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REFRIGERATING APPLIANCE FOR COLD STORAGE ROOMS

Filed May 2, 1929

2 Sheets-Sheet 1

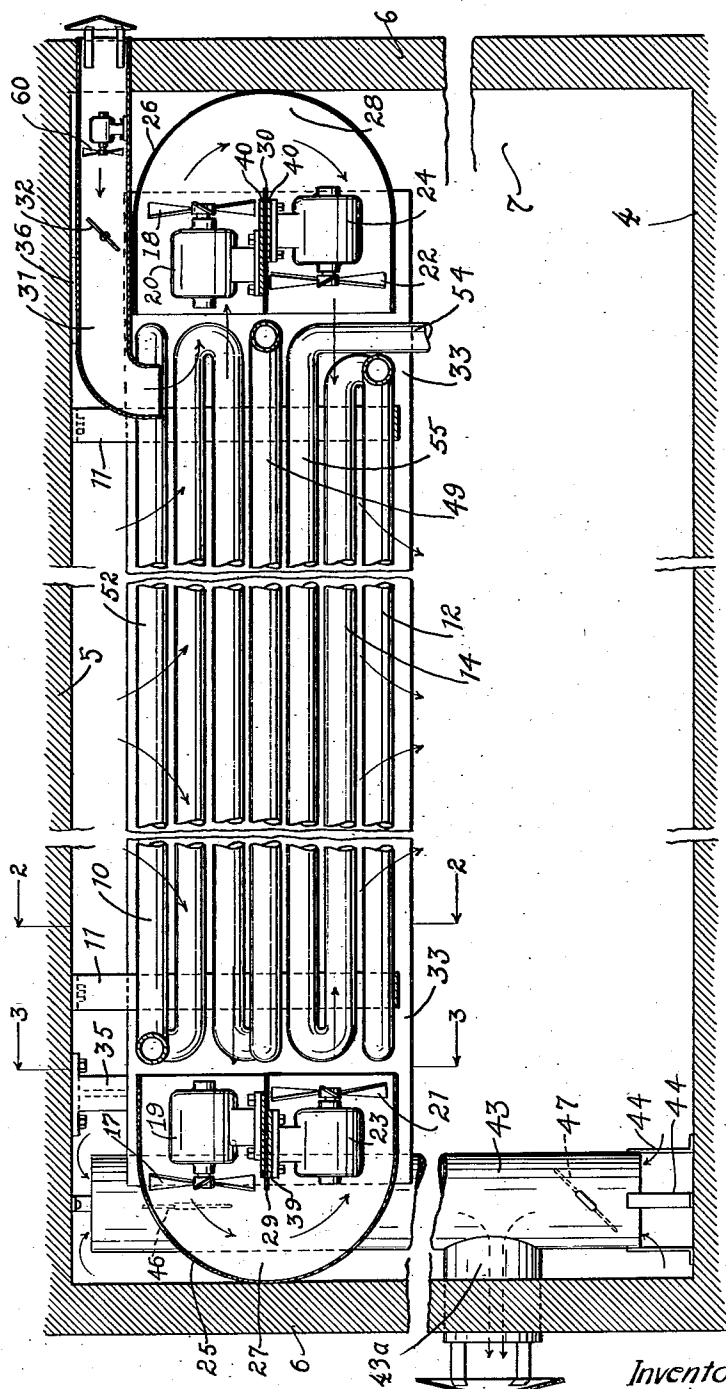


Fig. 1.

