Dec. 17, 1935. E. E. EICKMEYER 2,024,436

REFRIGERATOR

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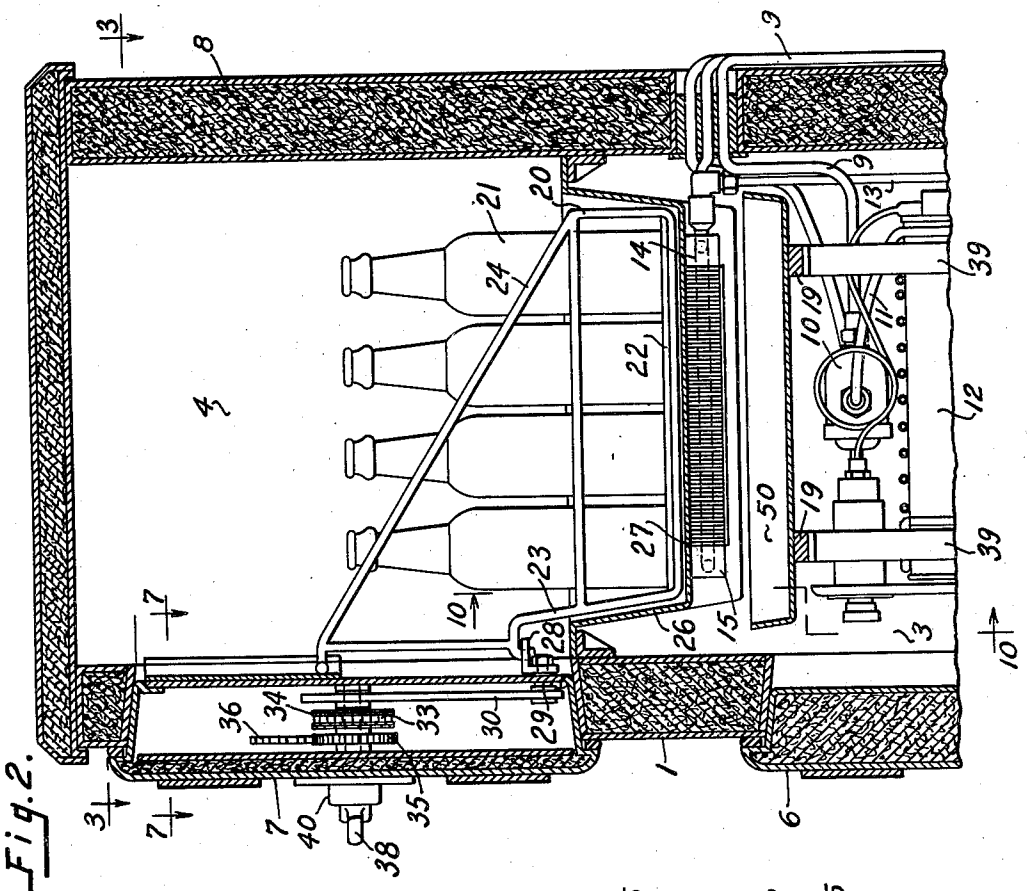


Fig. 2.

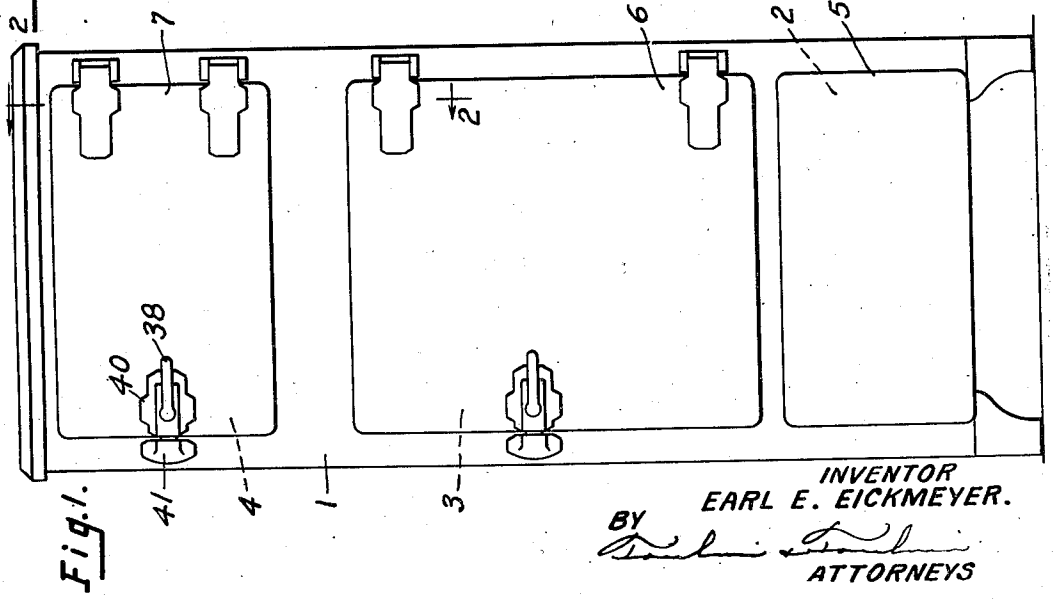


Fig. 1.

