May 31, 1966 L. R. VAN STEENBURGH, JR 3,253,424

APPARATUS FOR MAKING ICE MEMBERS

Filed Feb. 18, 1965 2 Sheets-Sheet 1

Fig. 1

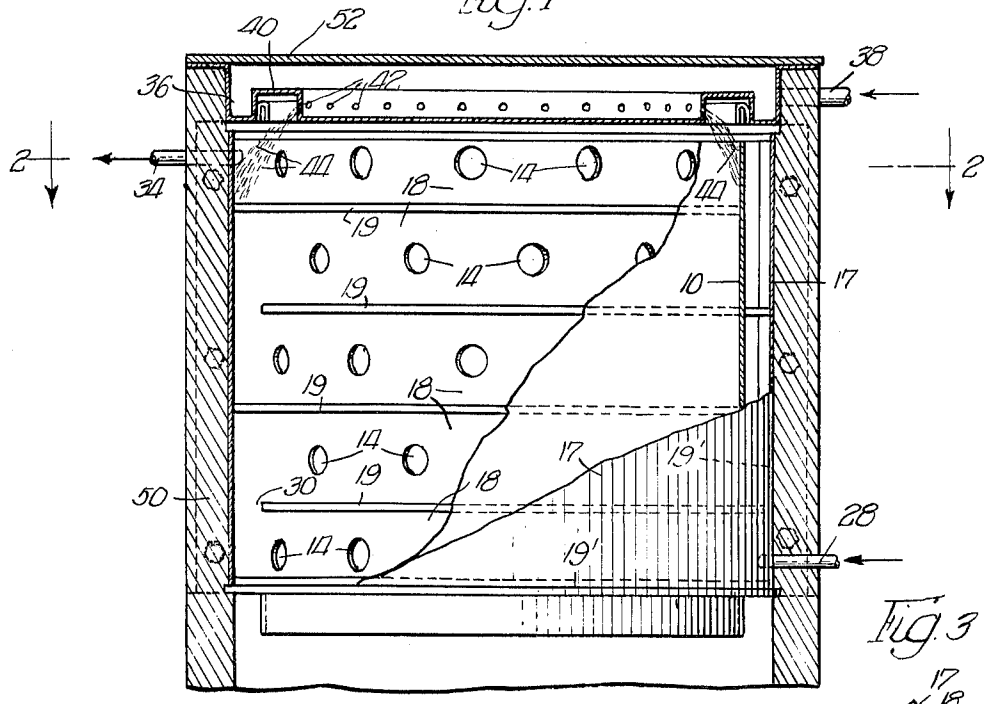


Fig. 3

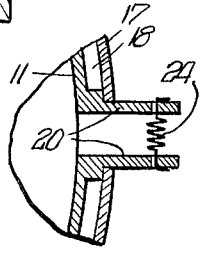
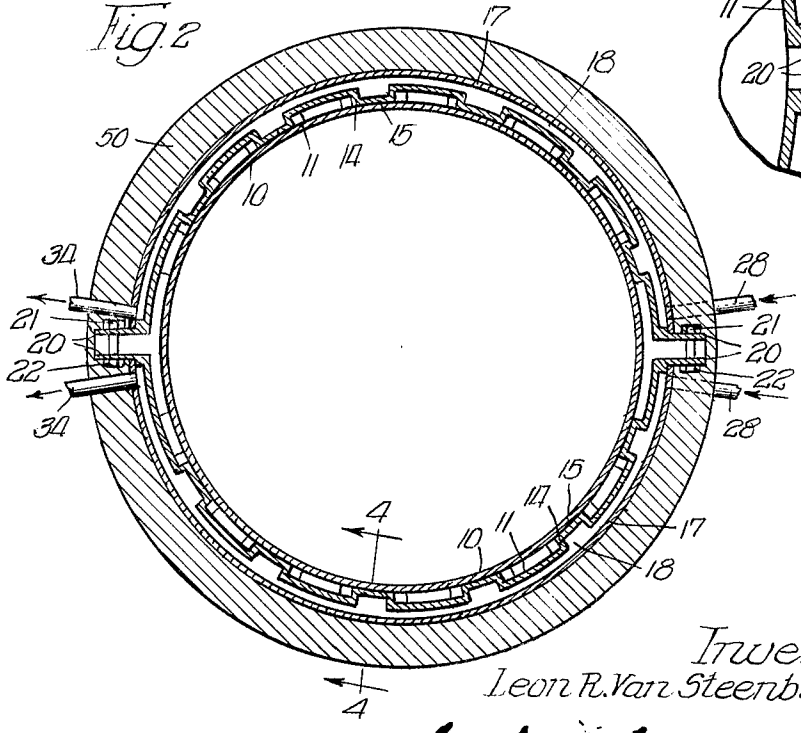