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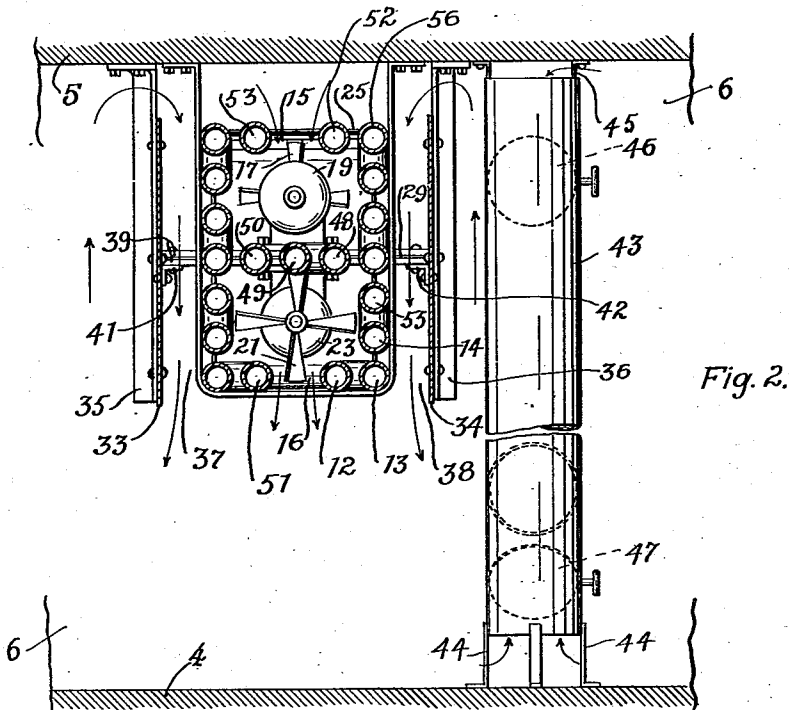


Fig. 2.

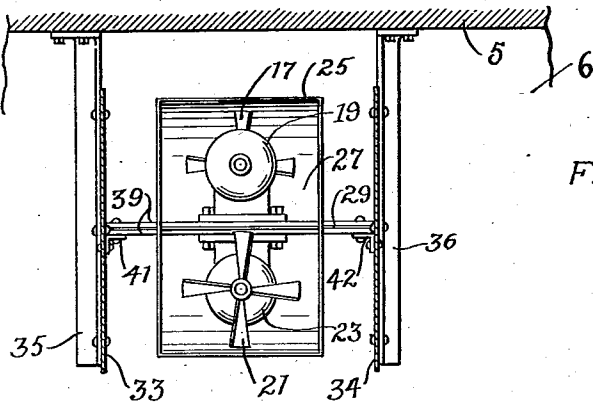


Fig. 3.

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REFRIGERATING APPLIANCE FOR COLD-STORAGE ROOMS

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This invention relates to refrigerating appliances for cold storage rooms.

An object of the invention is to provide a simple, efficient, easily installed apparatus which does not take up any floor space.

Another object of the invention is to provide simple and effective refrigerating means for a cold storage room adapted to cause a natural, convective and diffused circulation of air within the room by gravity.

Another object of the invention is to include fans in such an appliance adapted to stimulate the natural convective and diffused circulation of air conditioned within the room.

A further object is to provide, in connection with an installation as above indicated, means whereby a controlled quantity of fresh air may be introduced, and a regulated proportion of the interior air may be exhausted from the room.

The various further objects and advantages will more fully appear from the detailed description.

In the drawings illustrating the invention, Fig. 1 is a vertical longitudinal sectional view of my improved apparatus installed in a room, parts being broken away for the sake of convenience in illustration; Fig. 2 is a cross sectional view, taken as on the line 2—2 of Fig. 1; Fig. 3 is a similar view taken along line 3—3 of Fig. 1.

Referring to the drawings, 4 designates the floor of a room; 5, the ceiling; 6, the end walls and 7, the side walls. My improved apparatus includes a cooling coil 10 of a novel construction, hereinafter to be more fully described, suspended from the ceiling 5, centrally thereof, in any suitable manner, as by the U-shaped hangers 11. The convolutions of the coil are so formed as to constitute a plurality of adjacent parallel lengths of pipe 12, 13, 14 etc., which in their general disposition form an upper and lower channel having a common base. Through these channels the air may pass and become cooled through contact with the pipe surfaces or with frost formed upon said surfaces. It may be noted that, with the pipe lengths of the coil relatively disposed as in-

indicated in Figs. 1 and 2, the closely adjacent surfaces will become joined by the accumulation of frost thereon.

Referring particularly to Fig. 2, it will be seen that the upper and lower channel members are formed by the parallel lengths of pipe forming openings 15 and 16 respectively. These openings extend the entire length of the coil, but are narrower than the interior of the channels. The channels constitute air ducts in which air is cooled as it gravitates therethrough in a natural manner or is forced along the same by mechanical means now to be described.

