

Dec. 27, 1932.

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1,892,224

APPARATUS FOR FREEZING CANNED GOODS

Filed Nov. 9, 1931

3 Sheets-Sheet 1

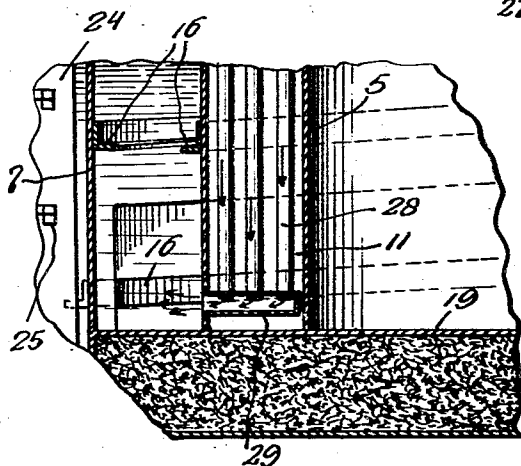
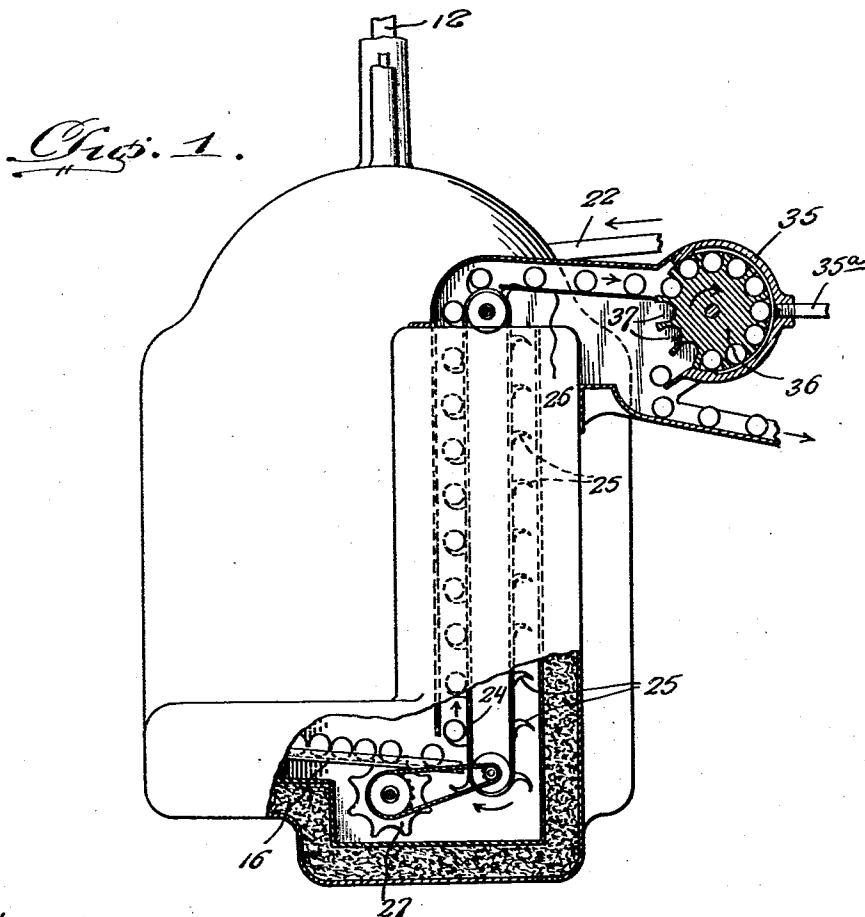


Fig. 5.