Fig. 2



Inventor:
Leon R. Van Steenburgh, Jr.,
Brown, Jacobson, Whittemore & Dixon
Attys

May 31, 1966 L. R. VAN STEENBURGH, JR 3,253,424

APPARATUS FOR MAKING ICE MEMBERS

Filed Feb. 18, 1965 2 Sheets-Sheet 2

Fig. 5

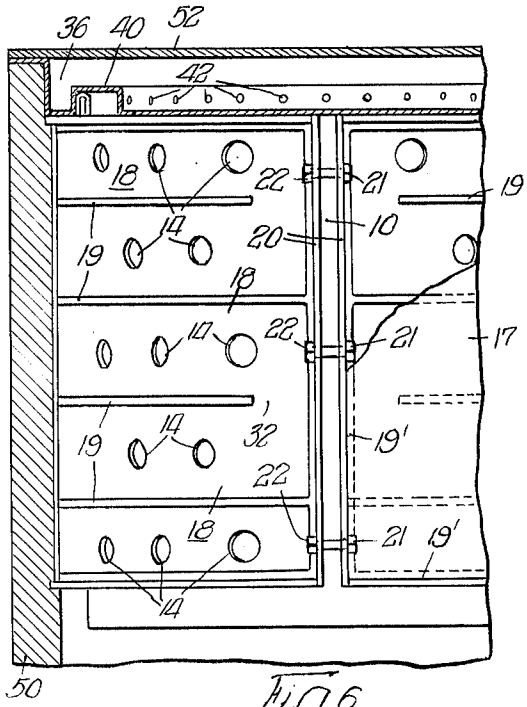


Fig. 4

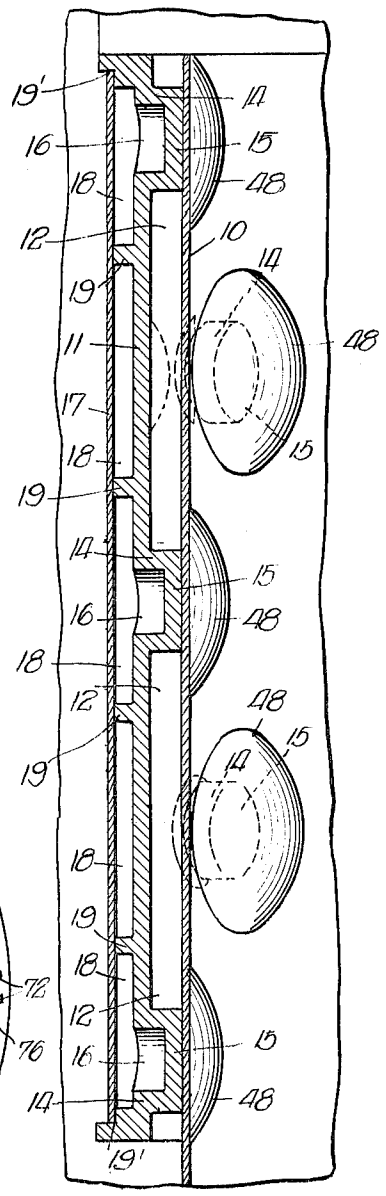
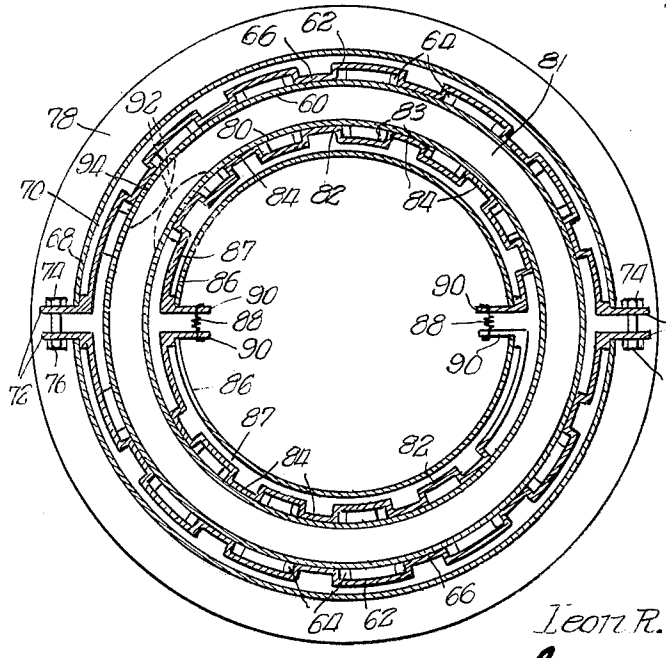


