

No. 685,475.

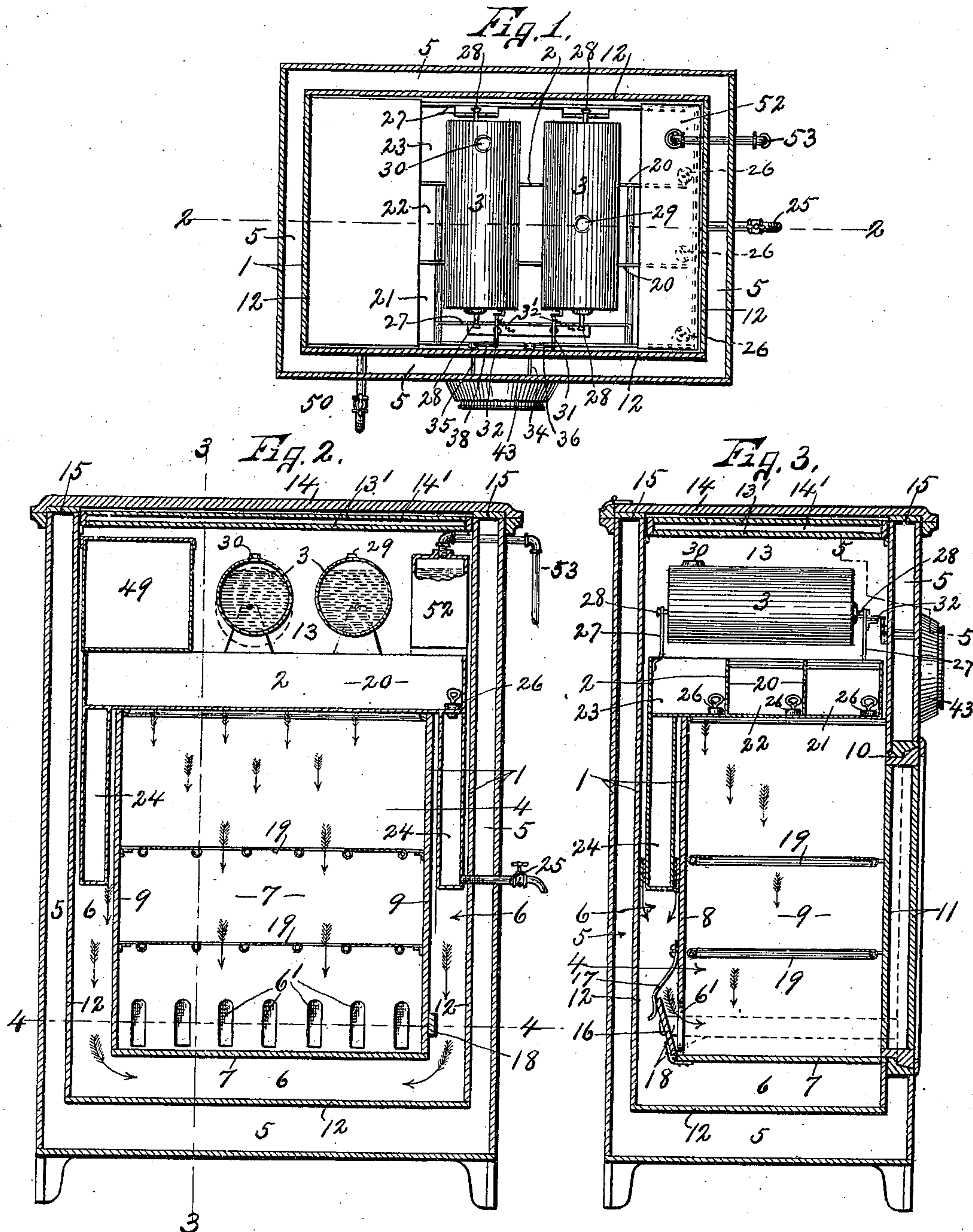
Patented Oct. 29, 1901.

R. HIRSH.  
REFRIGERATOR.

(Application filed Apr. 24, 1901.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:  
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W. E. Chase