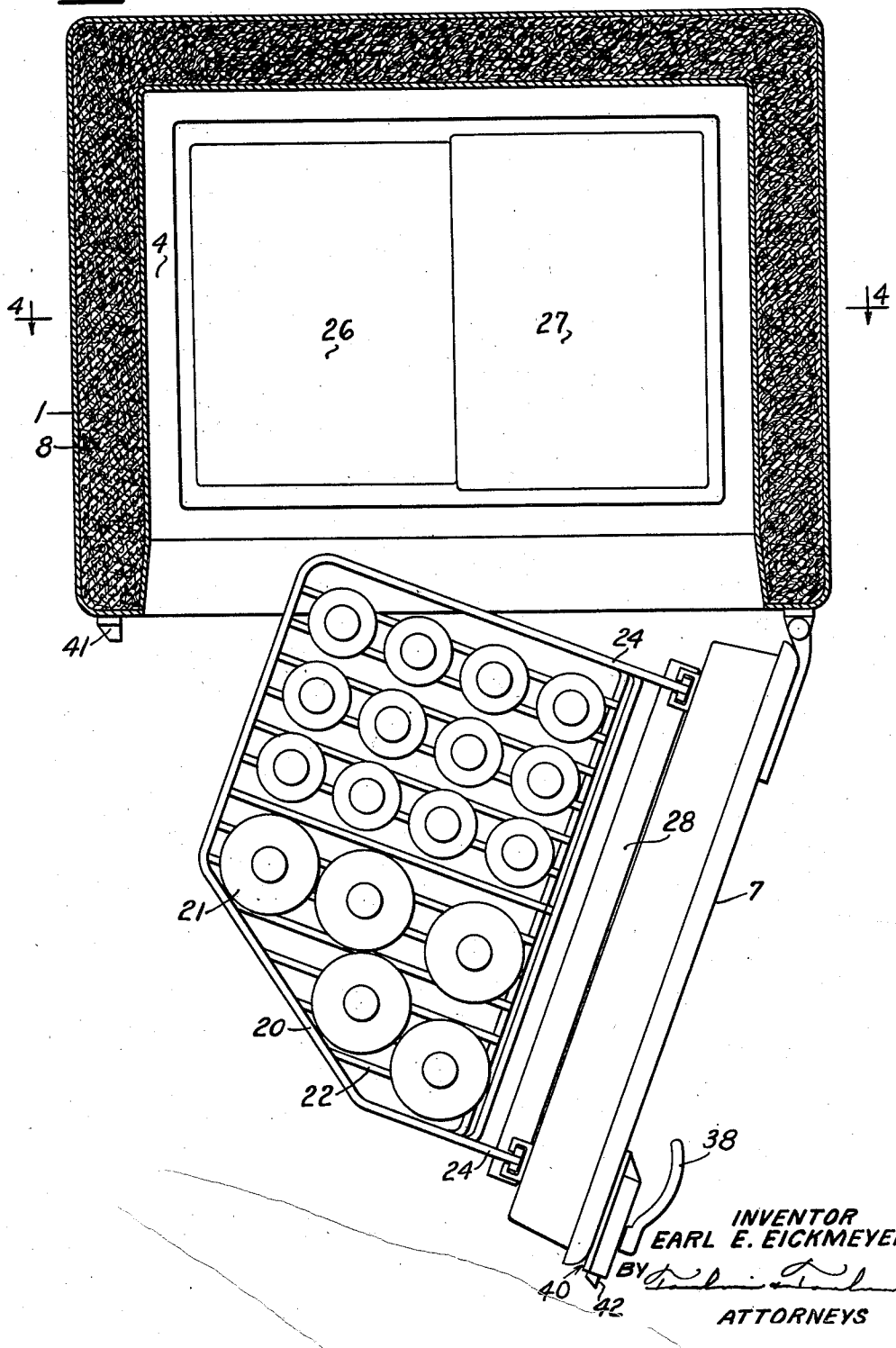
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Fig. 3.



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Fig. 4.

