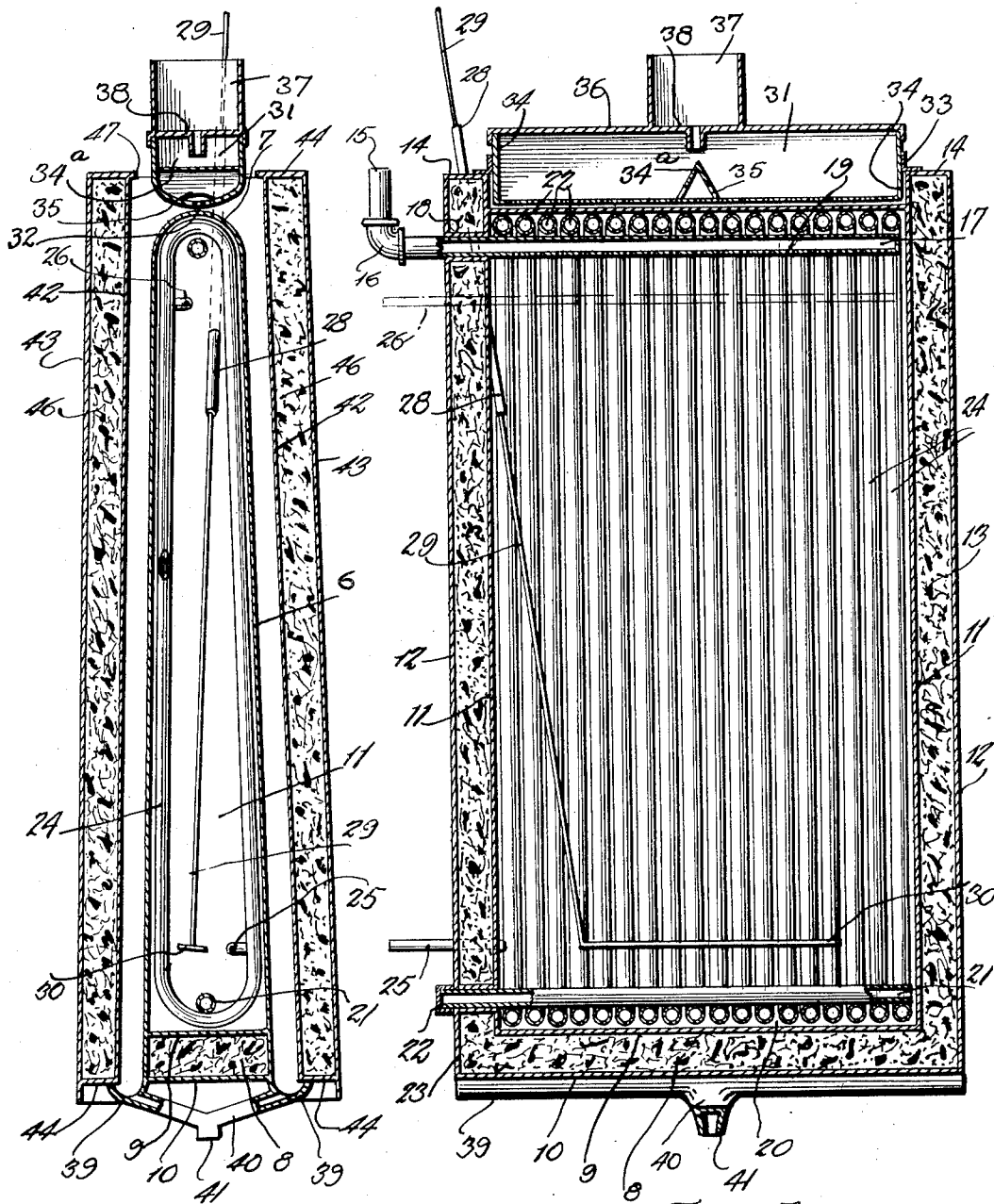


Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE

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HEAT EXCHANGER

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Application November 16, 1932

Serial No. 642,948

7 Claims. (Cl. 257—186)

This invention relates to heat exchangers of the trickler type and is particularly adapted for cooling liquid such as milk and cream.

