

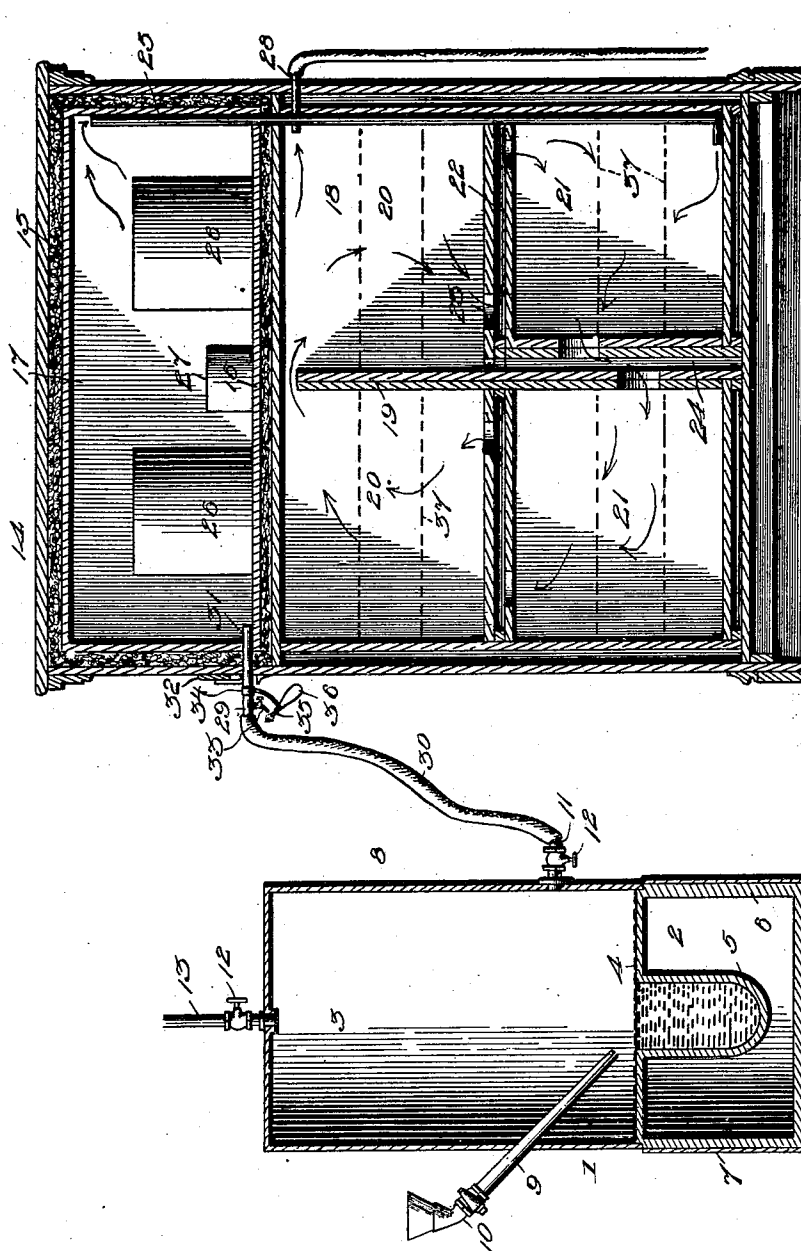
No. 677,837.

Patented July 2, 1901.

J. S. WRIGHTNOUR.
REFRIGERATOR.

(Application filed Aug. 21, 1900.)

(No Model.)



Inventor
J. S. Wrightnour,

Witnesses
Am. North.
Herbert S. Lawson.

By *Victor J. Evans.* Attorney

UNITED STATES PATENT OFFICE.

JOHN S. WRIGHTNOUR, OF OIL CITY, PENNSYLVANIA.

REFRIGERATOR.

SPECIFICATION forming part of Letters Patent No. 677,837, dated July 2, 1901.

Application filed August 21, 1900. Serial No. 27,582. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. WRIGHTNOUR, a citizen of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Refrigerators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the figures of reference marked thereon, which forms a part of this specification.

This invention relates to new and useful improvements in refrigerators; and its primary object is to provide a device of this character having means whereby a circulation of pure cold air containing an unusually low percentage of oxygen may be secured.

The device is especially adapted for use in connection with a liquid-air container secured by Letters Patent No. 651,223, granted to me on June 5, 1900.

The invention consists in a refrigerator having compartments, inlets, and outlets so arranged that air of this kind admitted to one of them will slowly circulate through the remaining compartments and issue to the outer air laden with any odors or gases that may be derived from the contents of the refrigerator.