INVENTOR  
Ralph Hirsch  
BY  
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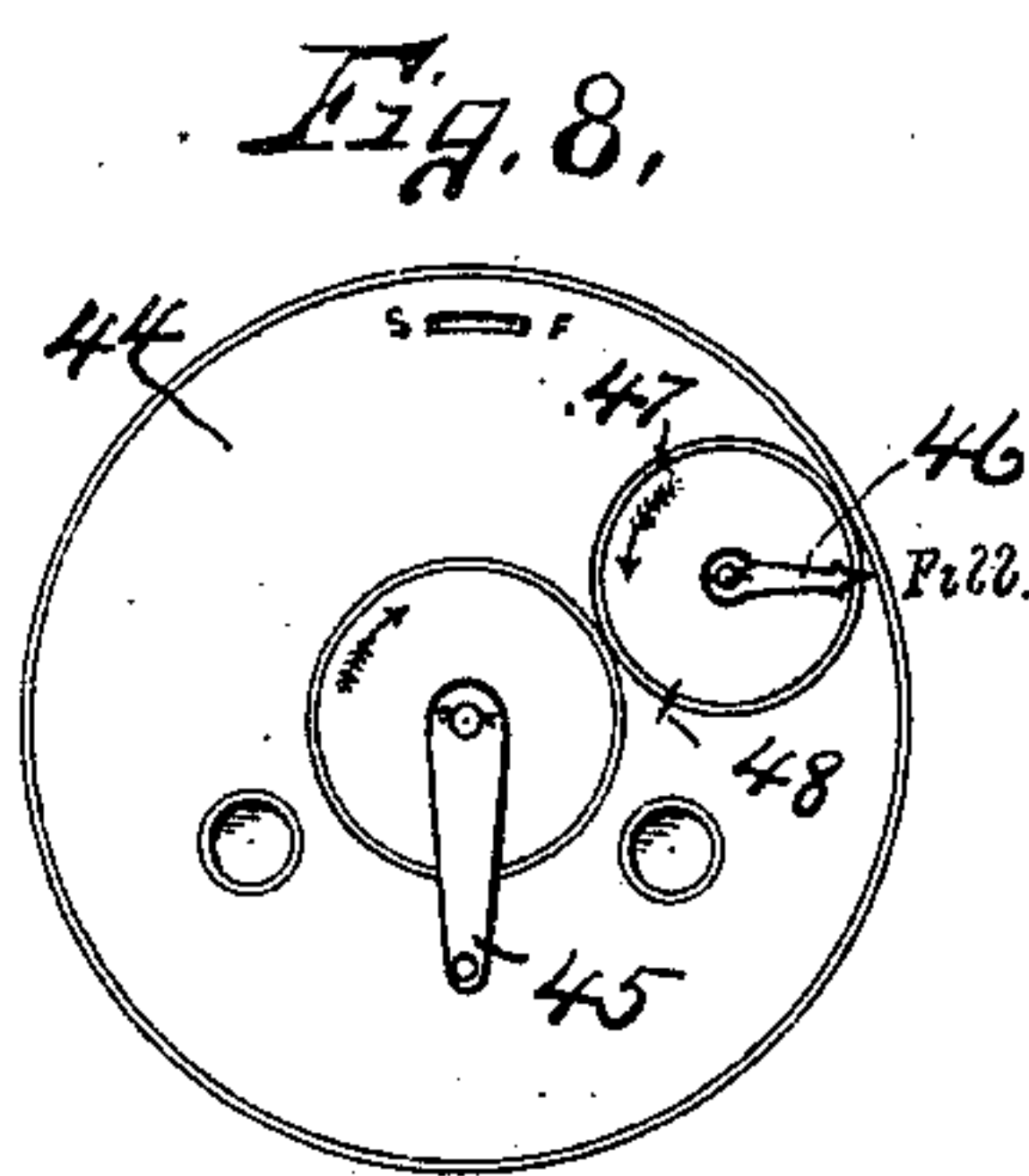
