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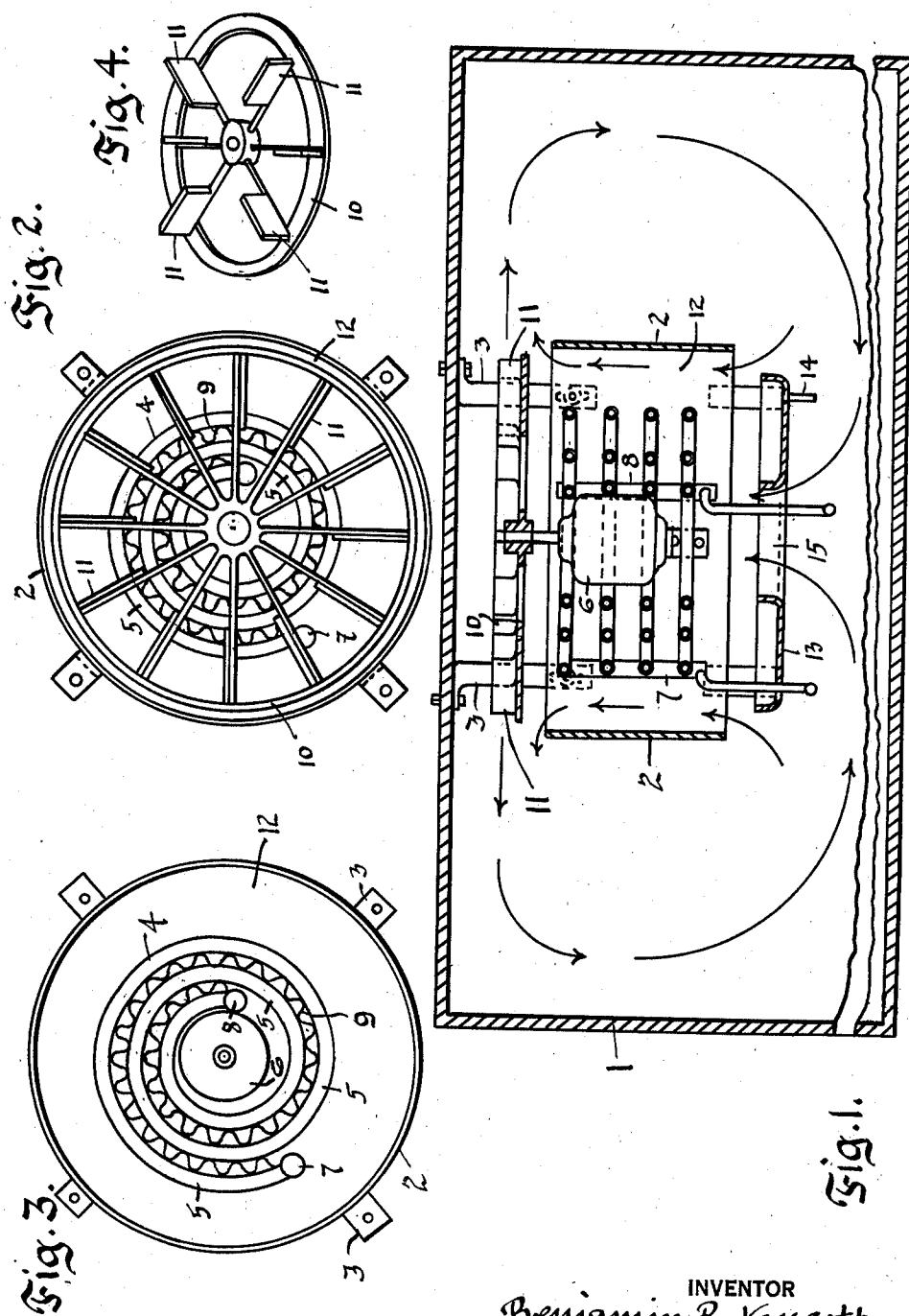
B. R. VANCOTT