The invention also consists in providing a tubular connection between the liquid-air container referred to and the ice-compartment of the refrigerator, the air admitted to said compartment being conducted to the lower part of the refrigerator by suitable means, as will be hereinafter more fully described.

An indicator is used in connection with the device, whereby the character of the air supplied to the refrigerator may be quickly determined.

The invention also consists in the further novel construction and combination of parts, which will be hereinafter fully described and claimed, and illustrated in the accompanying drawing, showing the preferred form of my invention, and which is a vertical longitudinal section through the complete device.

Referring to the drawing by numerals of reference, 1 is a container of any desired form

in cross-section, preferably cylindrical, and comprising a lower or base chamber 2 and an upper chamber or reservoir 3, said chambers being separated by a partition 4, within the center of which is formed a downwardly-projecting cup 5, as shown, opening into the reservoir 3.

The lower chamber 2 is hermetically sealed, and a partial or complete vacuum may be produced therein. The walls 6 of said lower chamber are preferably formed of material which will not readily conduct heat, such as thick glass or fire-brick, and may be provided with coverings 7, of mineral wool, felt, velvet, or similar materials, whereby the transmission of heat to the cup 5 is largely prevented. To the same end, if desired, especially-prepared material—as, for example, glazed tile with a porous or hollow interior—may be employed, through which interior, by suitable openings in the partition 4 above it, liquid air or gases therefrom may percolate. The walls 8 of the upper chamber of the reservoir 3 are formed of good heat-conducting material—such as thin copper, aluminium bronze, &c.—for promoting evaporation when the device is tilted and for receiving the evaporated gases.

For the introduction of liquid air into the reservoir 3 and the cup 5 a tube 9 is provided, said tube extending preferably diagonally through the wall of the reservoir to a point above the cup 5, though it may be of any desired length. A funnel 10 may be secured to the outer end of the tube 9, and a suitable filter placed therein to prevent the admission of frozen carbon dioxide, particles of ice, dust, &c., to the container.

A pipe or pipes 11 are located within the wall of the reservoir 3, near the surface of the liquid air which is contained within the cup and reservoir, and a pipe 13 extends from the top of the container and is adapted to serve as an outlet for oxygenated air from the container, as described in my aforesaid patent. This pipe, as well as the pipe 11, is provided with a cock 12 for controlling the flow of air therethrough.

The walls of the refrigerator 14, and particularly those of the upper chamber 17, are constructed of thick material, the chamber 17 being preferably lined with mineral wool 15

or other materials which will exclude the heat of the outer air. The refrigerator is divided by the thick partition 16 into the aforesaid upper chamber 17 and a lower or storage chamber 18. This chamber may be divided as desired by means of vertical and horizontal partitions 19 into a suitable number of upper and lower compartments 20 and 21, respectively. The ceilings of the lower compartments 21 are provided with chambers 22 therein, which communicate through flues 23 with the upper and lower compartments. These flues are preferably arranged out of alinement with each other, so as to cause the air to circulate within the ceilings and walls when passing from one compartment to the other. The dotted lines 37 indicate perforated shelves which may be placed in the compartments. These arrangements are merely typical of similar arrangements in the storage-chamber which may be made.

The vertical partition or partitions within the storage-chamber extend to a point adjacent to the ceilings of the upper compartments 20 and form a flue thereover, whereby air may circulate from one of said compartments to the other.

An open-ended pipe 25 extends from a point near the ceiling of the chamber 17 down to the floor of one of the compartments 21 and is adapted to conduct air from the top of said chamber 17 to the bottom of the refrigerator in the manner shown. This is to be the only means of air communication between the chamber 17 and the storage-chamber or storage-compartments.

The chamber 17 contains one or more receptacles 26, made of thin heat-conducting material and which are adapted to be filled with water or similar liquid. A smaller receptacle 27 is located within said chamber for the reception of liquid air, which liquid air is preferably to be that portion taken from near the surface of a quantity thereof which has not parted with its nitrogen by evaporation. Such portion will be relatively poor in oxygen.

A small outlet 28 extends through the wall of the refrigerator at a point adjacent to the ceiling of one of the compartments 20 and may extend, by means of an attached tube of preferably flexible character, to any suitable point removed from the refrigerator—as, for instance, out of doors. This pipe is adapted to permit the used air to flow from the refrigerator after the same has passed through all the compartments.