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3 Sheets-Sheet 2

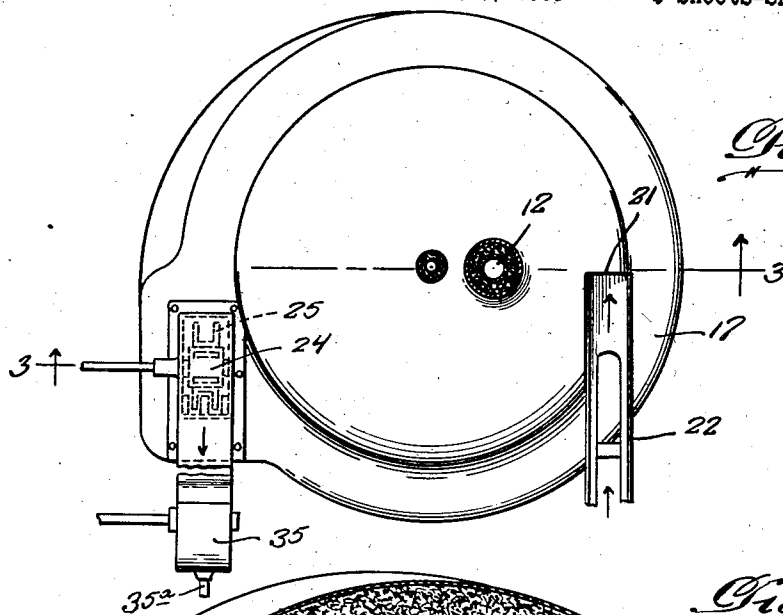


Fig. 2.

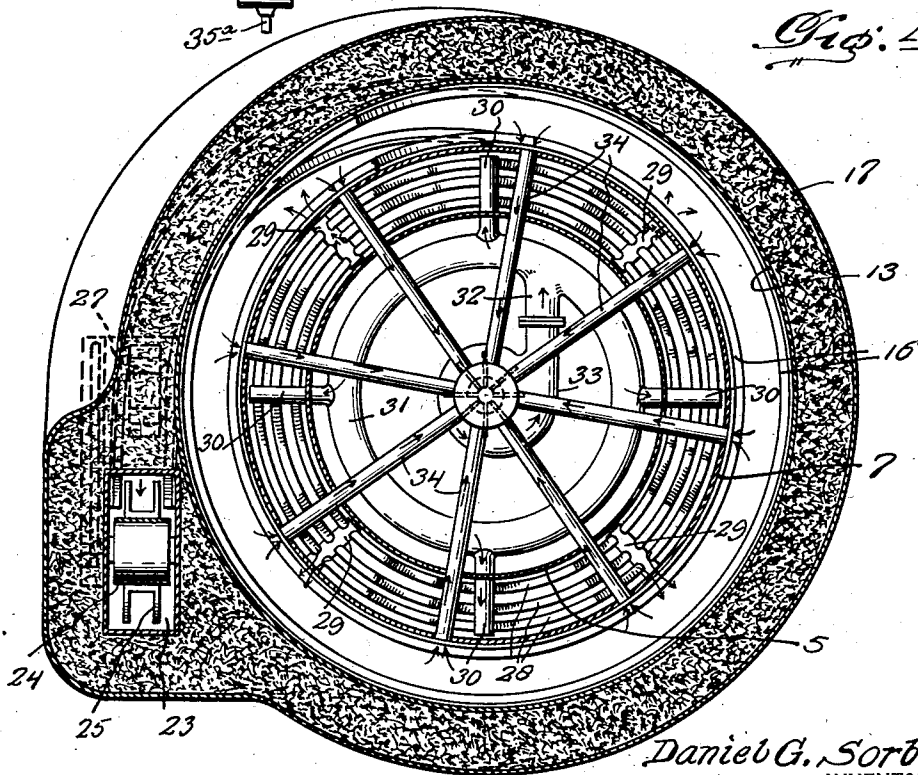


Fig. 4.