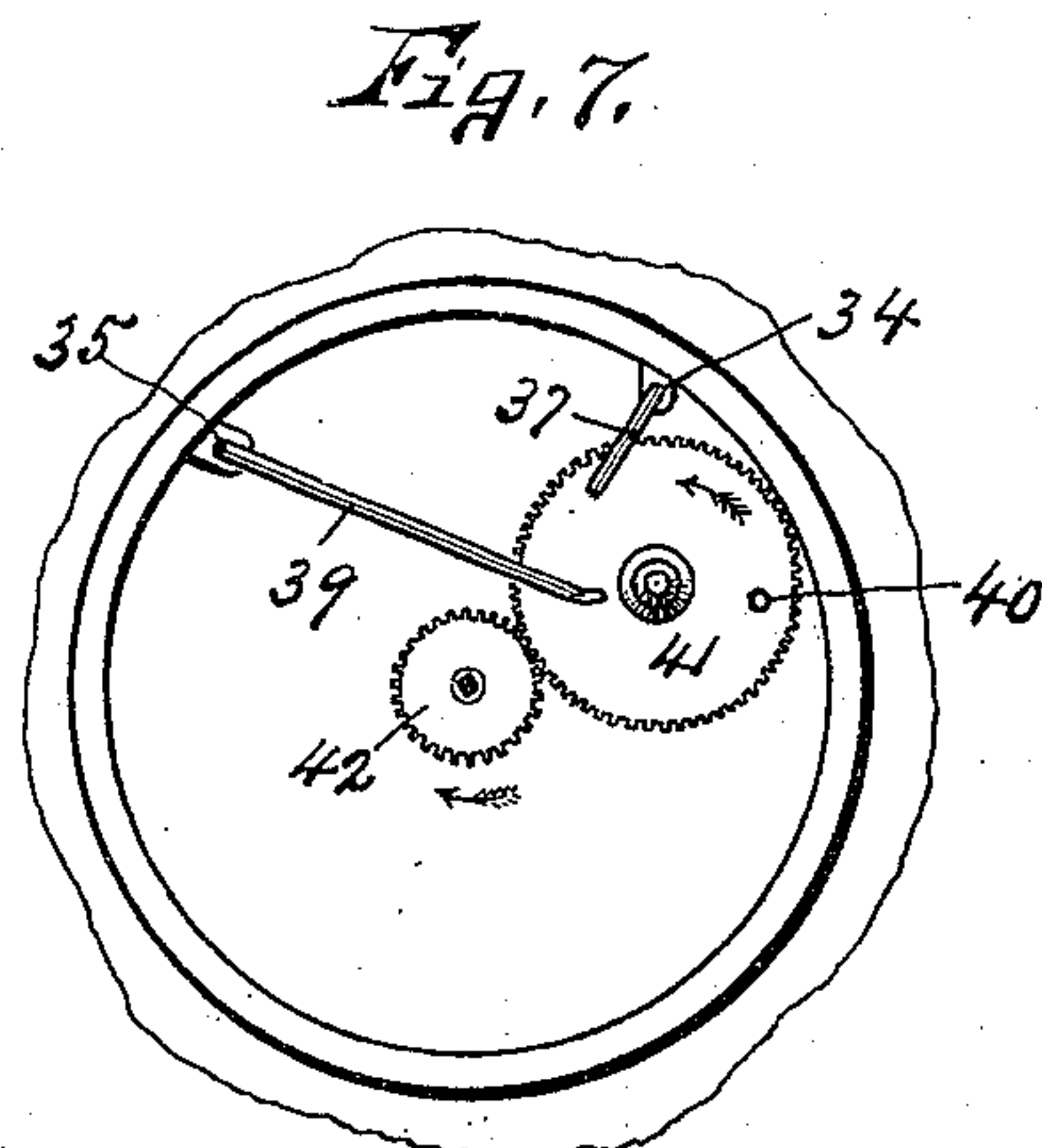
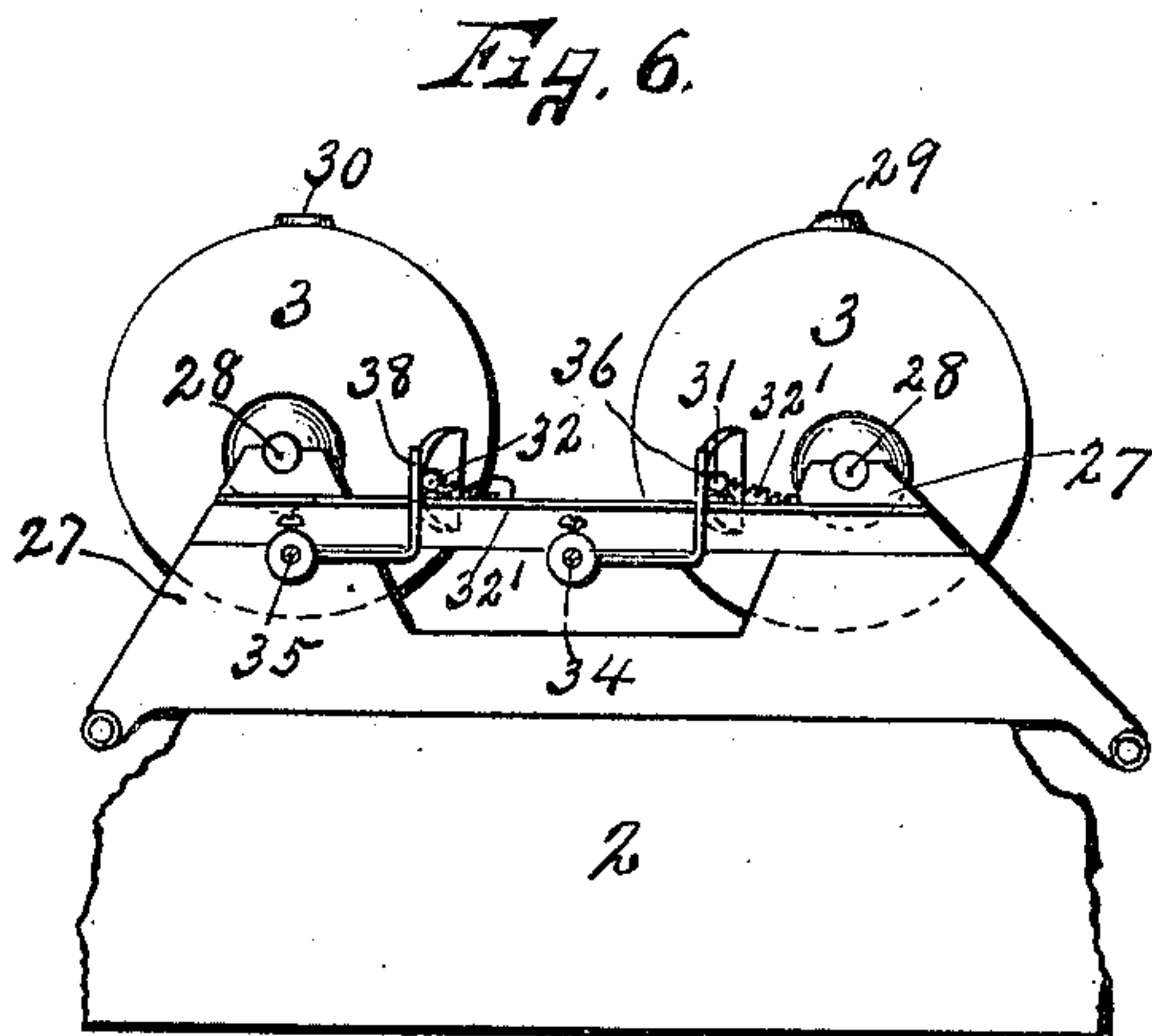
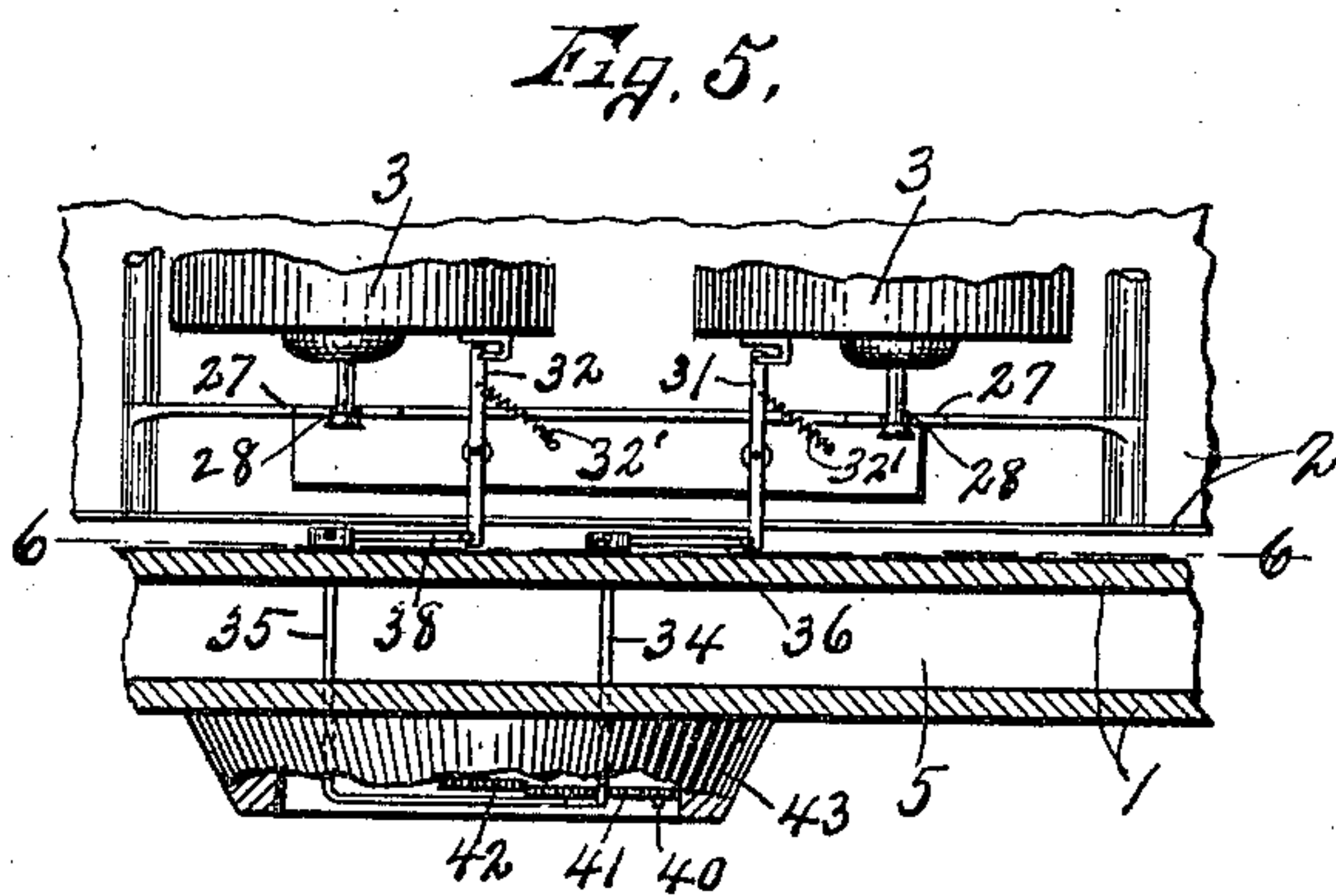