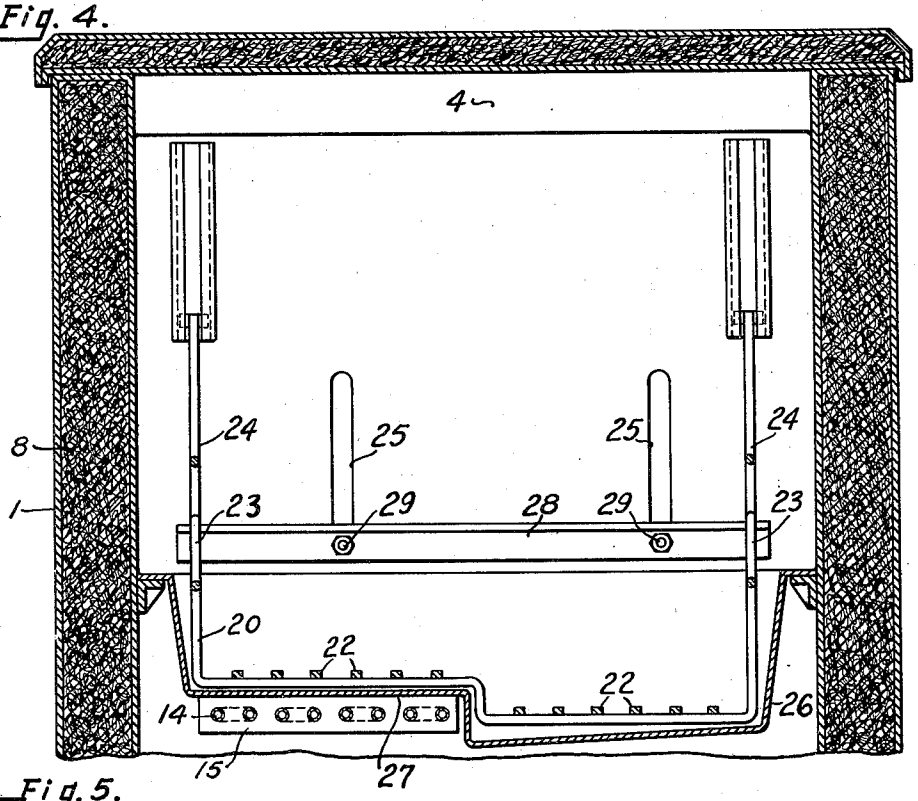
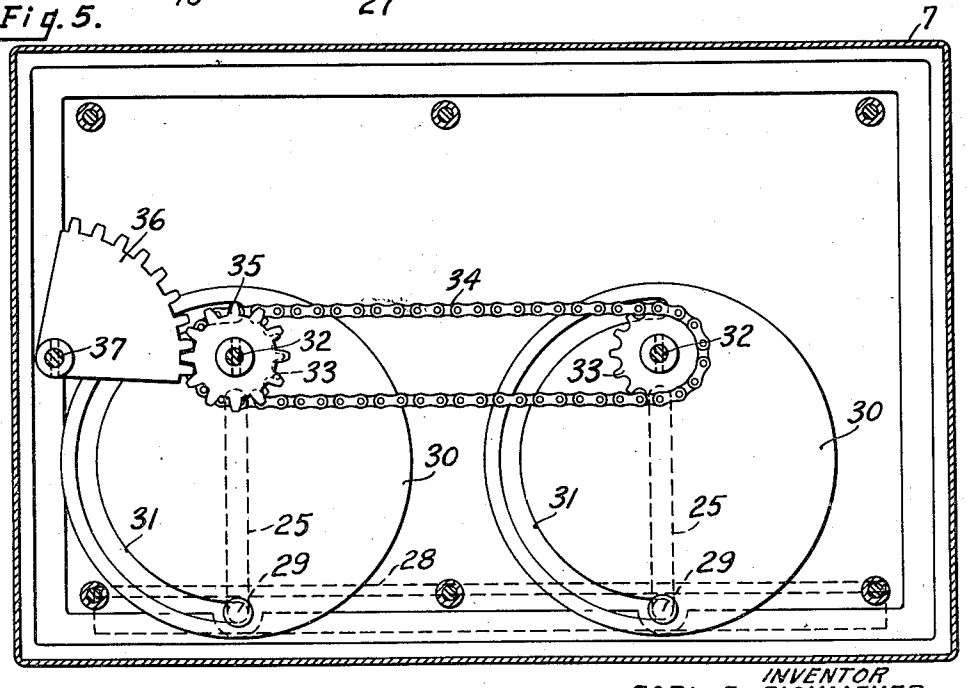


Fig. 5.



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Fig. 6.