The primary object of this invention is to provide an apparatus of the above mentioned character wherein the milk is fed to a trough positioned above a casing so that the liquid or milk may trickle downwardly over the casing to be collected at the bottom thereof.

A further object of this invention is to provide a liquid cooling apparatus of the above mentioned character in which the surface over which the milk is trickled is cooled by refrigerating coils immersed in a brine solution whereby the heat of the milk will be dissipated in a much more rapid manner than has heretofore been the practice.

A still further object of this invention is to provide a liquid cooling apparatus in which the milk trickles downwardly in a completely enclosed casing thereby preventing dust and other foreign matter from mingling with the liquid and causing impurities therein.

A still further object of this invention is to provide a liquid cooler of the above mentioned character having removable front and rear walls whereby the cooling surface may be exposed for the purpose of cleaning.

A still further object of this invention is to provide a liquid cooling apparatus in which a refrigerant is employed for cooling a brine solution and means for agitating the brine solution at intervals to prevent the saline from settling in the bottom of the casing.

A still further object of this invention is to provide a liquid cooling apparatus having heat insulating walls to prevent the effect of external atmospheric temperatures.

Other objects and advantages of the invention will become apparent during the course of the following description forming a part of this specification and in which,

Figure 1 is a front elevational view of the heat exchanger showing a portion thereof broken away to illustrate the manner in which the refrigerating coils are installed within the trickler casing;

Figure 2 is a side elevational view of the liquid cooler showing a portion thereof broken away to expose the arrangement of the refrigerating coils relative to the trickler casing and the space between the removable front and back walls;

Figure 3 is a front elevational view of the invention showing the distributing trough remov-

ably positioned on the upper portion of the trickler casing;

Figure 4 is a vertical cross-sectional view taken on line 4—4 of Figure 1 looking in the direction of the arrows, illustrating in detail the construction and arrangement of the liquid cooling apparatus embodying this invention; and

Figure 5 is a vertical longitudinal sectional view taken on line 5—5 of Figure 2 looking in the direction of the arrows further illustrating the manner and arrangement of the associated parts of the liquid cooler.

In the drawings, wherein for the purpose of illustrating the invention and wherein like reference characters will be employed to designate like parts throughout the same, the reference character 6 will generally be employed to designate a brine receptacle, the outer surface of which is inclined downwardly and outwardly for accommodating the flow of the liquid to be cooled.

The receptacle 6 consists of a piece of sheet metal bent upon itself as at 7 so that the lower end may be connected by a spacing portion 8 including spaced walls 9 and 10, between which may be interposed a heat insulating material such as cork or the like.

The end walls of the receptacle 6 include metal plates 11 which may be welded to the lateral edges of the receptacle 6 formed by the bent sheet metal plates. It will be noted that the end walls 11 extend beyond the plane of the receptacle 6 and spaced from the end walls 11 are similarly shaped plates 12 between which is interposed an insulating material 13. The end walls are closed at the top by means of angle portions 14 which may be fastened in place by welding or riveting, while the bottom portion of the end wall plates 11 and 12 are connected by the upper and lower sections of the spacing member 8 designated by the reference characters 9 and 10 respectively.

Heat insulating material may also be interposed between the spacing plates 9 and 10 as clearly shown in Figures 4 and 5.

It is to be understood that the lower portions of the U-shaped bent metal plate 6 may be welded or otherwise secured to the bottom spacing members 9 and 10 to produce a waterproof joint and form a receptacle capable of holding a brine solution which may be fed to the container by means of an inlet pipe 15 having an elbow connection 16 with a horizontal pipe 17 extending into the receptacle 6 through the end wall thereof in an opening 18. The pipe 17 is

provided with spaced perforations 19 for allowing the passage of the brine into the interior of the receptacle 6.