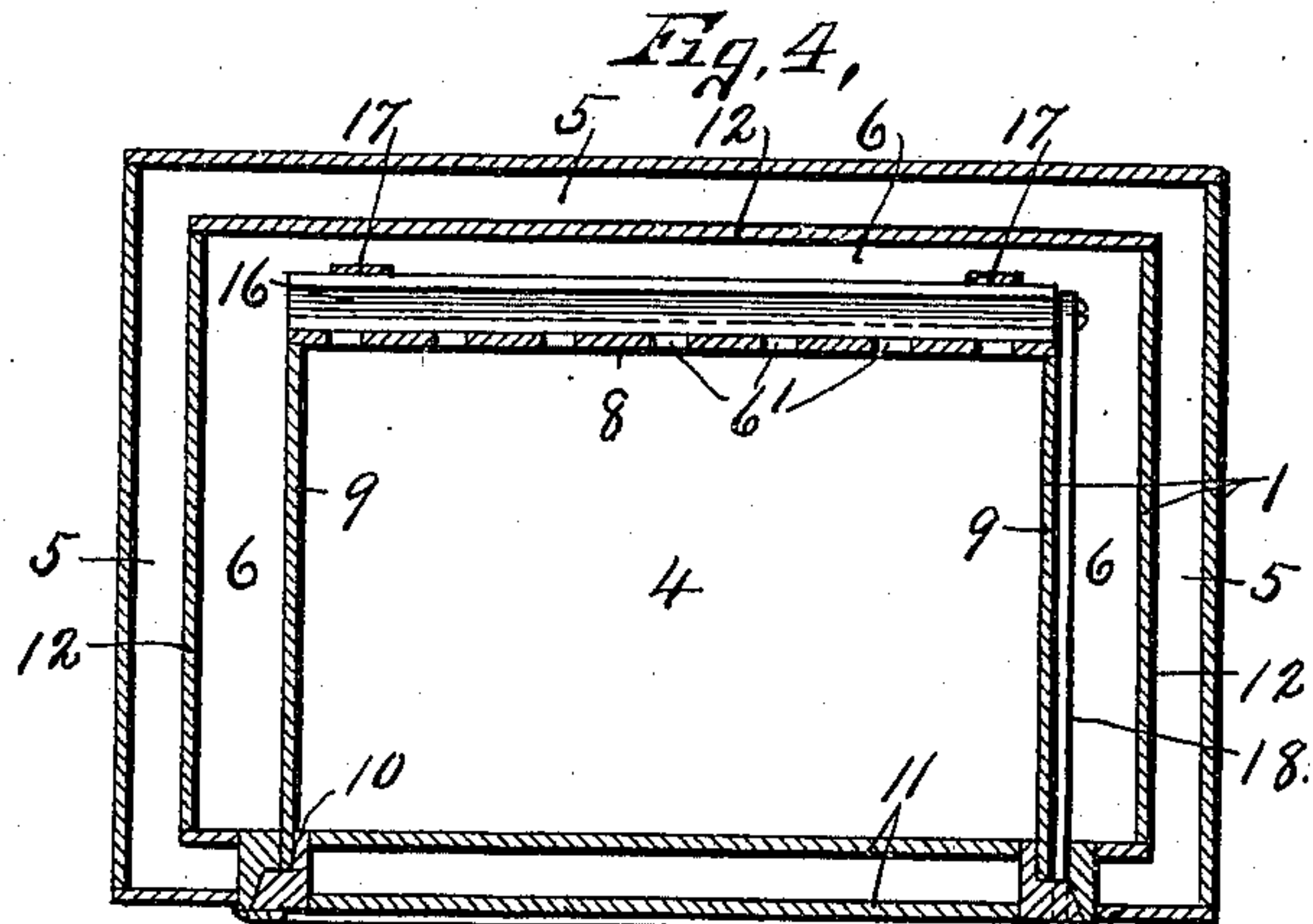
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# UNITED STATES PATENT OFFICE.