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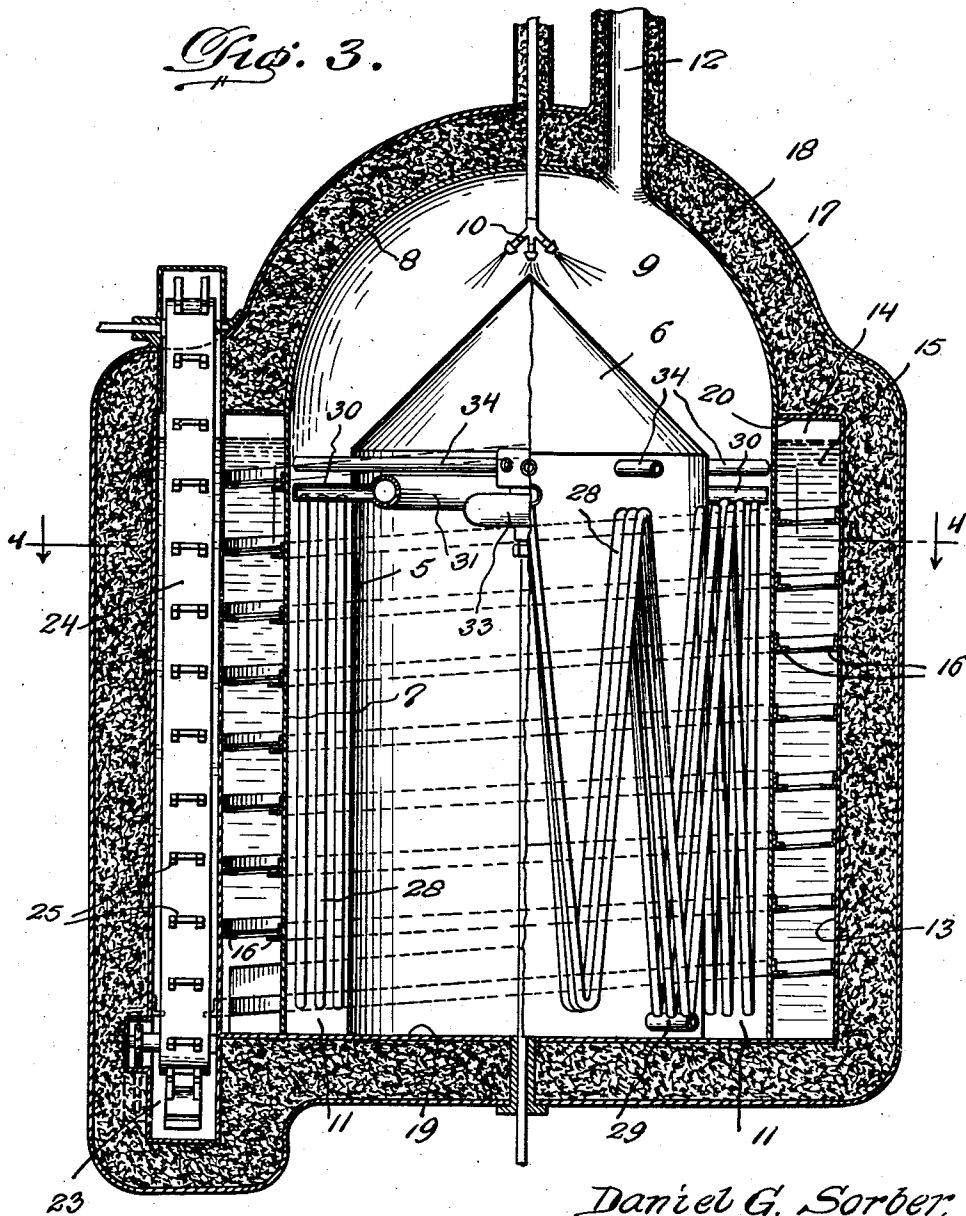
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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APPARATUS FOR FREEZING CANNED GOODS

Application filed November 9, 1931. Serial No. 573,974.

This invention relates to an improved apparatus for freezing canned goods to be stored and marketed in a frozen condition.

The primary object of the present invention is to provide a machine or apparatus of the above kind within which an intensely cold condition is produced and through which the canned goods to be frozen are passed, thereby effecting a close-coupled transfer of heat.

A further object of the invention is to provide an improved self-contained apparatus for effecting a direct transfer of heat from the product being frozen to the refrigerating system.

Another object of the present invention is to provide an apparatus of the above kind which is efficient and continuous in operation, comparatively simple in construction, and otherwise well adapted for being readily placed into practical use.

Briefly stated, the present invention contemplates the provision of an apparatus for freezing canned goods or the like, including an expansion chamber within which a compressed and cooled refrigerant is expanded for being further cooled, a settling chamber to receive the refrigerant after being expanded and further cooled, a further chamber directly surrounding the settling chamber and having a refrigerant bath therein so that transfer of heat may take place from the refrigerant bath to the refrigerant in the settling chamber, means for continuously passing the canned goods through the refrigerant bath, means for discharging the canned goods from the refrigerant bath after passing therethrough, absorption coils within the settling chamber, and means for circulating the refrigerant of the bath through said absorption coils from the refrigerant bath chamber back to the latter whereby transfer of heat from the refrigerant of the bath to the expanded refrigerant in the settling chamber is greatly augmented for effectively freezing the contents of the canned goods in the comparatively brief interval which they require to pass through the refrigerant bath.