Referring to Figs. 1 and 2, the mechanical air circulating means consists of a plurality of motor fans, preferably four in number, located adjacent to the extremities of the channels. Fans 17 and 18, driven, respectively by motors 19 and 20, draw the air in opposite directions from the ends of the upper channel, and fans 21 and 22 driven, respectively, by motors 23 and 24, force the air so drawn from the upper channel into the lower channel through its extremities toward the middle thereof. Suitable passageways 25 and 26 are provided for conducting the air from the ends of the upper channel to the ends of the lower channel. These passageways 25 and 26 may be made of sheet metal, or other suitable material, so as to form arcuate chambers 27 and 28. And these chambers are divided into upper and lower portions by plates 29 and 30, which extend from the mouths of the chambers part way into the interior thereof. The motors 19 and 23 are mounted, respectively, on the top and bottom of plate 29 and the motors 20 and 24 are similarly mounted on the plate 30. This construction, it will be noted, provides a passage for the air from the ends of the upper channel through the chambers 27 and 28 into the lower channel through the respective ends thereof, as clearly appears from the arrows in Fig. 1.

The apparatus so far described provides for the recirculation of the air within the room. For introducing fresh air into the room from the outside, I provide a conduit 31 communicating with the outside air and

opening into the upper channel of the coil, preferably near one of the fans 17 or 18. A damper 32 disposed in this conduit regulates the proportion of fresh air which may be admitted, as occasion requires. And a fan 60, also disposed in the conduit 31, may be employed, when desired, to stimulate the ingress of fresh air into the room through said conduit. The air introduced through the conduit 31 is drawn along with the other air by the fan 18 and then forced into the lower channel by the fan 22, the fresh air being cooled, as will be readily understood, and then circulated downwardly through the opening at the bottom of the lower channel.

To exhaust air from the interior of the room, an upright exhaust conduit 43 is suitably located within the room and supported in any suitable manner, as on feet 44 resting on the floor and hangers 45 attached to the ceiling. Intermediate the ends of this conduit is a branch conduit 43^a which extends through the wall of the room and opens into the outer air. Dampers 46 and 47, located in conduit 43 adjacent to the top and bottom thereof, control the escape of air from the upper and/or lower portion of the room, as occasion may require.

A pair of baffle plates 33 and 34 are provided, spaced from the coil 10 at each side thereof. These baffle plates may extend longitudinally along the length of the coil and be supported in any suitable manner, as from hangers 35 and 36 attached to the ceiling. Between these plates 33 and 34 and coil 10, are formed vertical passageways 37 and 38 through which the air may circulate, as shown by the arrows in Fig. 2. These baffle plates may also serve to provide suitable supports for the passageways 25 and 26 and the enclosed motors. Thus the plates 29 and 30 may be reinforced by plates 39 and 40 and these plates, passing through the side walls of the chamber 26' and 27, may be attached to angle irons 41 and 42 secured to the baffle plates.

It may be noted, that, as, in the course of the operation of the apparatus, the adjacent pipe lengths of the coil become frosted together they will constitute channels open at the top and at the bottom and at the ends through which the air may circulate. The row of pipe lengths 48, 49, 50 form the horizontal partition between the upper and lower channels and the pipe lengths 12 and 51, at the bottom, and 52 and 53 at the top, form the constricted openings 15 and 16 extending the length of the channels, through which the air is admitted and from which the air is exhausted in the operation of the apparatus.

The coil 10 may be formed of one continuous length of pipe, into which the cooling liquid may be admitted at one end and discharged at the other end. Thus, if the mix-

ture is admitted into pipe 54 (Fig. 1), forming a continuation of the horizontal pipe length 55 (Figs. 1 and 2), the coil may wind back and forth downward to lengths 14, 13, 12, 51, etc., then upward to lengths 53, 52 and 56, and then downward and sideways through lengths 48 and 49, finally ending at the length 50. With the dampers 46, 47 and 32 closed and with fans 17, 18, 21 and 22 idle, a convective and diffused internal circulation of air is established within the room by gravity. The air along the ceiling, in proximity to the coil, descends into the upper channel thereof and travels along this channel to its open ends, the air at either side of the medial point traveling in the direction of the adjacent end. Leaving the upper channel at its ends the air flows through the passageways 26, 27 into the lower channel and being effectively refrigerated in the coil descends therefrom through the opening 16 along the bottom thereof. Also, at either side of the coil and between it and the baffle plates 33 and 34, the air, upon becoming cooled, settles to the lower portion of the room. This air, affected by the relatively warm lading and by the relatively warm walls of the room divides and ascends to the ceiling of the room and thence moves along the ceiling toward position over the opening 15 in the coil 10, thus completing the circuit. The opening of the damper 32 attended with the opening of one or the other or both of dampers 46, 47 provides for the ingress of air to and the egress of air from the room. The freshening of the air by thus ventilating the room may be stimulated by operating the fan 60. In this connection, it may be noted that the temperature of the incoming fresh air will be reduced in commingling with the recirculating air within the channels of the coil. The fan motors 19, 20, 23 and 24, like the motor of fan 60, are independently operable. The circulation of the air, therefore, may be stimulated in greater or lesser degree and/or unbalanced, if desired, by the operation of said motors singly or in different combinations. Thus, the rotation of the companion fans in the arcuate passageways 26, 27 will result in a maximum flow of air from the upper channel into and out of the lower channel of the coil, while the rotation of one only of the fans of the different pairs will result in a relatively decreased flow. Further, the effect desired may require election between the companion fans of each pair.