RALPH HIRSH, OF SYRACUSE, NEW YORK.

## REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 685,475, dated October 29, 1901.

Application filed April 24, 1901. Serial No. 57,290. (No model.)

*To all whom it may concern:*

Be it known that I, RALPH HIRSH, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful  
5 Improvements in Refrigerators, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to improvements in  
10 refrigerators, having more particular reference to that class in which a freezing mixture is employed as a cooling agent.

The object of this device is to provide a soluble base as one of the elements of a freezing  
15 mixture in which water is used as the other element, whereby the soluble base may be recovered and reused as many times as may be desirable, the soluble material being free from odor or injurious fumes.

20 A further object of my invention is to provide a tank having one or more compartments for receiving the dry soluble element and in arranging a plurality of gravity-operated water-containing receptacles controlled by a  
25 clock-movement, whereby the receptacles may be made to discharge their contents into their respective compartments at predetermined intervals of time.

A still further object of this invention is to  
30 provide the refrigerator-case with a cold-air chamber surrounding the sides, back, and bottom of a suitable provision-chamber and forming the refrigerator-tank with water-legs depending into the cooling-chamber at the  
35 sides and back of the provision-chamber for receiving the solution from the refrigerator-tank, whereby additional heat is extracted from the provision-chamber.

Another object of this invention is to provide  
40 one of the walls of the provision-chamber with cold-air passages communicating with the cold-air chamber and arranging a valve controlled by the position of the door of the provision-chamber, whereby when the  
45 door is closed the valve is opened, and when the door is opened the valve is closed for preventing the escape of the cold air from the cold-air chamber of the refrigerating-case, the means for connecting said valve to the door  
50 being concealed in the cold-air chamber.

Another object of this invention is to provide

the refrigerating-chamber above the provision-chamber with a liquid-reservoir, from which air may be exhausted by a suitable vacuum-pump for the purpose of increasing  
55 the refrigeration within said chamber.

To this end the invention consists in the combination, construction, and arrangement of the component parts of a refrigerator, as hereinafter fully described, and pointed out  
60 in the claims.

Referring to the drawings, Figure 1 is a horizontal sectional view just beneath the lid of the refrigerator, showing in top plan the interior mechanism. Figs. 2, 3, 4, and 5 are  
65 sectional views taken, respectively, on lines 2 2, Fig. 1, 3 3 and 4 4, Fig. 2, and 5 5, Fig. 3, Fig. 5 being somewhat enlarged. Fig. 6 is a vertical sectional view taken on line 6 6, Fig. 5. Fig. 7 is a front face view of the  
70 clock-actuated gears which control the mechanism of the trips or catches which release the liquid-containing receptacles. Fig. 8 is a front face view of the dial and the resetting device for the indicator of the dial.  
75

Similar reference characters indicate corresponding parts in all the views.