Fig. 6



Inventor:
Leon R. Van Steenburgh, Jr.,
Owen, Jackson, Britton & Dicus
Attys.

United States Patent Office 3,253,424
Patented May 31, 1966

3,253,424

APPARATUS FOR MAKING ICE MEMBERS

Leon R. Van Steenburgh, Jr., 511 Parkside Drive, Rockford, Ill.

Filed Feb. 18, 1965, Ser. No. 433,719
5 Claims. (Cl. 62—298)

This invention relates to apparatus for making ice members, and is particularly directed to an improved ice member making apparatus for producing ice members of great clarity and purity at low cost and at a fast rate.

The present application is directed to improvements over my earlier applications Serial No. 336,414, filed January 8, 1964, and Serial No. 363,731, filed April 30, 1964.

One of the main objects of the present invention is the provision of an improved ice member making apparatus which will overcome certain problems and difficulties encountered with previous forms of apparatus for making ice members.

Another object is to eliminate the need for an evaporator tube having convolutions extending about the wall of the apparatus; and also cooling buttons fixed on the turns of the evaporator tube, and spring means, or mechanical clamping means, associated with each turn of the evaporator tube for pressing the cooling buttons against one surface of the wall of the apparatus, the opposite surface of which is wetted.

Another object is to provide cooling members which are formed integral with a second wall spaced from a first wall and which contact the other surface of the first wall and are of hollow form opening into a space between the second wall and a third wall spaced from the second wall, and means for supplying a refrigerant through the space between the second and third walls to cool the cooling members on the second wall and said first wall at the ends of said cooling members to form ice members on said first wall at the inner ends of the cooling members.

Another object is to provide cooling members on the second wall which are arranged in spaced relation in horizontal rows, and ribs on the second wall coacting with the third wall to form space for each horizontal row of cooling members, the inlet for the refrigerant being at one end of the space for the lower row of cooling members, the space for the lower row of cooling members being open at its opposite end to the overlying space for the next row of cooling members, the overlying space being open at its opposite ends to a space overlying the overlying space, and the top space having an outlet at its opposite end for the refrigerant.

Another object is to provide means coacting with the second wall for pressing the cooling members on the second wall into firm contact with the other surface of the first wall.

Another object is to provide ice member making apparatus having first and second walls with surfaces facing each other, means for wetting said facing surfaces, third and fourth walls spaced from the other surfaces of said first and second walls, cooling members on the third and fourth walls at spaced positions and contacting the other surfaces of said first and second walls, fifth and sixth walls spaced from said third and fourth walls, and means for supplying a refrigerant to the spaces between said third and fourth walls and said fifth and sixth walls to cool said cooling members on said third and fourth walls and the surfaces of said first and second walls which are wetted to form ice members on said wetted surfaces of said first and second walls at the inner ends of the cooling members.

Another object is to provide means coacting with the third and fourth walls for pressing the cooling members

on said walls into firm contact with the other surfaces of the first and second walls.

Further features, advantages and adaptations of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings, it being understood that the invention is limited only within the scope of the appended claims and not to the particular embodiments selected for illustration.

In the drawings:

FIGURE 1 is a vertical sectional view through one form of ice member making apparatus embodying the present invention;

FIGURE 2 is a sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary sectional view showing spring means for pressing the cooling members of FIGURES 1 and 2 into contact with the inner wall;

FIGURE 4 is a vertical sectional view taken along the line 4—4 of FIGURE 2;

FIGURE 5 is a fragmentary sectional view similar to FIGURE 1 but showing the wall portions with the cooling members thereon in side elevation; and also means for pressing the cooling members into contact with the inner wall, and fragmentarily the other wall between which walls with the cooling members thereon and said other wall the refrigerant passes; and

FIGURE 6 is a horizontal section of another form of apparatus embodying the present inveniton.