Disposed in the lower portion of the receptacle 6 is an outlet pipe 20 having an open end 21 adapted to drain the brine from the receptacle 6 when so desired by removing the screw threaded cap 22 secured to the outer end of the pipe 20 which also extends through a bushing 23 formed in the end walls 11 and 12.

Mounted within the trickler casing 6 is a refrigerating coil 24, the convolutions of which include straight portions terminating in upper and lower bent portions which pass over the brine inlet pipe 17 and the drain pipe 20 for centering the coil relative to the casing 6.

It will be noted that the refrigerating coil 24 is wound horizontally and is provided with an inlet pipe 25 and an outlet pipe 26. The inlet pipe 25 passes through the end walls 11 and 12 of the container 6 in the lower portion thereof so that the refrigerating medium will have a tendency to cool the lower portion of the refrigerating coil to more evenly distribute the cooling effect upon the brine solution in the brine receptacle 6. The outlet 26 is connected to the upper portion of the coil 24 at the end thereof and extends through the top portions of the end walls 11 and 12. The inlet and outlet pipes 25 and 26 of the refrigerating coil 24 may be connected to a conventional refrigerating machine.

Positioned angularly in one of the end walls 11 of the brine container 6 is a tube 28 having the inner end opening within the brine receptacle 6 and the outer end open to the atmosphere. The tube 28 is adapted to receive in a slidable manner a rod 29 having the lower end thereof provided with an angle portion 30 which may be flattened as shown in Figure 4 to form an agitating means within the brine receptacle 6 and disposed between the convolutions of the cooling coil 24.

Supported on the upper portion 14 of the end walls 11 and 12 is a liquid trough 31 which is box-shaped and is provided with a series of aligned apertures 32 in the bottom thereof immediately above the curved portion 7 of the brine receptacle 6. The trough 31 is provided with angle irons 33 which may be secured to the end wall 34 by welding or the like so that the downward movement of the trough 31 between the end walls 11 and 12 will be limited and the perforated portion 32 of the trough will be spaced from the curved portion 7 of the brine receptacle 6. Mounted within the trough 31 is a central division plate 34a having openings 35 for allowing the even distribution of milk or liquid to the apertures 32. The trough 31 is provided with a cover 36 having a marginal depending flange adapted to rest over the edge walls of the trough and also formed on the cover 36 is a chamber 37 having outlets 38 disposed directly over the division plate 34a whereby liquid or milk in the chamber 37 may pass downwardly into the trough 31 and flow toward the opposite ends thereof gradually passing through the apertures 32 onto the curved portion 7 of the brine tank so that the liquid will trickle down the inclined walls where it is collected at the bottom by means of transverse troughs 39 which are detachably secured to the free ends of the bent sheet metal plate 7 or which may be welded in place as shown in Fig. 4. The troughs 39 are connected by a Y-pipe 40 having an outlet 41

leading to a receptacle provided to collect the cooled liquid.

The front and back of the receptacle 6 are covered by removable walls consisting of spaced metallic plates 42 and 43, the edges of which are connected by horizontal and end walls 44 and 45 respectively. The space between the metallic plates 42 and 43 may be filled with a heat insulating material 46 consisting of a cork composition or asbestos. The horizontal end 44 on the lowermost portion of the removable front and back walls may rest upon the lip of the liquid receiving trough 39 and as is clearly shown in Figure 4 the upper horizontal end 44 may be provided with extensions 47 adapted to rest upon the lateral connecting strip 14 of the end walls 11 and 12. The front and back removable walls are arranged so that the same may be easily displaced for the purpose of cleaning the outer surface of the brine tank 6 over which the liquid is trickled and which becomes coated with a fatty substance after a period of use.