As seen in the drawings, this invention consists of a refrigerator-case 1, a tank 2 for receiving a soluble element of a freezing mixture, one or more gravity-operated receptacles 3, which contain a liquid forming the  
80 other element of the freezing mixture, and suitable clock-controlled trip mechanisms normally holding the receptacles in their elevated position.  
85

The inclosing case 1 of the refrigerator is provided with inner, outer, and intermediate chambers 4, 5, and 6, the inner chamber 4 forming the provision-chamber, and is  
90 closed by bottom, rear, and side walls 7, 8, and 9, the front portion of said provision-chamber being provided with an opening 10, closed by a suitable door 11, which forms the front wall of the provision-chamber. The  
95 chambers 5 and 6 are separated from each other by a suitable partition 12, which extends around the sides, back, and bottom of the provision-chamber 4 and above the upper wall of the provision-chamber, the chamber 6 communicating with a refrigerating-compartment  
100 13, which forms the upper portion of the in-



terior of the inclosing case above said provision-chamber and in which the cold air is produced.

The refrigerator-case 1 is provided with a  
5 suitable lid 14 and a removable supplementary lid 13', having a dead-air chamber 14', forming the upper wall of the refrigerating-chamber 13, and permits ready access to said chamber 13 when desired to supply the freezing  
10 mixture or to remove either of the liquid-receptacles 3 for the purpose of refilling the same.

The side and back walls of the partition 12 preferably extend upwardly to the lid 14, being  
15 united to the outer walls of the refrigerator-case by suitable caps or horizontal walls 15, which, together with the side, back, and bottom walls of the partition 12 and outer wall of the case, forms the dead-air chamber  
20 5, having no communication with the cold-air chamber 6, and thereby increases the efficiency of the refrigerator.

The base of the rear wall 8 of the provision-chamber is provided with a series of cold-air  
25 passages 6', connecting said provision-chamber with the cold-air chamber 6, the passages being closed by an automatically-closing valve 16, actuated by suitable springs or equivalent mechanism 17. This valve 16 is automatic-  
30 ally opened when the door is closed for permitting the cold air to pass from the cold-air chamber 6 to the chamber 4, being provided with a push-rod 18, concealed within the cold-air chamber and having one end pivotally  
35 connected to the valve 16 and its other end adapted to be engaged by the door 11, said valve being forced open against the action of the springs 17 by the door operating upon the push-rod 18 when the door is closed and the  
40 springs 17 serving to automatically close said valve when the door is opened for preventing undue escape of the cold air from the compartment 6. The provision-chamber 4 is provided with any number of shelves or horizontal  
45 partitions 19, which are removably supported upon the side walls 9 and may be withdrawn through the door-opening 10, it being understood that these shelves serve to support any provisions which it might be desired  
50 to place in the chamber 4.

The tank 2 is preferably formed of less area than the cross-sectional area of the chamber 13 for permitting the passage of the cold air from the chamber 13 downwardly into the  
55 compartments 6, is provided with lengthwise partitions 20, dividing the tank into a series of compartments 21, 22, and 23, and is provided with water-legs 24, depending from the bottom of the tank into the cold-air chamber 6  
60 at the sides and back of the provision-chamber 4, the bottom wall of said tank being provided with openings for discharging the freezing solution into the water-legs when desired, said water-legs being provided with an outlet-  
65 conduit 25, extending through the side walls of the casing for the purpose of drawing off said solution from the water-legs, which so-

lution may be placed into an evaporating-pan and the salts or soluble crystals recovered by evaporation, said salts or crystals being ca- 70  
pable of reuse in the refrigerating-tank 2 as many times as may be desired, there being but little waste, if any, in the evaporation. The discharge-opening in the bottom of each of the compartments of the tank 2 are pro- 75  
vided with suitable closures, as plugs 26, these plugs being normally in the openings until desired to draw off the solution into the water-legs.

The receptacles 3 are mounted above the 80  
tank 2 and preferably consist of cylindrical shells eccentrically mounted upon the brackets 27, being arranged one in advance of the other lengthwise of the compartments of the tank 2 and are usually provided at their op- 85  
posite ends with trunnions 28, journaled in the open-ended bearings in the upper ends of the bracket 27 for the purpose of permitting either of said shells to be removed and returned independently of the other through 90  
the opening in the upper end of the chamber 13. It will be noted that I have shown only two of these drums or shells, while I have shown three compartments in the tank 2, one of the shells being provided with an aperture 95  
or opening 29, alined with the compartment 22, and the other shell being provided with a discharge-opening 30, alined with the compartment 23. The purpose of providing one more compartment than there are liquid-con- 100  
taining shells is that I preferably supply the liquid to one of the compartments, as 21, by hand or from an additional receptacle, (not illustrated,) it being understood that the several compartments are previously provided 105  
with the desired quantity of salts or other equivalent element of a freezing mixture and that a sufficient quantity of the liquid is successively discharged into each of the said compartments to produce the best refrigerating 110  
effect.