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REFRIGERATION APPARATUS

Filed Sept. 30, 1936

2 Sheets-Sheet 1



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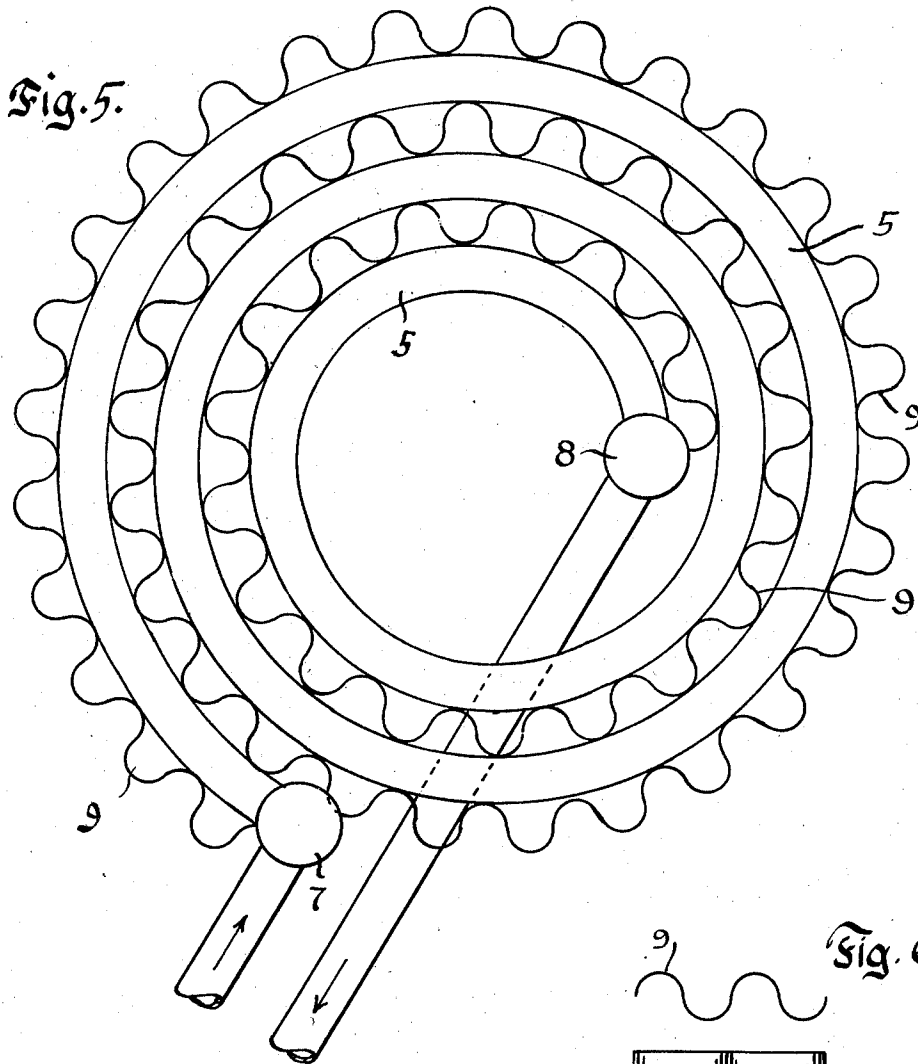
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UNITED STATES PATENT OFFICE

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REFRIGERATION APPARATUS

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2 Claims. (Cl. 62-102)

My invention relates to that class of apparatus in which electric refrigeration is applied to the cooling of a room or chamber, such as is commonly used for the storage of perishable goods or edibles. In this type of refrigeration the refrigeration machine consists of a compressor, compressing the refrigerant gas which passes into a condenser changing the gas to a liquid, thence through an expansion valve into an evaporator or chilling coil where it absorbs heat from the air surrounding the said chilling coil, becomes a gas and is piped back to the compressor thus completing the cycle.

In most of the apparatus for this purpose now in use the evaporator consists of pipe coils placed in a square box and an electric fan located at one side of the evaporator and drawing the warm air from the bottom of the chamber, either directly or by means of air ducts, and blowing the air through the evaporator in a horizontal stream and in one direction only. If the evaporator is located near the bottom of the chamber the chilled air must be forced through ducts to the upper part of the chamber, or if the evaporator itself is located near the top of the chamber the fan must have sufficient power to draw up the warm air through the ducts and to force the air stream clear across the chamber. In either way it will be seen that on account of these losses in efficiency, large coils, large fan and motor are required. This large fan creates an air pressure in the refrigerating chamber, resulting in the chilled air striking against the meat or other perishables in the chamber. This causes dehydration and discoloring of the contents.

The present type of refrigeration accumulates ice and frost on the coils and requires de-frosting at frequent intervals. An insulated section is also required for the accumulation of moisture and means for draining away the condensate.

The purpose of my invention is to provide a means for chilling the air in a refrigerating chamber without the use of ducts: One which will produce the same chilling effect with a smaller motor and fan, less chilling surface in the evaporator coils and a means for preventing the formation of frost or ice. A further purpose is to provide a means whereby the evaporator can be placed centrally near the top of the chamber, which is the natural location, the evaporator then being in a position to receive and assist the rising column of warm air, chilling and distributing the chilled air horizontally, letting it fall by gravity to the bottom of the chamber. This drawing of the warm air upwardly through the

evaporator and distributing the chilled air horizontally is accomplished by a special type of fan, vertically mounted with its electric motor located within the evaporator, as will be more fully hereinafter described.

The elimination of ice and frost is accomplished by placing a casing around the evaporator, said casing being open at the top and bottom and of a diameter sufficiently large as to leave an annular space between the inside of the casing and the outside of the evaporator. The suction of the fan and the suction created by the horizontally directed blast of air across the top of the evaporator and the annular space causes warm air to be drawn upwardly through the annular space and this envelope of warm air prevents the formation of frost or ice on the evaporator or other parts. The condensate which is released by the lowering temperature of the air passing around the evaporator does not form ice or frost but falls in the form of moisture into a pan which is readily drained. This action results in a relatively high humidity in the chamber. This is highly desirable if fresh perishables are to be kept in a normal condition.