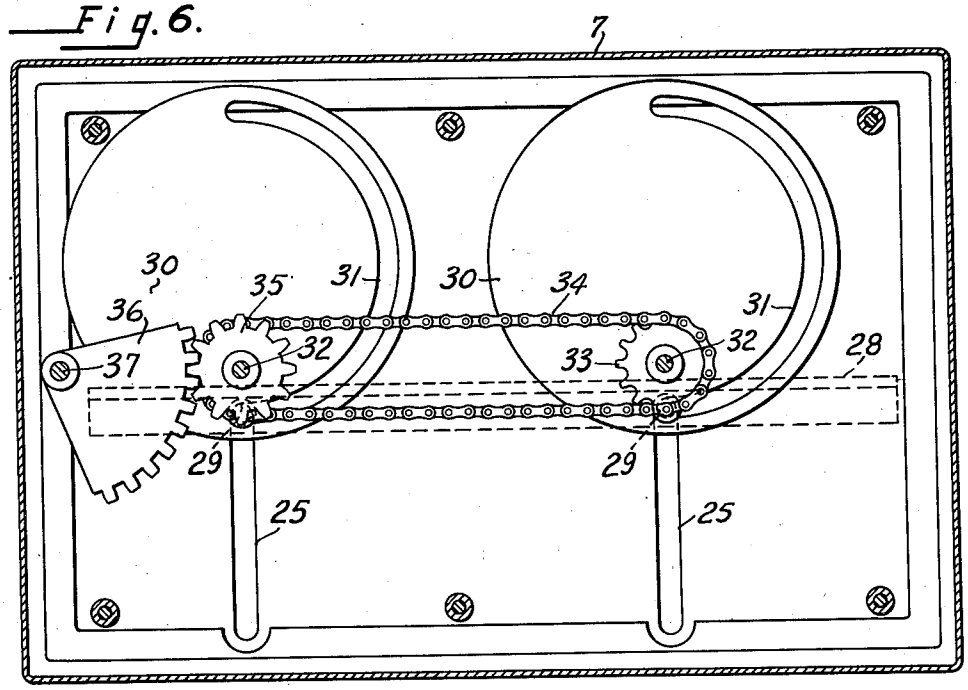


Fig. 7.

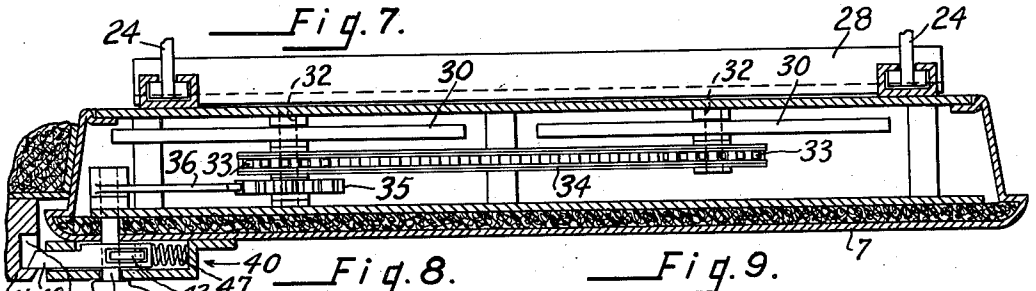


Fig. 8.

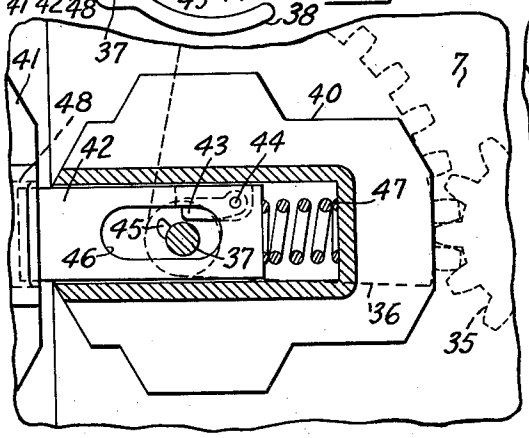
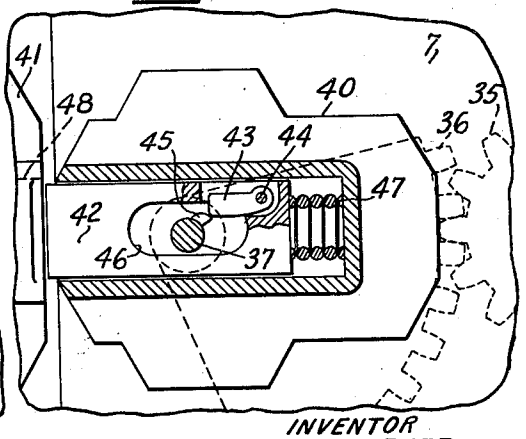


Fig. 9.