Detachably secured within the wall of the chamber 17, adjacent to the floor thereof, is a pipe 29, which is connected, by means of a flexible tube 30, preferably, with the pipe 11 of the liquid-air container. This tube is to be made of and the exposed portion of the pipe 29 covered with material adapted to exclude heat from the air passing therethrough. This pipe 29, as before stated, is removably fitted within an aperture 31, formed within the wall of the

refrigerator, and a slide 32, lined with felt or similar material, is secured to the said wall at a point above the opening and is adapted to close the same when the pipe is removed from position, and in addition to this slide a plug, of non-heat-conducting material, may be inserted in the opening when the pipe is removed, thus keeping the chamber 17 isolated from the outside heat.

Extending downward from the pipe 29 is a stem 33, having a small perforation at its lowest point. It may be opened and closed by such means as is usual for controlling the flow of gas. A bracket 34 depends from the pipe 29 at a point adjacent to the stem 33 and supports a burner 35, which may be fed by alcohol, gas, or other illuminant within the reservoir 36, formed therewith. This burner is arranged at a point directly beneath and adjacent to the perforated stem 33, and it is obvious that any air or gas escaping through said perforation would be directed upon the flame. The same end may be attained when the burner is not in use by a lighted match held below the said perforation, the valve in the stem being opened.

It is a well-known fact that the gas first given off by liquid air is composed almost wholly of nitrogen. As stated in the specification of the patent before referred to, when liquid air is introduced into the reservoir 3 and the cup 5 of the container evaporation will begin at once, but will gradually diminish, owing to the fact that the cup 5 is largely insulated from the warmth of the outside air and because its immediate surroundings are refrigerated. This nitrogenated air or air deficient in oxygen first given off by the evaporation of the liquid air will pass outward through the lower pipe 11 within the wall of the container. It will slowly pass through the tube 30 and pipe 29 in a very cold state into the upper chamber 17 of the refrigerator. Prior to this operation, however, the receptacle or receptacles 26 may be filled with water or similar liquid, if desired, and a suitable amount of nitrogenated liquid air, as hereinbefore described, may be placed within the small receptacle 27. The extremely cold air which is thus discharged into the upper compartment 17, insulated from external heat, will cause an extreme refrigeration of the compartment and will freeze the water or similar liquid placed in the receptacles 26. This air, freezing all moisture in the air of the compartment, will be very pure and dry, especially if no water is used, and containing but little oxygen will be extremely efficient in arresting the decay of any organic substances placed in the refrigerator.

When it is desired to test the quality of the air passing from the container to the compartment 17, the small quantity discharged through the small opening in the stem 33 by its effect on the flame of the small burner or a lighted match will show whether the air passing is deficient in oxygen or is becoming

richer therein. When the former is the case, the flame will burn dimly; when the latter its brilliancy will be increased, and this will indicate the quality of the air or gas fed to the refrigerator. As the cold nitrogenated air slowly enters the insulated chamber 17 or is otherwise slowly generated therein air from near the top thereof will be forced down through the pipe 25 into one of the lower compartments 21. The slow current of air thus produced will pass through the refrigerator in the directions indicated by the arrows and will pass out through the small discharge-pipe 28, located within the wall of the refrigerator, carrying therewith the warmer air and any odors which may have accumulated in the storage-compartments. The warmth from this outlet-pipe and the slowness of the air-passage will prevent undue refrigeration in the storage-chamber, the aforesaid arrangements equalizing the cold, though some compartments will be somewhat colder than others.

If water has been frozen in the receptacles 26, the container being removed the ice may be used to continue the work of refrigeration, the aperture 31 being closed by the slide 32 and by the plug of non-heat-conducting material before mentioned, thereby preventing the admission of warm air to the chamber 17. By a similar plug the small outlet 28 may be closed also. The ice may then be most conveniently used in the same thin heat-conducting receptacles in which it was formed, or, if otherwise, the refrigerator may be provided with the usual outflow for the melted ice. It is obvious that, if desired, the ice could be removed and used for other purposes.

In the foregoing description I have embodied the preferred form of my invention, though I do not wish to be understood as limiting myself thereto, as I am aware that modifications may be made therein without departing from the spirit or sacrificing any of the advantages thereof, and I therefore reserve to myself the right to make such changes as fairly fall within the scope of my invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. The combination with the walls of a refrigerator; of a transversely-extending partition therein forming an upper and a lower chamber, insulating material within said partition and within the walls of the upper chamber, air-passages within the walls of the lower chamber, a horizontally-extending partition within the lower chamber forming upper and lower compartments, said partitions having air-passages therein and apertures out of alinement with each other, whereby air may circulate from one to the other of the compartments, a partition within the lower compartment having an air-passage therein and apertures out of alinement with each other, a partition in the upper compartment having

an air-passage thereover, a pipe extending from a point adjacent to the top of the upper chamber to the bottom of the lower compartment, an air-inlet in the upper chamber, and an outlet adjacent to the top of the upper compartment.