As previously stated, the cylinders 3 are eccentrically pivoted upon the brackets 27, being operated by their own gravity to discharge through their respective outlet-openings into 115  
the corresponding compartments of the tank 2 and are held in their elevated position by catches or detents 31 and 32, engaged with shoulders on the adjacent end walls of the receptacles 3. The catches 31 and 32 are ar- 120  
ranged to be moved by a clock-actuated mechanism, presently described, for successively releasing the cylinders at predetermined intervals of time—in this instance every eight hours—that is, a certain quantity of freezing 125  
mixture is placed in the compartment 21 which is sufficient to produce a maximum degree of cold air for a period of eight hours or any other interval of time. At the expiration of this time the catch 31 is operated to release the 13  
cylinder 3, held thereby, which automatically rotates on its trunnions and discharges its contents through the opening 29 into the compartment 22, also containing a certain quan-



tity of salts or equivalent freezing element, which, together with the water discharged through the opening 29, is sufficient to last another period of eight hours, and at the end of this time the trip 32 is operated automatically and the cylinder 3, held thereby, also rotates by gravity to discharge its contents into the chamber 23, the mixture thus formed being sufficient to produce a maximum degree of cold air for another period of eight hours. It is therefore evident that the production of cold air is continuous and that as soon as the mixture in one compartment has lost its efficiency the solution may be readily drawn off into the water-legs 24, retaining therein a sufficient quantity at all times to produce additional refrigeration and may be drawn off through the conduit 25 at any time. After this operation of drawing off the solution from said compartment the same is refilled with a new mixture and the operation repeated, as above described. The catches 31 and 32 are preferably held in their normal position by suitable springs 32', the cylinders 3 being provided with stop-shoulders, which automatically engage the catches when rotated to their elevated positions, it being apparent that the cylinders 3 may be refilled in their operative position or removed from the brackets and refilled with water or other liquid from a faucet or other water-supply. Any desired means may be connected to the clock for periodically operating these catches; but I preferably provide rock-shafts 34 and 35, the rock-shaft 34 having its opposite ends provided with crank arms or pins 36 and 37, and the rock-shaft 35 is provided with similar arms 38 and 39, the arms 36 and 38 being arranged to engage the trips or detents 31 and 32 for moving the same out of engagement with the shoulders of the cylinders 3 and the arms 37 and 39 being arranged in the path of a pin 40, secured to a rotary clock-actuated gear 41, this gear 41 meshing with a pinion 42, which is provided on the hour-spindle of an ordinary clock mechanism, supported in a case 43. This clock is preferably secured to the front wall of the refrigerator-case and is connected to the gear 41 in such manner as to rotate said gear once in every twenty-four hours. The arms 37 and 39, projecting into the path of the pin 40, are so relatively arranged as to be operated by said pin at intervals of eight hours apart. In other words, the portions of the arms 37 adapted to be engaged by the pin 40 are separated a distance substantially equal to one-third of the travel of said pin during one revolution, and the pin 40 is normally set at a point substantially equidistant from the engaging ends of the arms 37 and 39, or, in other words, about one-third of its travel during one revolution from the engaging ends of said arms. In order to permit this pin 40 to be adjusted to the position just described, I provide the clock-frame with a suitable dial 44, having a hand-crank 45 and an indicator-finger 46, the hand-crank 45 being connected

to the pinion 42, and the indicator-finger 46 is connected to the gear 41, so that when the crank is rotated the indicator-finger 46 and pin 40 in alinement therewith may be set to the desired position, which is one-third of the distance at either side of the engaging ends of the arms 37 and 39, said dial being provided with graduations 47 and 48, corresponding to the engaging ends of said arms 37 and 39. When the indicator 46 and pin 40 are set at this position, as seen in Figs. 7 and 8, the compartments 21, 22, and 23 and the reservoirs or receptacles 3 are filled with the elements of the freezing mixture, it being remembered that at the beginning of the operation of the refrigeration the compartment 21 is supplied with both elements of the mixture sufficient to maintain a maximum degree of cold air for eight hours. During this time the pin 40 and indicator-finger 46 are traveling toward the graduation 47, and when the pin 40 reaches the arm 37 the trip 31 is operated to release the corresponding receptacle 3, whereupon said receptacle discharges its contents into the compartment 23, forming a freezing mixture in said compartment sufficient to last another eight hours, during which time the pin 40 continues to move toward the arm 39 and at the proper time operates the trip 32 to release the other receptacle 3, which in turn discharges its contents into the compartment 22, the mixture thus formed in the compartment 22 being sufficient to maintain a maximum degree of cold air for another period of eight hours, and at the expiration of the latter eight hours, which is the completion of the revolution of the pin 40, representing twenty-four hours of time, the indicator-finger 46 indicates the necessity of recharging the apparatus.

Mounted in the chamber 13, preferably upon one end of the tank 2, is a water-reservoir 49, containing drinking-water, which is cooled by the refrigerating mixture and may be drawn off for drinking purposes through a faucet or conduit 50. At the opposite end of the tank 2 is supported a second water-tank 52, which is connected by a conduit 53 to a suitable vacuum-pump (not illustrated) for the purpose of increasing the refrigeration within the chamber 13.