The form of apparatus, as shown in FIGURES 1, 2, 3, 4 and 5, comprises a wall or vertical cylindrical casing **10**, which is preferably formed of stainless steel because of its cleanliness and its low conductivity of heat.

Second walls **11** of partially tubular form surround and are spaced at **12** from the outer surface of the wall **10**. The walls **11** are preferably formed of brass or copper and have cooling members or buttons **14** formed integral therewith. The cooling members are shown of circular form and project inwardly from the walls **11**. The cooling members **14** have closed inner ends **15** contacting the outer surface of the wall **10** and are of hollow form at **16** opening into the space **18** between the walls **11** and **17**. The third walls **17** of partially tubular form are spaced from the walls **11** at **18** by ribs **19** integral with the walls **11** and contacting the walls **17**. The walls **17** are marginally secured and sealed to the walls **11** at **19'** as shown in FIGURES 1, 4 and 5. The walls **17** are preferably formed of stainless steel.

The walls **11** have spaced end flanges **20** provided with openings through which screws **21** or other mechanical means pass and engage, for example, in nuts **22** for pressing the inner ends **15** of the cooling members **14** into firm contact with the outer surface of the wall **10**.

Instead of using screws **21**, or other mechanical clamping means, springs **24** may be connected between the flanges **20** of the walls **11** as shown in FIGURE 3 for yieldingly pressing the inner ends **15** of the cooling members **14** into firm contact with the outer surface of the wall **10**.

The cooling members **14** on the walls **11** are arranged in spaced relation in horizontal rows. The ribs **19** on the second walls **11** coact with the third walls **17** to form the spaces **18** for each horizontal row of cooling members **14**. The inlets **28** for the refrigerant are at one end of the spaces for the lower rows of cooling members **14**. The spaces **18** for the lower row of cooling members **14** are open at their opposite ends at **30** (FIG. 1) to the overlying space **18** for the next row of cooling members **14**. The overlying space **18** is open at its opposite end at **32** (FIG. 5) to a space **18** overlying said overlying space **18**. This circulates the refrigerant in opposite directions through the spaces **18**, which may be repeated as many times as desired depending upon the number of hori-

zontal rows of cooling members **14**. The top spaces **18** have outlets **34** for the refrigerant at their opposite ends.

The cooling members **14** overlying the lower row of cooling members **14** are staggered with respect to the lower row of cooling members **14** and the cooling members in the row of cooling members overlying the overlying row of cooling members are staggered with respect to the cooling members which overlie the lower row of cooling members as shown in FIGURES 1, 4 and 5. The staggering of the cooling members **14** is preferably repeated throughout all of the rows of cooling members.

An annular trough **36** is provided at the upper end of the wall or cylindrical casing **10**. Water is supplied to the interior of the trough **36**, for example, by a water inlet **38**. A pump operated, for example, by an electric motor (not shown) may supply the water into the trough **36** through the inlet **38**. The trough **36** may have an annular raised portion **40** with openings at **42** through which the water is sprayed or directed at **44** onto the upper part of the inner surface of the wall **10** and trickles or circulates downwardly over the inner surface of the wall **10**. In the flow of refrigerant through the spaces **18**, the cooling members or buttons **14** are cooled and the inner surface of the wall **10** is cooled at the inner ends of the cooling members **14**. As a result ice members **48** are formed on the inner surface of the wall **10** as shown in FIGURE 4. The outer surfaces of these ice members **48** adhere to the cylindrical inner surface of the wall **10** and the inner surfaces of the ice members **48** are of rounded convex form as shown in FIGURE 4.

The ice members **48** may be released from the wall **10**, for example, in the manner disclosed in my copending application Serial No. 336,414, filed January 8, 1964. The ice members **48** upon being released from the wall **10** may drop onto a screen and may be discharged through an opening as also disclosed in said copending application.

The exteriors of the walls **17** are insulated by an annular wall of insulation **50** which covers the outer surfaces of the wall **17** as shown in FIGURES 1 and 2. The insulation **50** may be Styrofoam insulation or any other suitable insulation. The apparatus is thus effectively insulated from entering heat.

The top of the apparatus as shown in FIGURES 1 and 5 is closed by a removable cover **52**. The cover **52** may have a handle (not shown) for applying and removing the cover **52** from the top of the apparatus.

