Jan. 27, 1953 L. LEFEVRE 2,626,791

TANK COOLING DEVICE AND AIR COOLING DEVICE

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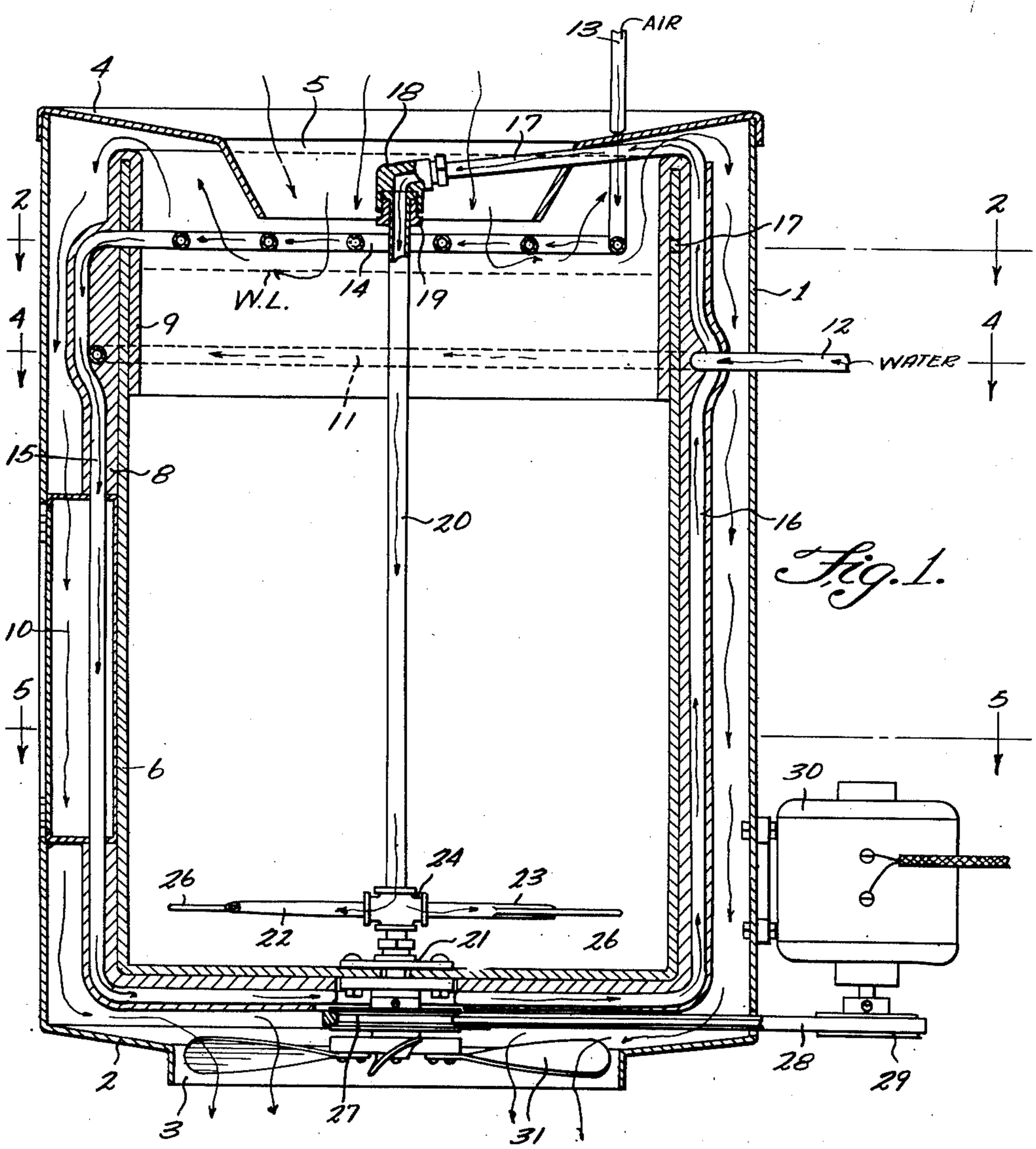

Fig. 1.

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Fig. 2.

