J. ALLAN.

LIQUID COOLER.

APPLICATION FILED JULY 26, 1909.

956,788.

Patented May 3, 1910.

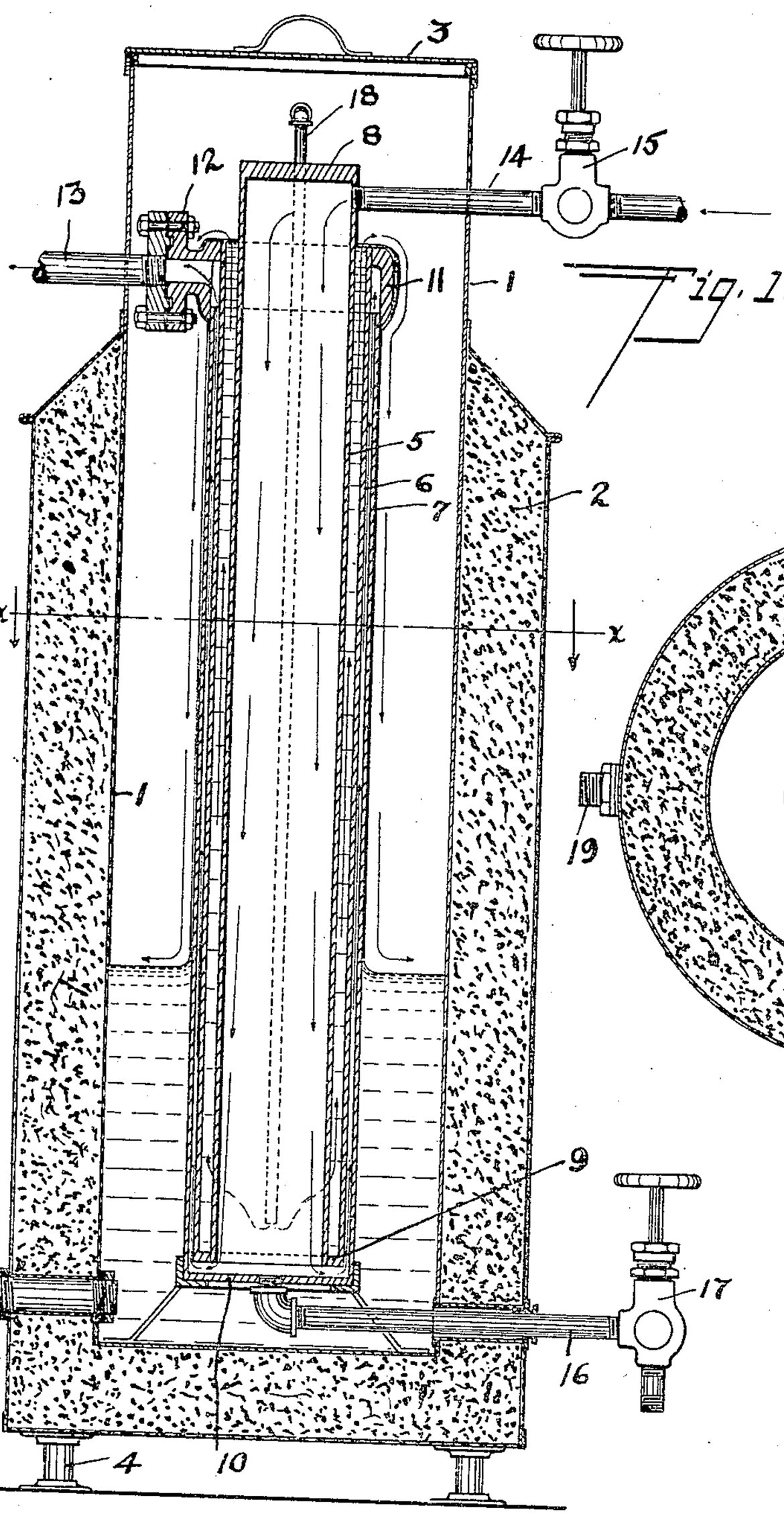

Fig. 1.