In the embodiment of the invention shown in horizontal section in FIGURE 6, the wall or vertically cylindrical casing **60** is preferably formed of stainless steel and it is similar to the wall **10** shown in FIGURES 2 and 4. The walls **62** of partially tubular form surrounding and spaced from the wall **60** at **64** are preferably formed of brass or copper and have cooling members **66** formed integrally therewith. The cooling members **66** have closed inner ends contacting the outer surface of the wall **60**.

The walls **62** and the cooling members **66** are similar to the walls and cooling members **11** and **14** of the preceding embodiment of the invention. Third walls **68** similar to the walls **17** of the preceding embodiment of the invention are spaced from the walls **62** at **70** and are marginally secured to the walls **62** as in the preceding embodiment of the invention. The walls **68** are preferably formed of stainless steel.

The walls **62** have spaced end flanges **72** provided with openings through which screws **74**, or other mechanical means pass and engage, for example, in nuts **76** for pressing the inner ends of the cooling members **66** into firm contact with the outer surface of the wall **60**.

Instead of using screws **74**, or other mechanical clamping means, springs may be connected between the flanges **72** of the walls **62** as shown in FIGURE 3 for yieldingly pressing the inner ends of the cooling members **66** into firm contact with the outer surface of the wall **60**.

The structure so far described in connection with FIGURE 6 is identical to the structure described in connection with the preceding embodiment of the invention. The annular wall of insulation **78** is similar to the insulation **50** described in connection with the preceding embodiment of the invention.

Spaced inwardly from the cylindrical wall **60** is a concentric vertical cylindrical wall **80** with an annular space **81** between the walls **60** and **80** within which the ice members are formed.

Walls **82** of partially tubular form are disposed with spaces **83** between the walls **82** and the wall **80**. The wall **80** is preferably formed of stainless steel and the walls **82** are preferably formed of brass or copper. The walls **82** have cooling members **84** formed integral therewith. The cooling members **84** have closed outer ends contacting the inner surface of the wall **80**. Third walls **86** are spaced from the walls **82** at **87** and are marginally secured and sealed to the walls **82**. The walls **86** are preferably formed of stainless steel.

Expanding springs **88** are interposed between the end flanges **90** of walls **82** and yieldingly press the outer ends of the cooling members **84** into firm contact with the inner surface of the wall **80**. Instead of using springs, screws or other mechanical means may be employed for pressing the outer ends of the cooling members **84** into contact with the inner surface of the wall **80**.

The cooling members on the walls **62** and **82** are arranged as described in connection with the preceding embodiment of the invention and there are spaces between ribs on the walls **62** and between ribs on the walls **82** as previously described. Refrigerant is circulated between the walls **62** and **68** and between the walls **82** and **86** to cause cooling of the members **66** and the cooling members **84** and the walls **60** and **80** at the opposite ends of the cooling members **66** and **84**.

Water is directed upon the upper parts of the opposing surfaces of the walls **60** and **80** and trickles or circulates downwardly over the opposing surfaces of the walls **60** and **80**. In the flow of refrigerant between the walls **62** and **68** and between the walls **82** and **86** the cooling members **66** and **84** are cooled and the opposing surfaces of the walls **60** and **80** are cooled at the ends of the cooling members **66** and **84**. With the water circulating downwardly over the opposing surfaces of the walls **60** and **80** ice discs or members **92** are formed on the opposing surfaces of the walls **60** and **80** as shown, by example, in dotted lines at **92** in FIGURE 6. The two opposing ice members grow in size as the freezing continues, and finally join and continue to freeze until each pair of ice members **92** forms one thick disc of ice as shown at **94** in FIGURE 6.

The ice members **94** may be released from the walls **60** and **80**, for example, in the manner disclosed in my copending application Serial No. 336,414, filed January 8, 1964. The ice members **94** upon being released from the walls **60** and **80** may drop onto a screen and may be discharged through an opening as also disclosed in said copending application.