For a consideration of the operation of the invention, it will be assumed that the chamber 37 is being constantly supplied with a liquid to be cooled, which liquid may feed to the trough 31 through the outlet 38. The trough 31 distributes the liquid to be cooled over the brine receptacle 6 at the bent portion 7 thereof whereby milk will trickle downwardly over the outer surface of the receptacle 6 and will be collected in the lower troughs 39 which are connected by means of a Y-pipe 40 to a common outlet 41. The receptacle 6 is cooled by being fed with a brine solution through the inlet pipe 15 which is lowered in temperature by means of refrigerating coils 24 containing a refrigerant under pressure such as carbon dioxide gas or other refrigerant used in present day refrigerating machines. The refrigerating coils 24 are fed by means of the pipes 25 and 26 which may be connected to the compressor of a conventional refrigerating machine.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred embodiment of the same and that various changes in the shape, size and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the sub-joined claims.

I claim:—

1. A heat exchanger of the character described comprising a vertical brine receptacle having downwardly inclined walls, a cooling coil mounted in the brine receptacle, means for causing a liquid to flow over the outer surface of the brine receptacle, means for collecting the liquid after it has flowed over the entire surface of the brine receptacle and removable protecting walls for confining the area over which the liquid contacts.

2. A heat exchanger of the character described comprising a vertical brine receptacle having downwardly and outwardly inclined spaced walls, a brine inlet pipe associated with the upper portion of the brine receptacle, a cooling coil mounted within the brine receptacle, a liquid feed trough mounted above the brine receptacle adapted to supply the outer inclined surface of the brine receptacle with a liquid to be cooled and an agitator reciprocally mounted in the brine receptacle for agitating the brine therein.

3. A heat exchanger of the character described comprising a receptacle adapted to con-

tain a cooling liquid, said receptacle having spaced downward and outwardly inclined walls, a refrigerating coil mounted within the receptacle, means for feeding a liquid to be cooled to the upper portion of the receptacle, means for collecting the liquid after it has been cooled and removable walls confining the outwardly and downwardly inclined walls of the liquid receptacle.

4. A heat exchanger of the character described comprising a receptacle adapted to contain a cooling liquid, a refrigerating coil mounted within the receptacle, a trough mounted above the receptacle for feeding a liquid to be treated over the top of said receptacle, and removable covers for confining the receptacle over which the liquid flows.

5. A heat exchanger comprising a receptacle having a curved top connecting downwardly and outwardly inclined front and rear walls, end walls extending beyond the front and rear walls, a bottom wall connecting the front, rear and end walls, a cooling coil mounted within the receptacle, a trough mounted above the curved top wall for feeding liquid to be treated to the inclined front and rear walls, a trough mounted beneath the front and rear walls, for collecting the liquid after it has been treated, and removable heat insulated walls, positioned over the front and rear walls of the receptacle in spaced relation, said removable walls being supported

by the end and bottom walls of the receptacle.

6. A heat exchanger of the character described comprising a refrigerating coil, a casing adapted to contain a heat transferring liquid surrounding the refrigerating coil, said casing having inclined front and rear walls connected at the top by a curved wall, a liquid feed trough mounted above the curved top wall of the casing, and removable covers for the front and rear walls of the casing.

7. A heat exchanger of the character described comprising a refrigerating coil adapted to be connected to the refrigerating unit of a conventional refrigerating machine, a casing surrounding the refrigerating coil having downwardly and outwardly inclined front and rear walls connected at the bottom by a bottom wall and at the top by a curved wall, end walls projecting beyond the front, rear and top walls, a liquid feed trough mounted above the curved top wall for feeding a liquid to be treated, troughs mounted below the front and rear walls for collecting the liquid after treatment, means associated with the end and bottom walls for excluding heat and heat insulating walls removably positioned in spaced relation from the front and rear walls, said removable heat insulating walls being supported by the end walls and bottom wall of the heat transferring liquid receptacle.

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