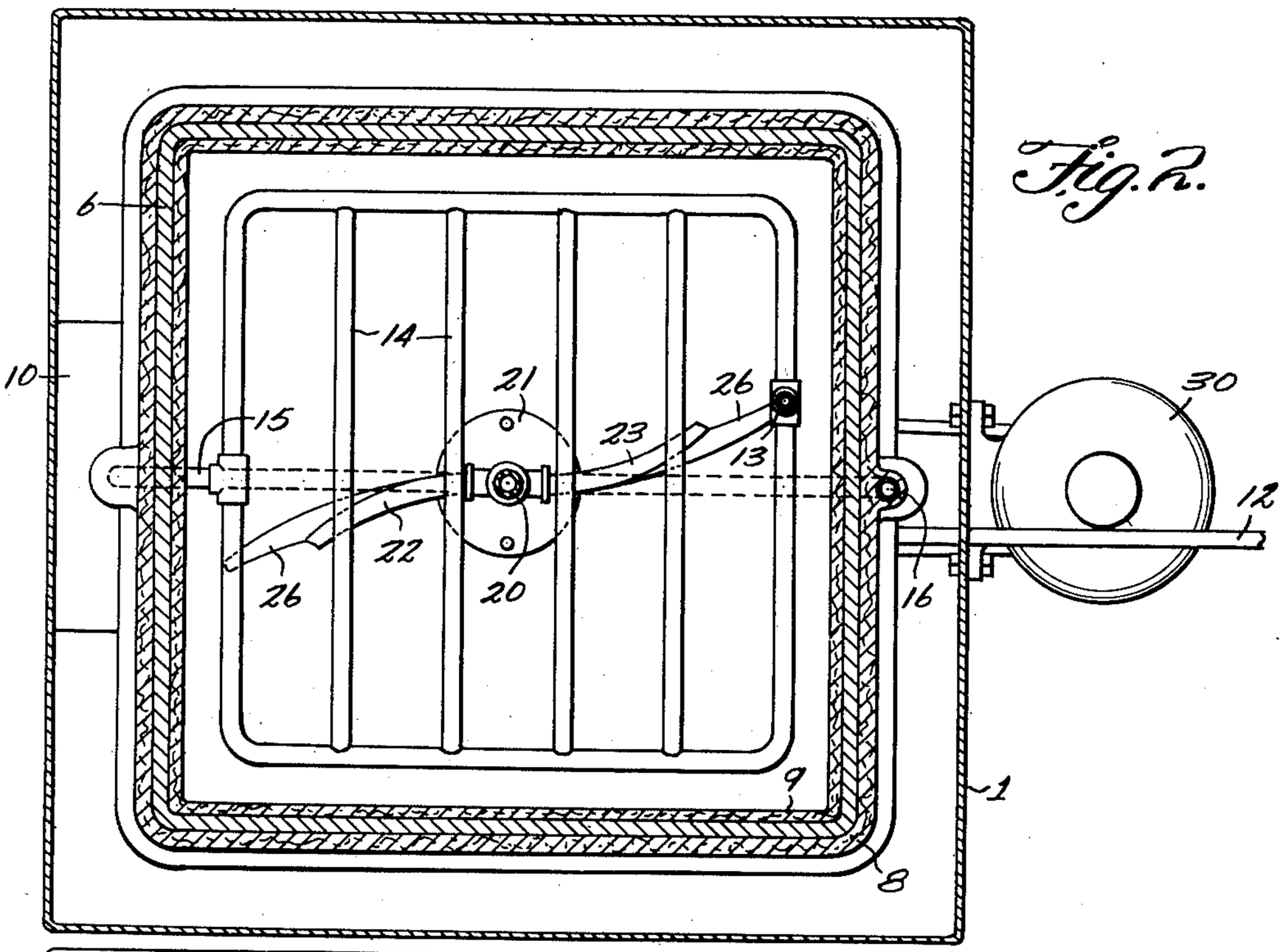

Fig. 3.