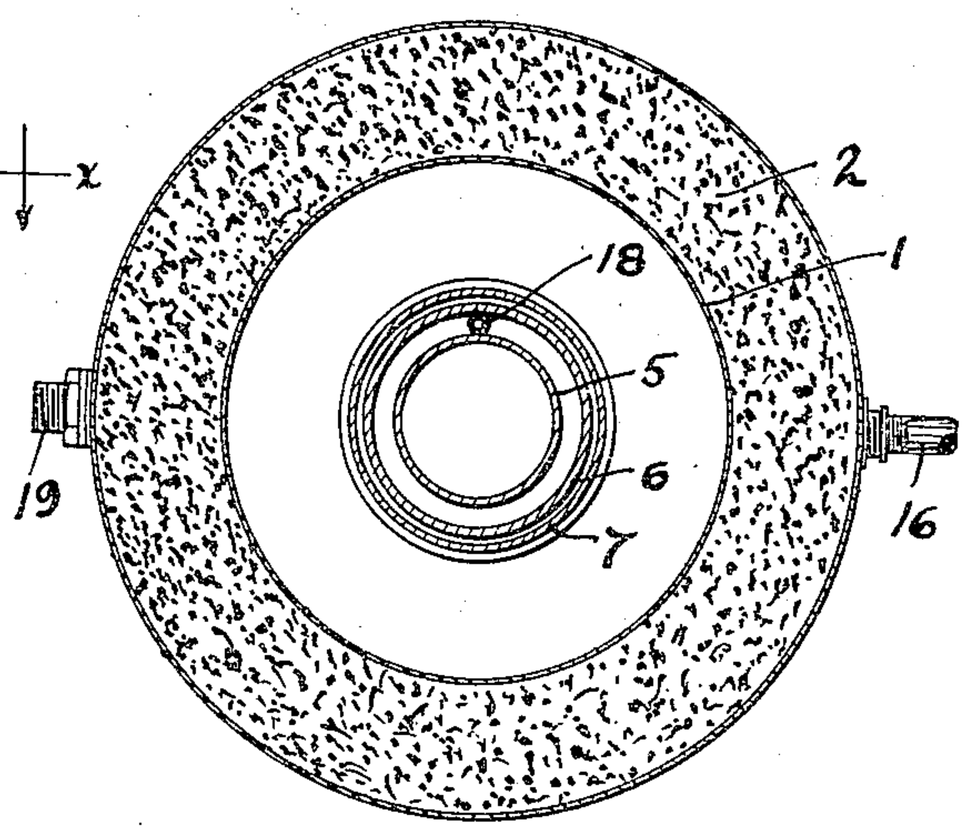

Fig. 2.

Witnesses:

Roy G. Kratz

E. A. Kratz

James Allan, Inventor.

By David O. Barnell,

Attorney.

UNITED STATES PATENT OFFICE.

JAMES ALLAN, OF OMAHA, NEBRASKA, ASSIGNOR TO LARSEN-BAKER ICE MACHINE CO., A CORPORATION OF NEBRASKA.

LIQUID-COOLER.

956,788. Specification of Letters Patent. Patented May 3, 1910.

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To all whom it may concern:

Be it known that I, JAMES ALLAN, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Liquid-Coolers, of which the following is a specification.

My invention relates to liquid coolers of the class in which liquid is flowed in a thin sheet or stream over a series of pipes through which is passed ammonia or other refrigerant. In the usual cooler of this type there is employed a flat coil or series of pipes connected by return bends and arranged above each other, and over which the liquid to be cooled is flowed by discharging the same from a perforated supply pipe onto the upper of the refrigerating pipes, flowing around said pipe and falling onto the next, and so on throughout the series, being finally caught in a tank arranged below the coil.

It is the object of my invention to provide a device having a capacity equal to that of a coil cooler but of a more compact structure so as to occupy a minimum of floor space, and also having a minimum number of joints all of which are of such a nature that they may be welded and made absolutely permanent. By the reduced number of joints and the smaller amount of material employed it is also possible to construct the device more cheaply than the coil coolers.

A construction embodying my invention is shown in the accompanying drawings, in which—

Figure 1 is a vertical sectional view, and Fig. 2 is a transverse horizontal sectional view on the plane of the line *x*—*x* of Fig. 1.