It is believed that the operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings.

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

1. A refrigerator comprising a tank having a plurality of compartments each containing one of the elements of a freezing mixture, a reservoir for each compartment containing a complementary element of the freezing mixture, and means for effecting the discharge of each reservoir into its compartment independently of the movement of the other.

2. A refrigerator comprising a tank having



a plurality of compartments each containing one of the elements of a freezing mixture, a reservoir for each compartment containing a complementary element of the freezing mixture, and clock-actuated means for effecting the discharge of each reservoir into its compartment independently of the movement of the other.

3. A refrigerator comprising a tank having a plurality of compartments each containing one of the elements of a freezing mixture, a gravity-operated reservoir for each compartment containing a complementary element of the freezing mixture adapted to be discharged into its compartment independently of the movement of the others, and movable means detachably holding each of the reservoirs in its normal position independently of the others.

4. In a refrigerator the combination of a receptacle having a plurality of compartments each containing one of the elements of a cooling mixture, additional receptacles pivotally supported above each of the compartments and arranged to be inverted independently of each other for discharging into their respective compartments, independent means for holding the pivoted receptacles in their normal positions, and clock-actuated mechanism for moving each of the former means and releasing the pivoted receptacle.

5. In a refrigerator the combination of a receptacle having a plurality of compartments each receptacle containing one of the elements of a cooling mixture, additional receptacles movable independently of each other and each provided with a discharge-opening normally above the level of the element therein and movable automatically beneath the level of said element for discharging its contents into its respective compartment, and clock-actuated mechanism for controlling the movement of each of said receptacles independently of the others.

6. A refrigerator comprising a tank having dependent water-legs, a provision-chamber beneath the tank, and between said water-legs, a liquid-containing reservoir eccentrically pivoted above the tank and provided with a discharge-opening, said reservoir being arranged to rock automatically upon its pivot for discharging its contents into the tank, a catch holding the reservoir in its normal position, and clock-actuated means to actuate the catch and release the reservoir for the purpose described.

7. In a refrigerator, the combination with an inclosing case having a provision-chamber and a cold-air chamber surrounding the provision-chamber, the bases of said chambers being connected by cold-air passages, a valve automatically closing said passages, a door for the provision-chamber adapted to open said valve when the door is closed, a tank having depending water-legs extending into the cold-air chamber at the sides and the back of the provision-chamber, the main por-

tion of the tank being above the provision-chamber, a liquid-containing reservoir pivoted above the tank and provided with a discharge-opening, said reservoir being arranged to rock automatically upon its pivot for discharging its contents into the tank, a catch holding the reservoir in its normal position, and clock-actuated means to actuate the catch and release the reservoir for the purpose described.

8. In a refrigerator the combination with provision and cooling chambers, one within the other, of receptacles containing the elements of a freezing mixture, one of the receptacles being gravity-operated and provided with an opening for discharging its contents into the other receptacle, water-legs leading from the latter receptacle and arranged at the back and sides of the provision-chamber, a catch holding the movable receptacle in its normal position, and clock-actuated means for moving the catch and releasing the movable receptacle.

9. In a refrigerator the combination with provision and cooling chambers, of a tank containing an element of a freezing mixture, a gravity-operated liquid-containing cylinder eccentrically supported above the tank and provided with an opening adapted to discharge into the tank when the cylinder is operated by its own gravity, said cylinder being refilled manually, a catch holding the cylinder in its normal position, and clock-actuated means for moving the catch and releasing the cylinder for the purpose set forth.

10. In a refrigerator the combination with an inclosing case having a provision-chamber, a tank supported above the provision-chamber and provided with a plurality of compartments, an eccentrically-pivoted cylinder supported above each compartment and each provided with an opening aligned with its respective compartment, catches for holding the cylinders in their normal positions, and clock-actuated means for successively moving the catches and releasing the cylinders for permitting the cylinders to discharge their contents into their respective compartments of the tank.

11. In a refrigerator the combination with an inclosing case having a provision-chamber and a cooling-chamber surrounding a portion of the provision-chamber and a refrigerating-tank removably supported in the case above the provision-chamber and provided with a discharge-opening and a supplementary tank depending into the cooling-chamber, said supplementary tank receiving the discharge from the former tank.

12. In a refrigerator the combination with an inclosing case having a provision-chamber and a cooling-chamber surrounding a portion of the provision-chamber and a refrigerating-tank removably supported in the case above the provision-chamber and provided with a discharge-opening and a supplementary tank depending into the cooling-cham-



ber, said supplementary tank receiving the discharge from the former tank and a closure for said discharge-opening.

5 13. In a refrigerator, the combination with an inclosing case having a provision-chamber and a cooling-chamber surrounding a portion of the provision-chamber, said chambers having their base connected by cold-air passages, automatically-closing valves for said  
10 passages, a door for the provision-chamber, means actuated by the door for opening the valve when the door is closed, a refrigerating-

tank removably supported in the case above the provision-chamber and provided with a discharge-opening, and a supplementary tank 15 depending into the cold-air chamber and arranged to receive the discharge from the former tank.

In witness whereof I have hereunto set my hand this 20th day of April, 1901.

RALPH HIRSH.

Witnesses:

MILDRED M. NOTT,

H. E. CHASE.