Other objects and features of the invention

will become apparent from the following description when considered in connection with the accompanying drawings, in which:

Figure 1 is an elevational view, partly broken away and in section, of an apparatus embodying the present invention.

Figure 2 is a top plan view thereof.

Figure 3 is an enlarged vertical section taken substantially upon line 3—3 of Figure 2.

Figure 4 is a horizontal section on line 4—4 of Figure 3; and

Figure 5 is a fragmentary detail section showing the connection whereby the refrigerant of the bath is discharged into the bath chamber from the absorption coils.

Referring more in detail to the drawings, the present invention preferably comprises a central inclosure composed of a cylindrical body portion 5 and a conical top 6. Surrounding this inclosure is a housing composed of a cylindrical body portion 7 in spaced concentric relation to the body portion 5 and a top hemispherical dome 8 in spaced surrounding relation to the conical top 6. An expansion or converting chamber 9 is thus formed within the dome 8 and between the latter and the conical top 6, within which a compressed and cooled refrigerant, such as carbon dioxide, may be expanded through a suitable expansion nozzle indicated generally at 10. Also, there is also formed between the cylindrical body portions 5 and 7 in communication with the converting dome or expansion chamber 9 an annular chamber 11 into which the refrigerant may pass or settle after being discharged through the nozzles 10 and expanded. In case the refrigerant used is liquid carbon dioxide, the latter will expand within the chamber or dome 9, and due to the sudden release of the same from pressure, its temperature will be sufficiently lowered so as to convert the same into a solid or snow. This snow will fall downwardly along the conical top 6 and into the settling chamber 11 as and for a purpose which will presently become apparent. The dome 8 is provided with a discharge pipe 12 through which the refrigerant may pass back to the compressor of the refrigerant

compressing and cooling system, it being understood that such refrigerant will evaporate and return to liquid or gaseous form from the solid form as the transfer of heat takes place within the chamber 11 in the manner to be described later. It is well known that carbon dioxide, upon sublimation, passes directly from a solid to a gaseous state, and the gas may be liquefied by again compressing and cooling the same.

Surrounding and in spaced concentric relation to the body portion 7 of the housing is a cylinder 13, whereby a chamber 14 is provided between the body portion 7 and the cylinder 13 for reception of a refrigerant bath indicated at 15. The refrigerant used for this bath may consist of alcohol, and arranged within the chamber 14 is a stationary helical track-way composed of spaced rails 16 respectively secured to the inner surface of cylinder 13 and the outer surface of body portion 7. This helical track-way provides a helical can-path down which the cans of goods to be frozen may roll by gravity from the top to the bottom of the chamber 14 and through the refrigerant bath at 15. The diameter of the spiral track-way is relatively great so that the cans can roll freely, and the spiral is quite long and of such slight pitch that there will be no undue pressure on the cans at the bottom to retard their downward rolling movement. A casing 17 is provided about the entire structure, and a packing of suitable heat-insulating material is provided at 18 between such casing and the parts which it surrounds, thus minimizing heat losses. A wall 19 is provided at the bottom of body portions 5 and 7 and cylinder 13 for closing the lower ends of the latter, and a wall extends inwardly as at 20 from the top of the cylinder 13 to the body portion 7 for closing the top of the refrigerant bath chamber 14. Provided in the top of casing 17 and cylinder 13 is an opening indicated generally at 21 in Figure 2, and leading through this opening is a chute 23 down which the canned goods may roll by gravity onto the spiral track-way formed by rails 16.

A vertical compartment 23 is provided at one side of the apparatus between the cylinder 13 and casing 17, which compartment 23 opens at the top through the casing 17 above the level of the bath 15. Arranged within this compartment is a suitable endless belt conveyor 24 having hook-shaped flights 25 and arranged to elevate the canned goods from the bottom of chamber 23 to a point outside of the casing 17 onto an inclined discharge spout or chute 26. At the lower end of the chamber 14, the track-way composed of rails 16 passes outwardly through the bottom portion of cylinder 13 into the bottom of chamber 23 so as to discharge the cans onto the flights 25 of conveyor belt 24. A suitable regulator or feeder 27 is provided in the bot-

tom of chamber 23 beneath the discharge ends of the track rails 16 so as to cause the cans to pass in regular order, one by one, onto the flights 25 as the latter come into position for properly receiving the cans. This feeder 27 merely consists in a peripherally notched wheel operated from the lower driven shaft of conveyor 24 and adapted to receive the cans successively in the peripheral notches thereof so that the cans are prevented from rolling too rapidly off of the lower ends of rails 16, or whereby they are intermittently discharged onto the flights 25 as they come into loading position with respect to rails 16.