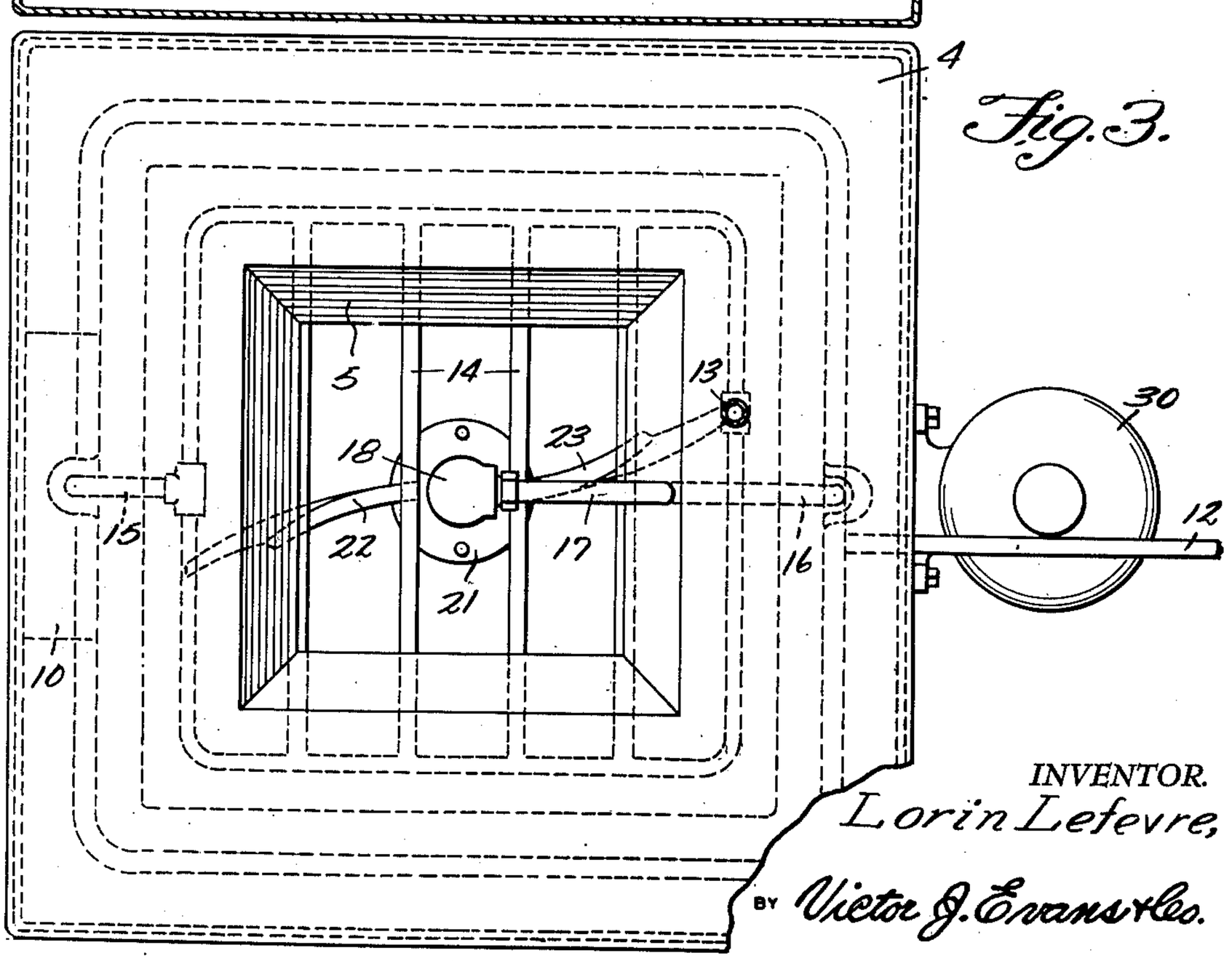

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Fig. 4.