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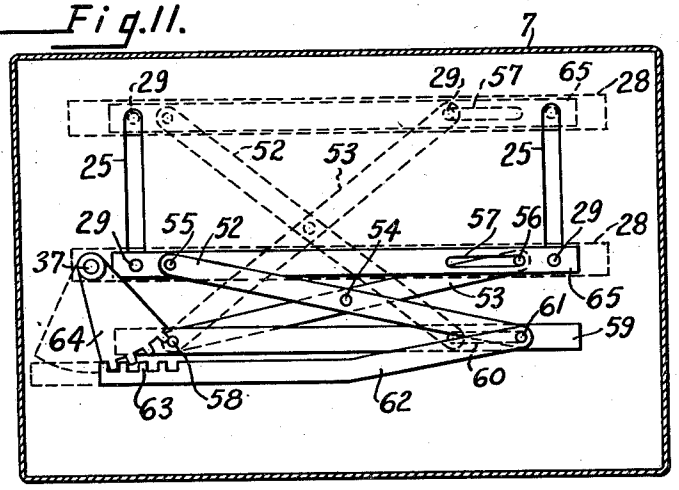
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Fig. 11.



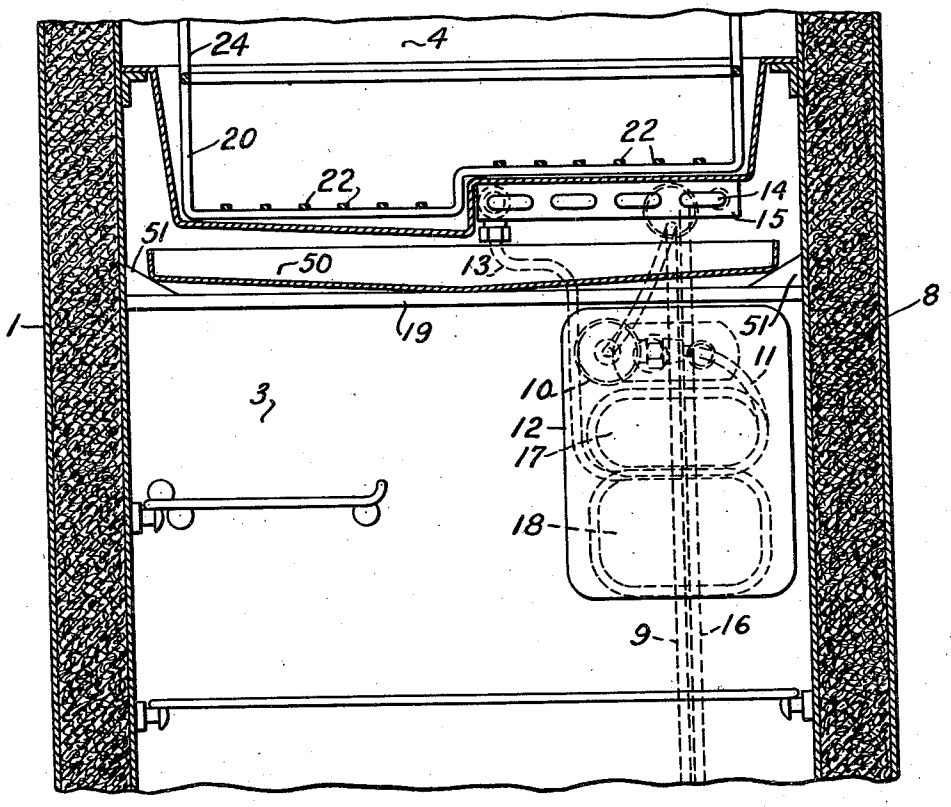


Fig. 10.

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Patented Dec. 17, 1935 2,024,436

UNITED STATES PATENT OFFICE

2,024,436

REFRIGERATOR

Earl E. Eickmeyer, Dayton, Ohio, assignor to The Dayton Pump & Manufacturing Co., Dayton, Ohio, a corporation of Ohio

Application July 19, 1934, Serial No. 736,102

11 Claims. (Cl. 62—116)

This invention relates to refrigerators and especially to refrigerators having provision for subjecting the contents to different conditions of refrigeration, as in different compartments thereof.

One object of the invention is to provide a refrigerator having a container for refrigerated articles, which is movable within the refrigerator.

Another object is to provide a refrigerator having a container for refrigerated articles, which is attached to the door and movable relatively thereto, so as to be changed in its position with respect to the refrigerating coils by which its contents are cooled.