It will be understood, of course, that various modifications in construction may be resorted to without departing from the spirit of the invention as set forth in the accompanying claims.

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

1. A refrigerating appliance comprising a

cooling coil, forming a horizontal channel open along the top thereof, and means for causing the air to flow longitudinally of said channel in opposite directions from mid-length thereof.

2. A refrigerating appliance comprising a cooling coil, forming a horizontal channel open along its top, and a fan disposed at each end of said channel to draw the air longitudinally in opposite directions from mid-length thereof.

3. A refrigerating appliance comprising a cooling coil, disposed adjacent the ceiling of the room, said coil forming a horizontal channel opening downward along the same and open at its ends, and means for forcing air into said channel from both ends thereof.

4. A refrigerating appliance comprising a cooling coil, forming a double horizontal channel, one of said channels opening upward substantially along the entire length thereof and the other opening downward substantially along its entire length, and means for drawing air longitudinally from said upwardly opening channel from both ends thereof and forcing the air so drawn into the opposite ends of the downwardly opening channel longitudinally thereof.

5. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling centrally thereof and comprising a coil, forming longitudinally extending upper and lower channels having a common base, said upper channel opening upwardly and the lower channel opening downwardly, and means for drawing air from each end of the upper channel and forcing it into each end of the lower channel.

6. A refrigerating appliance comprising a cooling chamber forming a double horizontal channel, said channels having restricted openings therein extending substantially the entire length thereof, and being also open at their ends, and means for drawing air from both ends of the upper channel and forcing it into the ends of the lower channel.

7. A refrigerating appliance comprising longitudinally extending, upper and lower cooling channels having openings at their top and bottom sides respectively, and open at their corresponding ends, and a connecting passageway between the open end of one channel and the adjacent open end of the other channel, and a pair of fans disposed in said passageway, one adjacent the open end of the upper channel and the other adjacent the open end of the lower channel, said fans being adapted to draw air from the upper channel and force it into the lower channel.

8. A refrigerating appliance comprising horizontally extending upper and lower cooling channels, disposed adjacent to the ceiling of the room to be cooled, said channels having openings along the top and bottom sides thereof respectively, and open at correspond-

ing ends thereof, and an arcuate passageway connecting the open ends of the upper and lower channels and having a horizontal partition therein, and fans mounted on the upper and lower sides of said partition to draw the air from the end of the upper channel and force it into the communicating end of the lower channel.

9. A refrigerating appliance comprising a cooling coil, forming horizontal upper and lower channels disposed adjacent to the ceiling of the room to be cooled, said channels opening upwardly and downwardly respectively substantially the entire length thereof, said channels being also open at their ends, passageways, one at each end of the coil, each passageway connecting adjacent ends of the upper and lower channels, and having a horizontal partition therein, and fans mounted on the upper and lower sides of the partition to draw the air from one end of the upper channel and to force it into the adjacent end of the lower channel.

10. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling centrally thereof and comprising a channel structure including a first cooling channel and a second cooling channel, each opening therealong into the room, the first at a higher elevation than the second, passageways, one at either end of the channel structure, each passageway bringing into communication the adjacent ends of the channels at one extremity of the channel structure, fans, one in each of said passageways, said fans being adapted to draw air from the opposite ends of the first channel and force it into the opposite ends of the second channel through said passageways, means for introducing air from the outer atmosphere into said first channel, and means for the egress of air from the room.

11. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling centrally thereof and comprising a channel structure including a first cooling channel and a second cooling channel, each opening therealong into the room, the first at a higher elevation than the second, passageways, one at either end of the channel structure, each passageway bringing into communication the adjacent ends of the channels at one extremity of the channel structure, and independently operable fans, two in each of said passageways, said fans being adapted to draw air from the opposite ends of the first channel and force it into the opposite ends of the second channel through said passageways.

12. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling centrally thereof and comprising a channel structure including a first cooling channel and a second cooling channel, each opening therealong into the

room, the first at a higher elevation than the second, passageways, one at either end of the channel structure, each passageway bringing into communication the adjacent ends of the channels at one extremity of the channel structure, fans, one in each of said pasageways, said fans being adapted to draw air from the opposite ends of the first channel and force it into the opposite ends of the second channel through said passageways, a conduit for introducing air from the outer atmosphere into said first channel, a fan in said conduit for stimulating the inflow of air therethrough, and means for the egress of air from the room.

13. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling centrally thereof and comprising a cooling coil having a plurality of paralleled closely adjacent lengths of pipe connected so as to form one continuous duct from inlet to outlet thereof, said lengths being disposed to form upwardly and downwardly opening channels having a common base and open at their ends, and means at the opposite ends of the coil adapted to take air from the ends of the upwardly opening channel and force it into the ends of the downwardly opening channel.

14. An appliance of the character described comprising a coil for a temperature affecting medium having a plurality of parallel closely adjacent lengths of pipe, connected so as to form one continuous duct from the inlet to the outlet thereof, said lengths being disposed so as to form two horizontal channels having a common base and open at their ends, and means bringing the corresponding open ends of said channels into communication with each other.

15. An appliance of the character described comprising a coil for a temperature affecting medium having a plurality of parallel lengths of pipe connected so as to form a continuous duct from the inlet to the outlet thereof, said lengths being disposed so as to form two horizontal channel structures open at their ends and having a common base, one channel structure having a restricted longitudinal opening in the upper portion thereof and the other channel structure having a similar opening in the lower portion thereof, and means bringing the corresponding open ends of said channels into communication with each other.

16. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling thereof and comprising conducting means for a circulatory refrigerating medium, said means forming a horizontal passageway for air opening along the lower portion thereof into the interior of the room, and means for introducing fresh air from the outer atmosphere into said passageway, lengthwise thereof.

17. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling thereof and comprising conducting means for a circulatory refrigerating medium, said means forming a horizontal passageway for air opening along the lower portion thereof into the interior of the room, means for impelling air from the interior of the room into said passageway at one end lengthwise thereof, and means for refrigerating said air prior to its passage into said passageway.

18. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling thereof and comprising conducting means for a circulatory refrigerating medium, said means forming a horizontal passageway for air opening along the lower portion thereof into the interior of the room, means for impelling fresh air from the outer atmosphere into said passageway at one end lengthwise thereof, and means for refrigerating said fresh air prior to its passage into said passageway.

19. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling thereof and comprising conducting means for a circulatory refrigerating medium, said means forming a horizontal passageway for air opening along the lower portion thereof into the interior of the room, means for impelling fresh air from the outer atmosphere into said passageway at its opposite ends, lengthwise thereof, and means for refrigerating such fresh air prior to its passage into said passageway.

20. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling thereof and comprising conducting means for a circulatory refrigerating medium, said means forming a horizontal passageway for air opening along the lower portion thereof into the interior of the room, means for impelling air from the interior of the room into said passageway at its opposite ends, lengthwise thereof, and means for refrigerating such air prior to its introduction to said passageway.

21. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling thereof and comprising conducting means for a circulatory refrigerating medium, said means forming a horizontal passageway for air opening along the lower portion thereof into the interior of the room, and means for impelling air from the interior of the room into said passageway at its opposite ends, lengthwise thereof.

22. In combination, a room structure, a refrigerating appliance disposed longitudinally of the room near the ceiling thereof and comprising conducting means for a cir-

culatory refrigerating medium, said means forming a horizontal passageway for air opening along the lower portion thereof into the interior of the room, and means for introducing fresh air from the outer atmosphere into said passageway at its opposite ends, lengthwise thereof.

23. In combination, a room structure, an appliance disposed longitudinally of the room near the ceiling and comprising conducting means for a temperature affecting medium, said means forming longitudinally extending channels opening into the room at different elevations, and means bringing the corresponding ends of said channels into communication with each other.

In testimony whereof I have affixed my signature to this specification.

CHARLES A. MOORE.