2. The combination with a liquid-air container having an outlet for the discharge of cold nitrogen gas or air with an unusual quantity thereof; of a refrigerator; an air-inlet thereto; a tube detachably secured within the inlet; a tubular connection between the outlet of the air-container and said tube; an outlet from the detachable tube; and a lamp secured adjacent to the outlet.

3. The combination with a liquid-air container having an outlet for the discharge of cold nitrogen gas or air with an unusual quantity thereof; of a refrigerator; an air-inlet thereto; a tube detachably secured within the inlet; a tubular connection between the outlet of the air-container and said tube; an outlet from the detachable tube; a lamp secured adjacent thereto; a closure for the air-inlet to the refrigerator; and an outlet from said refrigerator.

4. The combination with a liquid-air container having an outlet for the discharge of cold nitrogen gas or air with an unusual quantity thereof; of a refrigerator, a partition therein forming an upper and a lower chamber, hollow partitions within the lower chamber forming upper and lower compartments, flues or passages within the partitions of the compartments, a flue extending from the upper chamber to one of the lower compartments, an air-inlet to the upper chamber communicating with the outlet of the air-container, and an outlet from one of the upper compartments of the lower chamber.

5. The combination with a liquid-air container having an outlet for the discharge of cold nitrogen gas or air with an unusual quantity thereof; of a refrigerator, a partition therein forming an upper and lower chamber, vertical and transverse partitions within the lower chamber forming communicating compartments, a pipe extending from the upper chamber to a point within one of the lower compartments, receptacles within the upper chamber and adapted to receive water or similar liquid, an air-inlet to said chamber communicating with the outlet of the air-container, and an outlet from one of the upper compartments of the lower chamber.

6. The combination with a liquid-air container having an outlet for the discharge of cold nitrogen gas or air with an unusual quantity thereof; of a refrigerator, an insulating-partition therein forming an upper and a lower chamber, insulating material within the walls of the upper chamber, partitions within the lower chamber forming upper and lower communicating compartments, a pipe extending from the upper chamber to one of the lower compartments, receptacles within the upper chamber adapted to receive water

or similar liquid, an air-inlet pipe detachably secured within an aperture within a wall of the upper chamber and communicating with the outlet of the air-container, a slide adapted 5 to close said aperture when the pipe is removed, and an outlet from one of the upper compartments of the lower chamber.

7. The combination with a liquid-air container comprising two chambers divided by a 10 hermetic partition, a cup supported by the partition and projecting into the lower sealed chamber, and an outlet from the container; of a refrigerator having an upper and lower chamber therein, receptacles within the upper 15 chamber adapted to receive water or similar liquids, an inlet to said chamber communicating with the outlet of the container, a flue for conducting air from the upper to the lower chambers of the refrigerator, an outlet 20 from the lower chamber, and means for indicating the quality of the air discharged into the refrigerator.

8. The combination with a liquid-air container having an outlet for the discharge of 25 cold nitrogen gas, or air with an unusual quantity thereof; of a refrigerator having an upper and a lower chamber therein, receptacles within the upper chamber adapted to receive water or similar liquids, a liquid-air receptacle 30 within said chamber, a flue connecting the upper and lower chambers, an inlet-pipe

to the upper chamber connected to said outlet of the container, a perforated stem to said pipe, a burner located in close proximity to said stem, and an outlet from the refrigerator. 35

9. The combination with a liquid-air container having an outlet for the discharge of cold nitrogen gas, or air containing an unusual quantity thereof; of a refrigerator, a 40 partition therein forming an upper and lower chamber, partitions within the lower chamber forming communicating compartments, a flue connecting the upper chamber with one of the lower compartments, an outlet from the upper compartment, receptacles within 45 the upper chamber adapted to receive water or similar liquid, a liquid-air receptacle within said chamber, an inlet-pipe within an aperture in the wall of said chamber at a point adjacent to the floor thereof, a slide adapted to 50 close said aperture when the pipe is removed from position, a perforated stem to the pipe, a burner suspended from the pipe adjacent to the stem, and a flexible connection of a heat-insulating character between said pipe 55 and the outlet of the container.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN S. WRIGHTNOUR.

Witnesses:

H. P. MERRITT,
FRED. FAIR.