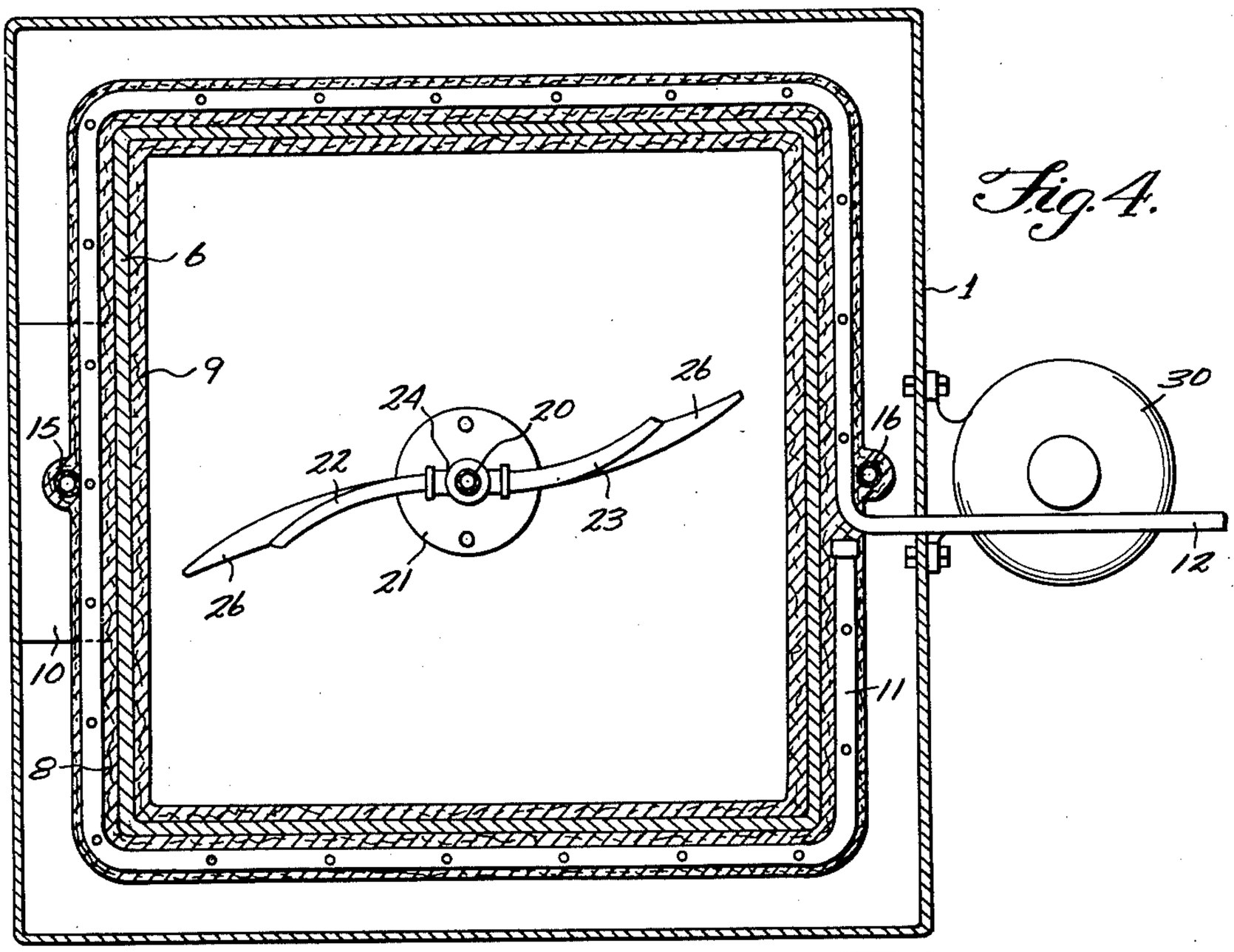

Fig. 5.

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Fig. 6.