Another object is to provide a refrigerator having a movable container operatively connected with the door-opening mechanism so as to be moved when the door is opened and/or closed.

Another object is to provide a refrigerator having a refrigerated-article container attached to a door of the refrigerator and operatively connected to the door-locking device in such a manner that the door may not be opened until the container is in a position to freely move out of the refrigerator casing without colliding with any part of the apparatus.

Another object is to provide a refrigerator having separate refrigerated compartments, at least one of which is provided with cooling coils and a container movable relatively thereto, this container being adapted to contain refrigerated articles and being mounted in such a manner as to be in close proximity to the cooling coils when the refrigerator is closed, yet movable into a raised position when the door of the refrigerator is opened.

In the drawings:

Figure 1 is a front elevation of the refrigerator of the invention;

Figure 2 is a vertical section through the refrigerator, taken along the line 2—2 of Figure 1;

Figure 3 is a horizontal section along the line 3—3 of Figure 2;

Figure 4 is a vertical section along the line 4—4 of Figure 3, but with the door of the refrigerator closed;

Figure 5 is an elevational section of the mechanism interconnecting the door-opening lever with the container raising mechanism, with the container in its lower position;

Figure 6 is a view similar to Figure 5, but with the container-lifting mechanism in its raised position;

Figure 7 is a horizontal section through the door-locking and container-raising mechanism, taken along the line 7—7 of Figure 2;

Figure 8 is an enlarged view, in section, of the door lock, with the mechanism in a locked position;

Figure 9 is a view similar to Figure 8, but with the mechanism in an unlocked position;

Figure 10 is a vertical section along the line 10—10 of Figure 2, showing the container in position over its cooling coils;

Figure 11 is a front elevation, partly in section, of operating mechanism for a modified type of container-raising apparatus.

Referring to the drawings in detail, Figure 1 shows the refrigerator of the invention as having a casing 1 with lower, middle, and upper compartments 2, 3 and 4 respectively. Access to the interior of these compartments is gained by means of doors 5, 6 and 7. The walls and doors of the casing 1 are filled with a suitable insulating material 8 to retard the conduction of heat therethrough.

The lower compartment 2 is adapted to contain the refrigerating unit of any suitable type, this forming no part of the present invention. Such a refrigerating-unit generally consists of an electric motor arranged to drive a compressor which is in turn connected to condensing coils. The latter are usually provided with a liquid tank for receiving the refrigerant in its liquid condition.

The liquefied refrigerant is conducted upward from the refrigerating unit through the pipe 9 (Figures 2 and 10) to the "header" 10, from which the pipe 11 leads downward to the main refrigerating coils 12. From the opposite end of the main refrigerating coils 12, the pipe 13 leads upward to the supplementary refrigerating coils 14, which are mounted in a frame 15, supported between the refrigerator walls. From the opposite end of the supplementary refrigerating coils 14, the return pipe 16 leads downward to the refrigerating unit. The main refrigerating coils 12 surround hollow chambers 17 and 18 (Figure 10), these being adapted to receive trays for the production of ice cubes or other similar refrigerated articles. The main refrigerating coils 12 are supported by the brackets 39 connected to the cross members 19 extending horizontally between the opposite walls of the refrigerator (Figures 2 and 10).

Movably mounted upon the door 7 of the refrigerator is the container 20 which is adapted to receive the articles to be refrigerated. The latter may comprise substances in bottles 21, it being found preferable to cool bottled goods by immersing them in a cooled solution rather than by

merely exposing them to the cooling action of air whose temperature has been reduced. To this end the container 20 is provided with a reticulated bottom wall 22 so that the liquid may pass readily through it and surround the bottles 21 when the container 20 is immersed in the cooling liquid.

The container 20 is attached to the door 7 by means of the bracket members 23 and 24, these being movably supported in guideways 25 on the door. (Figures 2 and 4). The guideways 25 are arranged in a vertical direction and cooperate with the brackets 23 and 24 in such a manner as to allow the container 20 to be raised and lowered, yet to provide a supporting action during this operation. The container 20 in its lowered position rests in a liquid tank 26 (Figures 2, 4 and 10), which has a pocket 27, in which is arranged the supplementary cooling coils 14. The liquid tank 26 is filled with any suitable liquid, such as water, the temperature of this liquid being reduced by the action of cooling coils 14. The substances in the bottles 21 in the container 20 are then cooled by the action of the cooled liquid surrounding them.