I illustrate my device by means of the accompanying drawings, in which similar numerals refer to similar parts in the several views. Figure 1 is a vertical central section of a chamber showing the position of my device near the top of the chamber. Figure 2 is a plan view of the evaporator, fan and associated parts. Figure 3 is a plan view of the evaporator with the fan removed. Figure 4 is a detailed isometric view of the fan. Figure 5 is an enlarged plan view of the evaporator coils with the motor and fan omitted but showing the fins. Figure 6 is a top plan of a developed section of the fins. Figure 7 is a side elevation of a developed section of the fins.

1 is the chamber to be cooled. 2 is a cylindrical casing suspended from the inside of the upper portion of the said chamber by the adjustable brackets 3. Centrally located within and secured to the casing 2 is an evaporator 4. This evaporator consists of a plurality of coils 5, said coils being preferably spirally wound in a horizontal plane and located in parallel one above another and being so wound as to leave a space in the center sufficiently large to receive an electric fan motor, 6. The outer end of each coil is connected to a manifold 7 which is in turn connected to a refrigerating machine furnishing liquid refrigerant to the evaporator. The inner

end of each coil is connected to a manifold 8 which is also connected to the said refrigerating machine and for the purpose of returning gas vapor to the said machine. The refrigerating machine is not shown on the drawings as any of the usual types can be used. The coils 5 may be provided with fins to increase the heat absorption by providing additional surface exposed to the air being drawn through the evaporator. In the drawings I have shown a preferred method of increasing this absorption surface. It consists of a strip of metal 9 which has been fluted and which has a width suitable to reach vertically from the center of one coil to the center of the adjacent coil, or of sufficient width to reach vertically from the bottom of the lowest coil to the top of the highest coil. This strip 9 is wound between the spiral coils forming vertical passages for the air to pass upwardly through its convolutions, the heat absorbed being transferred to the coils 5, thus chilling the air and changing the refrigerant from a liquid to a gas. Centrally located within the coils and vertically mounted by suitable brackets attached to the casing 2 is an electric fan motor 6 having its shaft extended upwardly and having mounted thereon a fan 10. This fan differs from the usual type in that its blades 11 are turned up at right-angles to the plane of the fan. These blades extend only part way from the perimeter to the center. The purpose of this design is to provide a fan which will act as a suction fan in that portion which has no blades and to cause by the action of the blades a horizontal discharge of the air which the central portion has drawn into its field. The casing 2 is of larger diameter than the evaporator 4 and the annular space 12 between the evaporator 4 and the casing 2 is important as it is through this space that warm air is drawn upwardly around the outside of the coils 5 and preventing the formation of ice or frost. Also secured to the lower part of the casing 2 is a pan 13 which is adapted to receive any condensed moisture which may drip from the coils 5 and the fins 9. This moisture may be drained from the pan 13 by the tube 14. The center of the pan 13 has a flanged opening 15 to permit the passage of warm air upwardly through the evaporator 4.

The purpose of locating the electric fan motor 6 so that it is surrounded by coils 5 is not only to accommodate the position of the fan 10, but is so located that the heat from the motor will superheat the gas leaving the evaporator through the manifold 8.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a device of the class described, the combination of, an evaporator located in the upper portion of a refrigerating chamber, said evaporator consisting of a plurality of spirally wound coils horizontally disposed one above the other, and having fluted fins vertically disposed between said coils, inlet and outlet manifolds connecting said coils with a refrigerating machine, a vertically mounted electric motor surrounded by said coils, a fan above said coils adapted to be operated by said motor, said fan being adapted to draw warm air upwardly around the said coils and also adapted to discharge the chilled air horizontally in all directions across the said chamber, a single casing surrounding the said evaporator and spaced therefrom creating an annular space between the said casing and the evaporator through which warm air is drawn by the said fan for the purpose of preventing the formation of ice on the said casing, said prevention also being aided by the suction of the horizontally discharged chilled air drawing warm air upwardly around the outside of the said single casing.

2. In a device of the class described, the combination of, an evaporator located in the upper portion of a refrigerating chamber, said evaporator consisting of a plurality of spirally wound coils horizontally disposed one above the other, and having fins vertically disposed between the coils; inlet and outlet manifolds connecting said coils with a refrigerating machine, a vertically mounted electric motor surrounded by said coils, a fan adapted to be operated by said motor, said fan being adapted to draw warm air upwardly around the said coils and also adapted to discharge the chilled air horizontally in all directions across the said chamber for the purpose of cooling said chamber and at the same time maintaining a relatively high humidity by means of the condensed moisture in the upward warm air stream being partially re-entrained into the horizontally discharged cold air stream; and means for preventing the formation of ice, said means consisting of a single casing surrounding the said evaporator and spaced therefrom creating an annular space between the said casing and the evaporator through which warm air is drawn by the said fan, said prevention of ice formation also being aided by the suction of the horizontally discharged chilled air drawing warm air upwardly around the outside of the said casing.

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