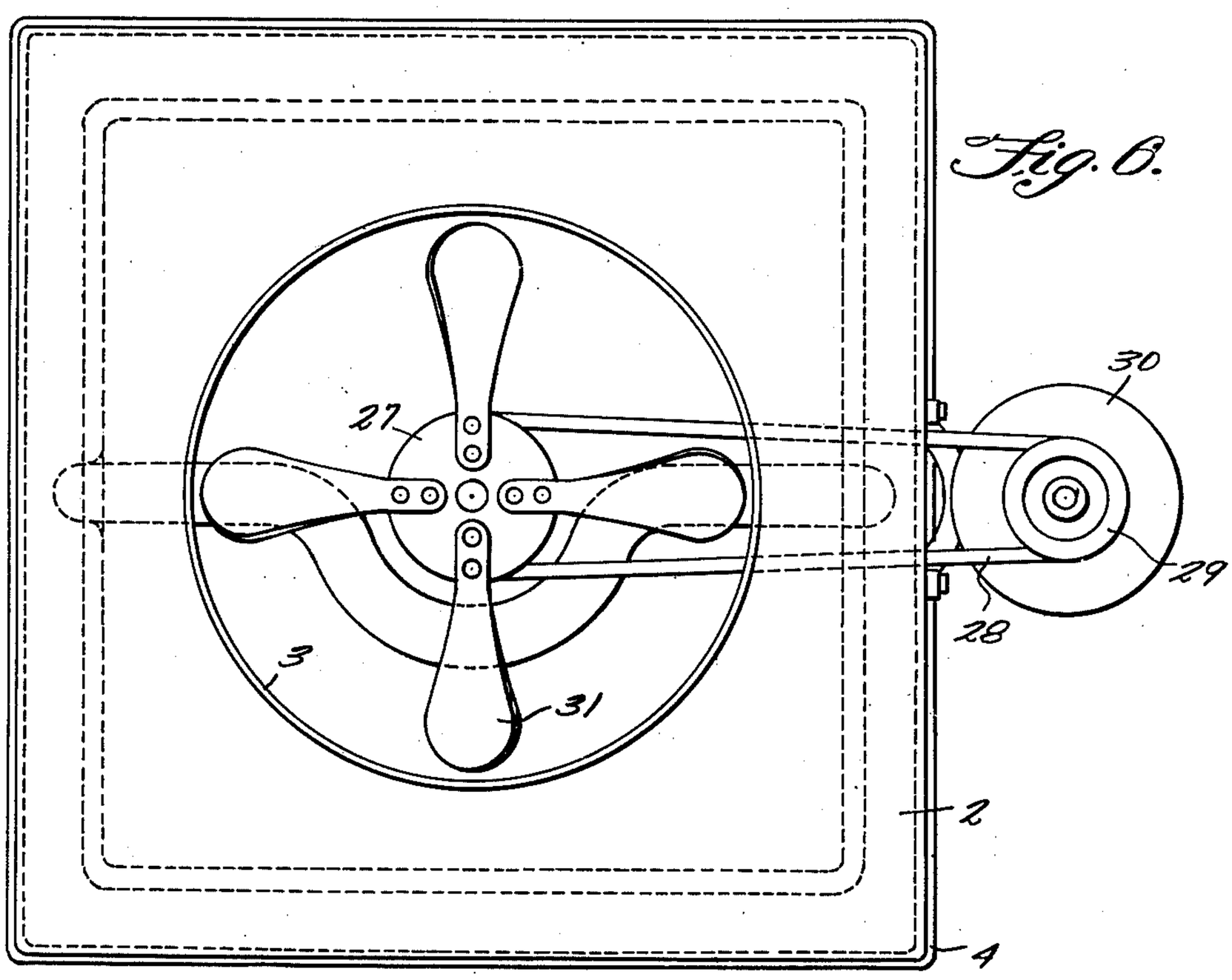


Fig. 10.

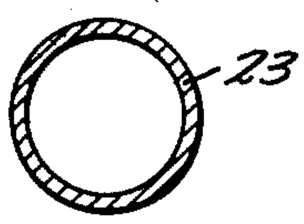


Fig. 9.

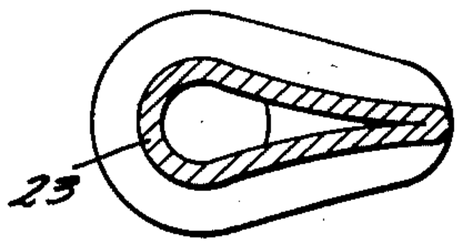
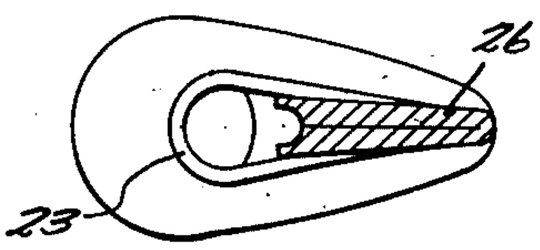


Fig. 8.



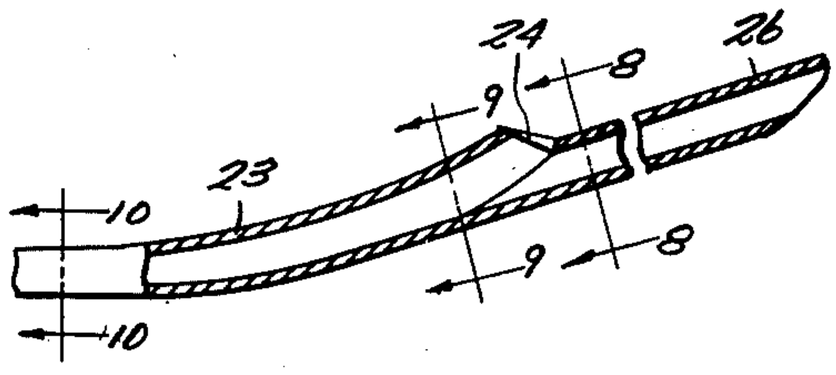


Fig. 7.