The embodiments of the invention disclosed in the drawings and the specification are for illustrative purposes only, and it is to be expressly understood that said drawings and the specification are not be construed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

I claim:

1. Ice making apparatus comprising a first wall, means for wetting one surface of said first wall, a second wall spaced from said first wall, cooling members on said second wall arranged in spaced relation in horizontal rows and contacting the other surface of said first wall, a third wall spaced from said second wall, ribs on said second wall coacting with said third wall to form spaces for each horizontal row of cooling members, and means for supplying a refrigerant through the space between said

second and third walls to cool said cooling members on said second wall and said first wall at the inner ends of said cooling members to form ice members on one surface of said first wall at the inner ends of said cooling members, the inlet for the refrigerant being at one end of the space for the lower row of cooling members, said space for the lower row of cooling members being open at its opposite end to the overlying space for the next row of cooling members, the overlying space being open at its opposite end to a space overlying said overlying space, and the top space having an outlet at its opposite end for refrigerant.

2. Ice member making apparatus comprising a first wall of tubular form, means for wetting one surface of said first wall, a second wall spaced from said first wall, cooling members on said second wall at spaced positions and contacting the other surface of said first wall, said second wall being composed of partially tubular portions surrounding and spaced from said first wall, spring means coacting with the partially tubular portions of said second wall for pressing the cooling members on said second wall into firm contact with said first wall, and means for supplying a refrigerant through said partially tubular portions of said second wall to cool said cooling members on said second wall and said first wall at the inner ends of said cooling members to form ice members on one surface of said first wall at the inner ends of said cooling members.

3. Ice member making apparatus comprising a first substantially vertical cylindrical and stationary wall, means for wetting one surface of said first wall, a second stationary wall substantially concentric with and spaced from said first wall, cooling members on said second wall at spaced positions and contacting the other surface of said first wall, said second wall comprising partially tubular portions substantially surrounding and spaced from said first wall, means coacting with the partially tubular positions of said second wall for maintaining said cooling members on said second wall in pressure contact with said first wall, and means for supplying a refrigerant through said partially tubular portions of said second wall to cool said cooling members on said second wall and said first wall at the ends of said cooling members to form ice members on said surface of said first wall at the ends of said cooling members.

4. Ice making apparatus comprising a first substantially vertical cylindrical and stationary wall, means for wetting the inner surface of said first wall, a second stationary wall substantially concentric with and surrounding said first wall and spaced outwardly therefrom, cooling members on said second wall at spaced positions and extending inwardly therefrom with their inner ends contacting the outer surface of said first wall, said second wall comprising partially tubular portions substantially surrounding and spaced outwardly from said first wall, means coacting with the partially tubular portions of said

second wall for maintaining said cooling members on said second wall in pressure contact with said first wall, and means for supplying a refrigerant through said partially tubular portions of said second wall to cool said cooling members on said second wall and said first wall at the inner ends of said cooling members to form ice members on said inner surface of said first wall at the inner ends of said cooling members.

5. Ice making apparatus comprising a first substantially vertical cylindrical and stationary wall, a second stationary wall substantially concentric with and surrounded by said first wall and spaced inwardly therefrom, cooling members on said second wall at spaced positions and extending outwardly therefrom with their outer ends contacting the inner surface of said first wall, a third substantially vertical cylindrical and stationary wall substantially concentric with and surrounding said first wall and spaced outwardly therefrom, a fourth stationary wall substantially concentric with and surrounding said third wall and spaced outwardly therefrom, cooling members on said fourth wall at spaced positions and extending inwardly therefrom with their inner ends contacting the outer surface of said third wall and substantially aligned with said cooling members of said second wall, means for wetting the outer surface of said first wall and the inner surface of said third wall, said second wall comprising partially tubular portions substantially surrounded by and spaced inwardly from said first wall, said fourth wall comprising partially tubular portions substantially surrounding and spaced outwardly from said third wall, means coacting with said tubular portions of said second wall for maintaining said cooling members thereof in pressure contact with said first wall, means coacting with said tubular portions of said fourth wall for maintaining said cooling members thereof in pressure contact with said third wall, and means for supplying a refrigerant through said partially tubular portions of said second and fourth walls to cool said cooling members thereof and said first and third walls at the ends of said cooling members to form ice members on said first and third walls between the opposed ends of said cooling members.

References Cited by the Examiner

UNITED STATES PATENTS

2,683,357	7/1954	Albright	62—348 X
2,836,038	5/1958	Morgan	62—344 X
2,900,804	8/1959	Rising	62—344 X
2,940,276	6/1960	Loewenthal et al.	62—347
2,963,885	12/1960	Loewenthal	62—344
3,146,610	9/1964	Lowe	62—347

ROBERT A. O'LEARY, *Primary Examiner.*

W. E. WAYNER, *Assistant Examiner.*