In carrying out my invention I provide a vertical cylindrical tank 1, constructed of sheet metal, the lower part thereof being made with double walls between which is a packing 2 of heat insulating material, the top being provided with a removable cover 3, and the whole supported above the floor by legs 4. The cooling device proper is disposed within the tank and is made up principally of the concentrically arranged tubes or shells 5, 6 and 7, which are preferably ordinary commercial wrought iron pipe. The inner pipe 5 is of greatest length and has a cap 8 welded in the top thereof and thereby made integral therewith. The inner pipe is connected at the lower end thereof with the intermediate pipe 6 by means of a ring 9 which is welded between the ends of the pipes and made integral with both of the same. Where the facilities are not at hand for making the double weld, the ring may be welded to the intermediate pipe before assembling the parts, the inner side of the ring and the end of inner pipe threaded, and the same screwed together in the assembling of the parts. The outer pipe 7 has a bottom cap 10 welded therein, and the upper ends of the outer and intermediate pipes are connected by means of the ring 11 which has an internal annular recess or space formed therein and extending out at one side through a coupling flange 12 to which is connected the discharge pipe or suction-line 13 of the refrigerating circulatory system. The said upper ends of the outer and intermediate pipes are preferably welded to the annular cap 11 but may be screwed therein where the facilities for welding are not at hand. The supply pipe 14 or liquid-line of the refrigerating circulatory system is connected with the inner pipe 5 at one side thereof and just below the cap 8, the flow of the refrigerant through said pipe being controlled by a valve 15. To the bottom cap 10 of the outer pipe is connected the pipe 16, the passage through which is controlled by a valve 17, and the purpose of which is to draw off any impurities carried by the refrigerant which may collect at the bottom of the pipe 7.

The liquid supply pipe 18 is brought into the tank 1 near the top thereof and is extended down into the space between the inner pipe 5 and the intermediate pipe 6 to a point near the bottom of said space, as indicated by the dotted lines in Fig. 1. The liquid from said pipe flows upwardly through the space between the inner and intermediate pipes and, overflowing the annular cap 11, passes down over the outside of the outer pipe 7 in a thin sheet or film, being received in the lower part of the tank 1 from which it is drawn off through the pipe 19.

The direction of flow of both the refrigerant and the liquid to be cooled is indicated by arrows in the drawing. It will be obvious that by the arrangement disclosed a simple, compact, and comparatively inexpensive liquid cooler may be constructed, in which the liquid and the refrigerant are brought

into intimate relation throughout a relatively large area of the thin metal walls which separate them, and that both the liquid and the refrigerant are spread into thin sheets so that there is the greatest opportunity for the rapid and effective exchange of heat between them.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a liquid cooling device, three vertically disposed concentrically arranged pipes, caps arranged to close the upper end of the inner pipe and the lower end of the outer pipe, annular means arranged to connect the upper ends of the outer and intermediate pipes and the lower ends of the intermediate and inner pipes, means arranged to permit the flow of a refrigerant through the inner pipe and between the intermediate and outer pipes, and a liquid supply pipe arranged to discharge at the bottom of the space between the inner and intermediate pipes, so as to cause a flow of liquid upward through said space, overflowing the annular means connecting the outer and intermediate pipes and flowing down over the outside of the outer pipe.

2. In a liquid cooling device, three vertically disposed concentrically arranged pipes, caps arranged to close the upper end of the inner pipe and the lower end of the outer pipe, annular means arranged to connect the upper ends of the outer and intermediate pipes and the lower ends of the intermediate and inner pipes, means arranged to permit the flow of a refrigerant through the inner pipe and between the intermediate and outer pipes, a liquid supply pipe extending into and discharging at the bottom of the space between the inner and intermediate pipes, and a tank inclosing said pipes for the purpose described.

3. In a liquid cooling device, an insulated tank, a series of pipes arranged vertically within said tank, the said pipes being disposed concentrically with each other and connected to form and inclose an inner space, an intermediate space and an outer space, the outer space connecting with the inner space at the bottom thereof, refrigerant supply and discharge pipes connected with the inner and outer pipes respectively to permit a flow of refrigerant through the outer and inner spaces, and a liquid supply pipe extending into and discharging near the bottom of the intermediate space, the said intermediate space being open at the top so that the liquid may overflow and pass down over the outside of the outer pipe into the tank.

In testimony whereof I have hereunto subscribed my name in the presence of two witnesses.

JAMES ALLAN.

Witnesses:
ROY G. KRATZ,
D. O. BARNELL.