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Patented Jan. 27, 1953

2,626,791

UNITED STATES PATENT OFFICE

2,626,791

TANK COOLING DEVICE AND AIR COOLING DEVICE

Lorin Lefevre, Great Falls, Mont.

Application June 7, 1948, Serial No. 31,480

1 Claim. (Cl. 261—87)

1

My present invention relates generally to the broad class of air and liquid contact apparatus of the aerating and evaporating type employing a rotary air impeller utilizing a hollow shaft and submerged blast, and more specifically to an improved cooling tank and air cooler which, while adapted for various purposes and uses, is especially designed for creating and supplying a constant and uniform flow of filtered and chilled or refrigerated air currents.

The refrigeration set up by the appliance of my invention may be utilized not only for cooling of liquids contained within the cooling tank, which may be employed as a tank for transferring fish referred to in my prior Patent No. 2,187,746 of January 23, 1940, but the air currents discharged from the cooling tank of the appliance may also be utilized for various other purposes.

The appliance involving the water-cooling tank and air-cooler of my invention includes a minimum number of parts that may be manufactured with facility and low cost of production, and the parts may be assembled with convenience to constitute a simplified and durable structure that may be operated and maintained with comparatively low expense, and which is highly efficient in the performance of its required functions.

The invention consists in certain novel features of construction and combinations and arrangements of parts as will hereinafter be described and more particularly set forth in the appended claim.

In the accompanying drawings I have illustrated a complete example of a physical embodiment of my invention wherein the parts are combined and arranged in accord with one mode I have devised for the practical application of the principles of my invention. It will however be understood that changes and alterations are contemplated and may be made in these exemplifying drawings and mechanical structures, within the scope of my claim, without departing from the principles of my invention.

Figure 1 is a vertical sectional view of an appliance in which my invention is physically embodied.

Figure 2 is a horizontal sectional view at the top portion of the appliance, omitting the lid or cover; and

Figure 3 is a top plan of the appliance showing the funnel shaped lid with its air intake, and indicating interior elements by dotted lines.

Figure 4 is a horizontal sectional view just below the water level of the tank; and Figure 5

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is a horizontal sectional view of the appliance through the Dry-Ice chest or casing and showing the submerged rotary aerator.

Figure 6 is a bottom plan view of the appliance.

Figure 7 is an enlarged sectional view of one of the rotary tubular aerator impeller and agitating arms; and Figures 8, 9, and 10, are respectively transverse sectional views on lines 8—8, 9—9, and 10—10, in Fig. 7.

In carrying out my invention the appliance may be manufactured in various sizes and shapes, and of desirable materials, and in the drawings I have illustrated an appliance of rectangular shape including an exterior, open top jacket 1 having a dished bottom 2 that terminates in an annular or cylindrical flange 3 forming a discharge outlet for the air currents after they have been refrigerated or chilled.

In some instances the top of the jacket may be left open, but as here shown the jacket is equipped with a lid or cover 4 that is removable, or it may be hinged to the jacket to permit ready access to the interior of the appliance, and the lid or cover is fashioned with a four-fold flange or collar 5 forming an intake funnel that depends a desired distance into the top portion of the appliance. As indicated by the arrows in Fig. 1 currents of air are induced to flow through the funnel, with a down-draft through the jacket, and from the bottom of the jacket the air currents pass through the discharge outlet 3. In some instances the circulating movement of the air currents may be reversed, and they are conducted by an updraft through the jacket from the bottom of the jacket and out through the top of the jacket.

Within the jacket is mounted a water tank 6 of substantially less dimensions than the jacket to provide an evaporation chamber or air space within the jacket and around and below the tank, and as seen in Fig. 1 the upper open end of the tank projects upwardly and surrounds the intake funnel 5 to provide an air space above the water line W. L. in Fig. 1. Thus the air currents are drawn in through the funnel and distributed in contact with the surface of the water in the tank, and then the air flows upwardly over the top of the tank, and thence downwardly as described.

The tank may be supplied with the desired quantity of water in suitable manner, for aerating and cooling, and the supply may be replenished as required.

As indicated in Fig. 1 at 7, the four walls of the tank may be perforated, above the water level,

for use in the evaporative process carried out within the air chamber surrounding the tank. For the process of evaporation the exterior faces of the upright walls and the bottom of the tank are equipped with a casing 8 of suitable porous material, and the upper end 9 of this evaporator casing overhangs the rim of the tank and extends downwardly within the tank and is submerged below the water level as indicated. By capillary attraction, and through the ports 7, the whole area of the portions 9 and 8 of the evaporator casing are impregnated with moisture, and the constantly moistened surfaces by evaporation chill the air currents as they flow in contact with the evaporating surfaces.