Arranged within the chamber 11 are a series or plurality of serially connected vertical V-shaped coil elements 28, which, in the present apparatus, constitute absorption coils which are connected at suitable intervals at the lower portions thereof as at 29 with the chamber 14, and whose upper portions are connected at suitable intervals as at 30 with a horizontal annular manifold 31 arranged within the upper portion of the enclosure 5, 6. This manifold 31 connects as at 32 with the outlet of a rotary pump 33. Radial pipes 34 extending through the top of chamber 11 and body portion 5 place the refrigerant bath chamber 14 in communication with the inlet of pump 33, and it will thus be seen that when pump 33 is placed into operation the refrigerant of bath 15 will be drawn into pump 33 through pipes 34 and will then be discharged from said pump into manifold 31 and then through connections 30 into the upper portions of the coil elements 28, finally passing from said coil elements through the connections 29 into the lower portion of chamber 14. As this refrigerant of the bath 15 circulates through the coils 28 it is effectively cooled by the absorption of heat therefrom to the expanded refrigerant within the chamber 11 about the coil elements 28. The V-shaped form of the coil elements 28 is such as to facilitate packing of the solid carbon dioxide or carbon dioxide snow against such coils as it falls into the settling chamber 11. This insures good contact between the expanded refrigerant and the coil elements 28 so that most efficient transfer of heat is insured. As before pointed out, when the apparatus is in use the expanded refrigerant will constantly sublime or pass directly from a solid to a gaseous state for being conducted through pipe 12 to a desired point for being compressed and cooled for re-use in the apparatus.

The refrigerant for the bath 15 is preferably provided by alcohol, and when alcohol is used, the cans, upon leaving the apparatus by way of chute 26, are preferably passed through a vacuum chamber 35 so that the alcohol may be removed from the cans and condensed for re-use in the apparatus. The vacuum chamber 35 may have a suction pipe 35a in communication therewith, and the cans

may be carried through this chamber by a rotatable carrier 36 having peripheral pockets 37 to receive the cans, and being suitably operated by power.

5 In operation, the cans are continuously fed onto the track-way composed of rails 16, from a suitable source of supply and by means of chute 22. The cans roll slowly and by gravity down this track-way from top to
10 bottom of the chamber 14 and at all times within the refrigerant bath 15. As transfer of heat takes place from the canned goods to the refrigerant of the bath, such heat is removed from the refrigerant of the bath by
15 conduction through the wall of body portion 7 and by contact of the expanded refrigerant with coil elements 28 within chamber 11, as such refrigerant of the bath is circulated through the coil elements 28 by means of
20 pump 33. The cans are then delivered intermittently and one by one onto the flights 25 of the elevator or conveyor 24 which delivers the canned goods onto chute 26 for being discharged from the apparatus to a suitable point of delivery. In case alcohol is
25 used for the refrigerant bath, the cans will pass through the vacuum chamber 35 for having excess alcohol removed therefrom, whereby the alcohol so removed may be recovered and re-used in the apparatus. As before stated, the compressed and cooled refrigerant, such as carbon dioxide, is discharged through expansion nozzles 10 into the expansion chamber or converting dome 9,
30 and as this refrigerant is released from pressure it is greatly cooled and passes downwardly along the conical top 6 into the settling chamber 11 about the coil elements 28. As the transfer of heat takes place within the chamber 11, the expanded refrigerant
40 vaporizes or sublimates and passes back to the compressor of the refrigerating cycle by way of pipe 12.

From the foregoing description, it will be seen that I have provided a comparatively
45 simple and efficient apparatus for continuously moving cans of goods through a cooling bath so that the temperature of the contents of the cans will be quickly lowered to a point where such contents are frozen solid. Minor changes are contemplated within the spirit and scope of the invention as claimed.