The mechanism for raising and lowering the container 20 relative to the liquid tank 26 comprises an arm 28 (Figures 2 and 7), which is connected by the short rods 29 to the cam wheels 30 (Figures 5, 6 and 7). The latter are provided with cam grooves 31 engaged by the rods 29 and mounted eccentrically upon the shafts 32. The rods 29 are adapted to engage the vertical guideways 25, so that when the cam wheels 30 are turned, the rods 29 rise or fall, transmitting a corresponding motion to the container 20 through the arm 28 and the brackets 23 and 24. The cam wheels 30 are moved in synchronism by the sprockets 33 mounted upon the cam wheel shafts 32 and drivingly interconnected by the sprocket chain 34.

Mounted upon one of the shafts 32 is a pinion 35 by which the cam wheels 30 are driven simultaneously from the gear quadrant 36 mounted upon the door handle shaft 37 (Figures 5, 6 and 7). The latter passes through the locking mechanism, and carries a hand lever 38 on its outer end.

The locking devices, generally designated 40, comprise a latch-receiving member 41 (Figures 7, 8 and 9), which is engaged by the latch member 42, when the lock is in its closed position as shown in Figure 8. The latch member 42 is operated by the pawl 43 pivotally mounted upon the pin 44 attached thereto (Figures 8 and 9). The handle shaft 37 is provided with a stud 45 which is arranged to engage the pawl 43 when the handle shaft 37 is rotated through the action of the hand lever 38. The latch-receiving member 41 is provided with a slotted portion 46 whereby the latch member 42 may reciprocate without interfering with the moving parts of the handle shaft 37. The latch member 42 is urged in one direction by the coil spring 47, opposing the action of the handle shaft 37 and stud 45. Figure 8 shows the position of the locking mechanism when the lock is in its closed position. In Figure 9, however, the handle shaft has been turned to withdraw the latch member 42 from the socket 48 of the latch-receiving member 41. This same action rotates the cam wheels 30, thereby lifting the container 20 out of the tank 26 and placing it in such a position as to be withdrawn from the refrigerator casing when the door is opened. Figure 5 shows the position of the container-raising mechanism in its lowered position, whereas Figure 6 shows the same mechanism in its raised position. It will be observed, however, that the lock 40 does not become operative to unlock the door 7 until the container 20 has reached its fully raised position. This action prevents a collision between the container and the walls or other parts of the refrigerator. When the handle shaft 37 is turned to a more advanced position, such as in Figure 9, the stud 45 passes the pawl 43, releasing the latch member 42 so that the latter is free to reengage the socket 48 when the door 7 is again closed.

The refrigerator is provided with a drip pan 50 (Figure 10), which is preferably of heat-conducting material of such a nature as to permit the refrigerating action of the refrigerating coils 12 and 14 to extend therethrough between the compartments 3 and 4. The drip pan 50 is supported by the brackets 51 and the cross members 19.

A modified form of container-raising mechanism is shown in Figure 11. In this modification, the arm 28 is provided with the rods 29 which engage the vertical guideways 25, as previously described. The arm 28, however, is raised and lowered by a "lazy-tong" linkage. The latter consists of a pair of links 52 and 53 which are pivotally connected to one another as at 54 (Figure 11). The upper end of the link 52 is pivotally connected to the arm 65, whereas the upper end of the link 53 is provided with a pin 56 slidably engaging the horizontal slot 57 in the arm 65. The lower end of the link 53 is pivotally connected, as at 58, to the supporting bar 59, the opposite end of which is provided with a slotted portion 60 engaged by the pin 61. The latter is mounted upon the lower end of the link 52 and on it is pivotally mounted the connecting link 62 having the rack portion 63 upon its opposite end. The rack portion 63 is engaged by the teeth on the gear quadrant 64 in a manner similar to that previously described for the gear quadrant 36. When the handle shaft 37 of the mechanism shown in Figure 11 is turned, the connecting link 62 is moved horizontally through the action of its rack portion 63, thus raising or lowering the container arm 28 through the intermediate action of the "lazy-tong" levers 52 and 53. The raised position of the container arm 28 is shown in dotted lines in Figure 11.

In the operation of the refrigerator, the doors 5, 6 and 7 are closed, whereupon the container 20 with its contents moves downward into the liquid tank 26 through the action of the mechanism just described. The refrigerating unit is then started, whereupon the refrigerating gas is liquefied and passes upward through the pipe 9 into the "header" 10 (Figures 2 and 10) into the main cooling coils 12. The refrigerant is then in an expanding condition, and while in that condition, it extracts heat from the surrounding air according to the well-known principles of thermodynamics. After passing through the main cooling coils 12, the refrigerant proceeds upward through the pipe 13 to and through the supplementary cooling coils 14, returning to the refrigerating unit through the return pipe 16. The supplementary cooling coils 14 likewise withdraw heat from the liquid in the liquid tank 26, thus cooling the contents of the bottles 21 in the container 20 immersed therein.