As a supplemental or auxiliary air cooler, a Dry-Ice chest 10, of substantially rectangular shape may be interposed within the air-flow chamber in the path of air currents on their way to the bottom discharge outlet 3.

Supplemental moistening means may be utilized, if desirable, for the evaporating casing, as for instance a horizontally arranged and perforated water tube 11 may be imbedded within the walls of the evaporator casing, and supplied with water through an inlet pipe 12 that conveys the supply of water from a suitable source and is equipped with regulating and control valves.

The water, or liquid, within the tank is aerated by means of a circulating system, and air from a suitable source is introduced through an upper supply pipe 13 that is connected with a horizontally disposed, tubular grid or radiator 14 of rectangular shape that is located above the water level of the tank and beneath the intake funnel, and the grid or radiator is provided with an outlet downdraft air duct or tube 15 which passes through a wall of the evaporator casing, across beneath the bottom of the tank, and merges with a return pipe or air duct 16 that rises to the top of the tank and terminates in an approximately horizontal section 17 that is connected with a nozzle 18 located along the vertical axis of the tank.

The air flow through these tubes is indicated by arrows in Fig. 1, and a suitable aerating appliance, such as illustrated in my above mentioned patent, is utilized for circulating the air and blowing the air into the water of the tank.

In the installation of the aerating appliance, the nozzle or fixture 18 is equipped with a bearing bushing 19 in which the upper end of a tubular, rotary, impeller shaft 20 is journaled to revolve, and the lower end of the shaft is journaled in a bearing 21 attached on the interior of the tank bottom.

Near its lower end the tubular shaft is equipped with a pair or pairs of duplicate reversely curved and horizontally disposed, tubular air distributing arms or blades 22 and 23 mounted with their inner ends in a hollow coupling head 24 fixed on and communicating with the tubular shaft.

Each of these agitating and distributing arms is fashioned with an air-blast or outlet port, and the arms terminate in knife edges, as 26 that cut through the water and form elongated extensions of the outlets for the airstreams issuing from the distributing arms.

The shaft 20 below the bearing 21, extends through the bottom of the tank, and this extension is provided with a grooved sheave or pulley 27 around which a belt 28 passes to the drive pulley 29 of an electric motor 30 attached to one

side of the jacket. The aerating appliance is thus operated to circulate the air and aerate the water in the tank, and the tubular grid or radiator cools the incoming currents of air, the air flowing through the tubes 15 and 16 in the evaporator is also cooled in the process of evaporation, and this cooling effect is supplemented by the passage of the air tube 15 through the Dry-Ice chest 10.

The operating motor 30 also drives an exhaust fan 31 that is mounted on the lower end of the impeller shaft 20, and the fan is located within the discharge outlet 3 in the bottom of the jacket, to induce the downdraft flow of the treated air currents, and discharge the cooled or chilled air currents to the desired destination or place of use, for creating and maintaining a desired low temperature.

Various changes and alterations may be utilized, as for instance a closed top may be provided for the tank, in which event ports may be provided in the top for venting the tank in proportion to the aerating supply that is introduced to the liquid or water in the tank; and the illustrated arrangement of the driving means for the aerator and the exhaust fan may also be varied to suit different conditions.

The appliance may also be employed in connection with an air-conditioning system for a refrigerator, a building and its rooms, and other spaces, where it is desired for humidifying, purifying, and cooling the air supplied to such spaces.

The appliance is thus equipped to set up refrigeration through rapid evaporation and thereby effectively reduce the temperature of water or other liquids, and the circulating air below atmospheric temperature, and these desired degrees of temperature may uniformly and constantly be maintained.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

In a circulating air cooler for an aerating tank, having a base with side walls in which an aerator is positioned, a porous jacket extended over the outer surface of said tank, over the upper edge thereof and downwardly on the inner surface to a point below the water level of the tank, the improvement comprising an outer tank surrounding the first tank and spaced therefrom and having an opening in the lower end, a vertically disposed shaft journaled in the lower end of said first tank from the inner end of which the said aerator is carried, an exhaust fan positioned on the lower outer end of said shaft, and located in the opening in the lower end of the said outer tank, and means driving the shaft for rotating the said fan and aerator.

LORIN LEFEVRE.

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