What I claim as new is:

1. An apparatus for freezing canned goods
55 or the like comprising an expansion chamber, means for supplying a compressed and cooled refrigerant to and expanding the same within said expansion chamber, a settling chamber to receive the refrigerant after being expanded, a further heat-insulated chamber directly surrounding the settling chamber and in heat transferring relation to the latter, said further chamber having a refrigerant bath therein, a fixed helically directed track within said further chamber defining a can-path
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down which the cans may roll by gravity through the bath, absorption coils within the settling chamber, and means for circulating the refrigerant of the bath from said further chamber through said absorption coils and
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2. In an apparatus for freezing canned goods or the like, the combination of an expansion chamber, means for supplying a compressed and cooled refrigerant to and expanding the same within said expansion chamber, a settling chamber to receive the expanded refrigerant from the expansion chamber, a further chamber having a refrigerant bath therein and surrounding the settling chamber in heat interchanging relation with the latter, and means for continuously passing canned goods in a helical path through the bath within said further chamber.
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3. An apparatus for freezing canned goods or the like comprising an expansion chamber, means for supplying a compressed and cooled refrigerant into and expanding the same within said expansion chamber, a vertical annular settling chamber to receive the refrigerant after being expanded, a further annular chamber surrounding the settling chamber and in heat interchanging relation to the latter, a fixed helical track within said further chamber down which the canned goods may roll by gravity within said further chamber, said further chamber having a refrigerant bath therein, absorption coils within said settling chamber, and means for circulating the refrigerant of said bath through said further chamber and said absorption coils.
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4. An apparatus for freezing canned goods or the like comprising an expansion chamber, means for supplying a compressed and cooled refrigerant into and expanding the same within said expansion chamber, a vertical annular settling chamber to receive the refrigerant after being expanded, a further annular chamber surrounding the settling chamber and in heat interchanging relation to the latter, a fixed helical track within said further chamber down which the canned goods may roll by gravity within said further chamber, said further chamber having a refrigerant bath therein, absorption coils within said settling chamber, and means for circulating the refrigerant of said bath through said further chamber and said absorption coils, said absorption coils being of vertical V-shaped form and serially connected together.
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5. An apparatus for freezing canned goods comprising an inclosure having a cylindrical body portion and a conical top, a housing surrounding and in spaced relation to said inclosure, said housing comprising a body portion in concentric relation with the body portion of the inclosure and a dome in spaced
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- relation to the conical top of the inclosure, whereby an expansion chamber is provided between the conical top and the dome and a settling chamber is provided in communication with the expansion chamber between said body portions, a heat-insulated casing surrounding and in spaced relation to the body portion of the housing to provide a further chamber surrounding and in heat-interchanging relation to the settling chamber, a vertical helical track arranged within said further chamber down which the cans may roll by gravity, means for feeding the cans onto said track at the top of said further chamber, means for discharging the cans from the apparatus after passing through said further chamber, absorption coils arranged within said settling chamber, and means for circulating a refrigerant through said further chamber and said absorption coils.
6. An apparatus for freezing canned goods comprising an inclosure having a cylindrical body portion and a conical top, a housing surrounding and in spaced relation to said inclosure, said housing comprising a body portion in concentric relation with the body portion of the inclosure and a dome in spaced relation to the conical top of the inclosure, whereby an expansion chamber is provided between the conical top and the dome and a settling chamber is provided in communication with the expansion chamber between said body portions, a heat-insulated casing surrounding and in spaced relation to the body portion of the housing to provide a further chamber surrounding and in heat-interchanging relation to the settling chamber, a vertical helical track arranged within said further chamber down which the cans may roll by gravity, means for feeding the cans onto said track at the top of said further chamber, means for discharging the cans from the apparatus after passing through said further chamber, absorption coils arranged within said settling chamber, means for circulating a refrigerant through said further chamber and said absorption coils, said last-named means comprising connections between the bottoms of said coils and the bottom of said further chamber, a circulating pump arranged within the inclosure and having its outlet connected with the tops of said coils, and further connections between the top of said further chamber and the inlet of said pump.
7. In an apparatus for freezing canned goods, a vertical cylindrical chamber having a refrigerant bath therein, a settling chamber in heat-interchanging relation with said first-named chamber, absorption coils within said settling chamber, means for circulating the refrigerant of the bath through said first-named chamber and said coils, means for continuously passing cans of goods through said first-named chamber, and means for expanding a compressed refrigerant and supplying the same to said settling chamber.
- In testimony whereof I affix my signature.
- DANIEL G. SORBER.

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