When it is desired to withdraw some of the bottles, the hand lever 38 is turned. The first part of the turning action lifts the container 20 and its contents out of the tank 26. When this motion has been accomplished, the stud 45

on the handle shaft 37 engages the pawl 43 (Figures 8 and 9), releasing the latch member 42 from the socket 48 and allowing the door to be opened. In this manner, the refrigerating door 7 cannot be opened until the container 20 is fully lifted, thus preventing any collisions between the container and other parts of the refrigerator.

When the door 7 has been opened, and the container 20 swings outward with the door, the tops of the bottles 21 then come completely into view so that the particular bottle may be selected. In this way the bottles are made more conveniently of access than is the case when they must be withdrawn through the top of the refrigerator. At the same time, the devices of this invention provide a dry-refrigerating effect in the chamber 3 as well as a wet-refrigerating effect in the chamber 4. These two kinds of refrigeration are best suited for different kinds of articles, as previously stated. It has been found that beverages are much more satisfactorily cooled when the bottles containing them are immersed in a cooling liquid than when they are merely exposed to the cooling action of air, whereas the reverse condition is true of other food products. The refrigerator of the present invention, therefore, enables the ideal cooling condition to be applied to the particular article for which it is best adapted.

It will be understood that I desire to comprehend within my invention such modifications as may be necessary to adapt it to varying conditions and uses.

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

1. In a refrigerator, a casing, a door for said casing, a refrigerating device within said casing, a container operatively connected to said door and movable relatively thereto, means for raising and lowering said container relative to said door, means for locking said door, and means operatively connected to said locking means to raise said container while said locking means is being operated.

2. In a refrigerator, a casing, a door for said casing, a refrigerating device within said casing, a container operatively connected to said door and movable relatively thereto, means for raising and lowering said container relative to said door and to said refrigerating device, means for locking said door, and means operated by said locking means to raise said container relatively to said door while opening said door.

3. In a refrigerator, a casing, a door for said casing, a refrigerating device within said casing, a movable container operatively connected to said door, means for raising and lowering said container relative to said refrigerating device, means for locking said door, means operatively connected to said locking means to raise said container while opening said door, and means for preventing the unlatching of said door before said container reaches its raised position.

4. In a refrigerator, a casing, a door for said casing, latching means mounted on said door, a refrigerating device within said casing, a tank associated with said refrigerating device, a container operatively connected to said door and movable relatively thereto, and means for raising and lowering said container relative to said tank, said last-mentioned means being operatively connected to said door-latching means to be actuated thereby when said door is unlatched whereby to raise said container out of said tank and permit said container to be withdrawn from said casing, said container in one of its positions being operative to interfere with the opening of said door.

5. In a refrigerator, a casing, a door for said casing, a refrigerating device within said casing, a tank associated with said refrigerating device, a movable container operatively connected to said door, means for raising and lowering said container relative to said tank, and means for preventing the unlatching of said door before said container reaches its raised position.

6. In a refrigerator, a casing, a door for said casing, a refrigerating device within said casing, a tank associated with said refrigerating device, means for raising said container relative to said tank, and latching means for said door, said latching means being operatively connected to said container-raising means to raise the same before releasing said door.

7. In a refrigerator, a casing, a door for said casing, a container movably mounted on said door, latching means for said door, means for successively operating said container-raising means and said door-latching means, a tank adapted to receive said container in its lowered position, a refrigerating device associated with said tank and adapted to cool liquid therein, and means for reciprocably guiding said container to move vertically relative to said door.

8. A door assembly for a refrigerator combining a door, a container movably mounted on said door, means for moving said container relative to said door, and means for latching said door, said latching means being arranged to simultaneously move said container and unlatch said door.

9. A door assembly for a refrigerator combining a door, a latch on said door adapted to releasably hold the door in a locked position, a container mounted on said door and movable relatively thereto, and means for moving said container relative to said door, and mechanism operatively interconnecting said latch and said container-moving means whereby to simultaneously move said container and unlatch said door.

10. A door assembly for a refrigerator combining a door, a container movably mounted on said door, operatively interconnected means for moving said container relative to said door and for unlatching said door, and means for preventing the unlatching of said door before said container is moved to a predetermined position.

11. A lock for a refrigerator door having a container movably supported thereon comprising a latch member on the door adapted to releasably hold the door in a locked position, a latch-receiving member, and means for operating said latch member, said last-mentioned means being operatively connected to said movable container whereby to simultaneously move said container and unlatch said door.

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