June 27, 1933. J. D. GLASS 1,915,276

REFRIGERATING APPARATUS

Filed Aug. 29, 1930

Fig. 1.

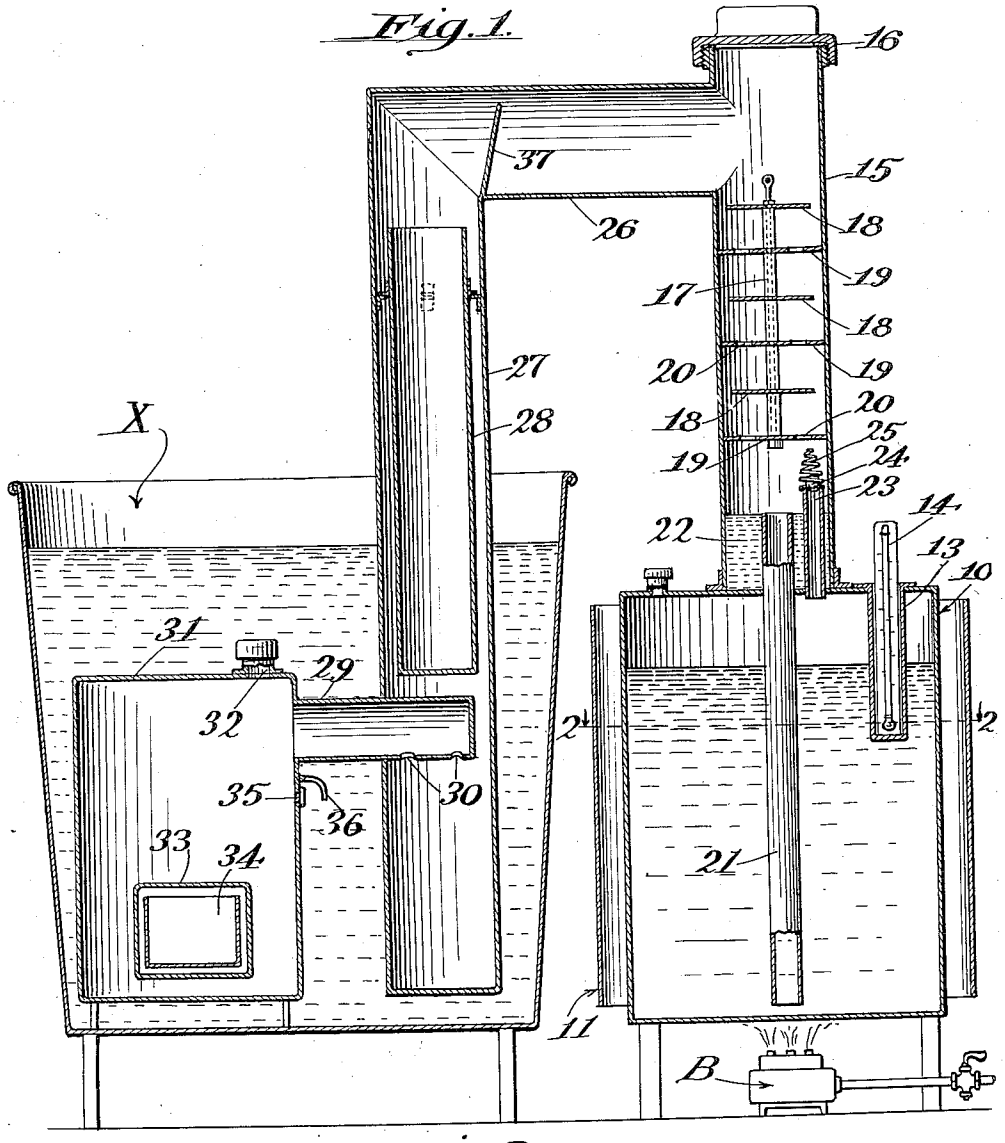


Fig. 2.

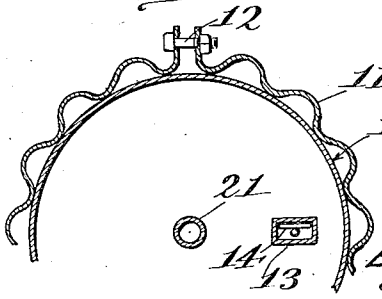
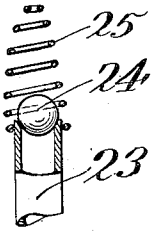


Fig. 3.



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UNITED STATES PATENT OFFICE

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REFRIGERATING APPARATUS

Application filed August 29, 1930. Serial No. 478,625.

My invention relates to a refrigerating apparatus of that character known as the reversing absorption type and has for its principal object the provision of a refrigerating apparatus that is relatively simple in construction, inexpensive of manufacture, practically automatic in operation and which is relatively small, compact, portable and therefore readily adapted for household and domestic purposes.

Further objects of my invention are, to provide, in a refrigerating apparatus of the character referred to, an adjustable radiator for controlling the heat that is applied to the refrigerant container for the purpose of vaporizing the same, also for controlling the exchange of heat from the vaporizer to the condenser and the refrigerating chamber within which said condenser is located, further, to provide an improved form of duct for the passage of vaporized refrigerant from the vaporizer to the condenser, further, to provide improved means for baffling the passage of vaporized refrigerant from the vaporizer to the condenser and further, to generally improve upon and simplify the construction of the existing forms of similar refrigerating apparatus.

Further objects of my invention are, to provide simple and effective means in the form of a valve for preventing the return of refrigerant gases direct to the generator absorber, further, to provide a refrigerating apparatus that is of compact construction, comparatively light in weight so as to permit it to be readily moved or shifted from one position to another during operation, and further, to provide a refrigerating apparatus having a heat measuring device such as a thermometer which will enable the operation of the apparatus to be more readily observed and ascertained and further, to provide the apparatus with a relief valve that will act automatically under abnormal conditions, thereby insuring safety of operation of the apparatus.

With the foregoing and other objects in view, my invention consists in certain novel features of construction and arrangement of parts that will hereinafter be more fully described and claimed and illustrated in the accompanying drawing in which:

Fig. 1 is a vertical section taken through the center of a refrigerating apparatus embodying the principles of my invention.

Fig. 2 is a horizontal section taken approximately on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged detail view of a check valve utilized for controlling the outlet of vaporized refrigerant from the vaporizing chamber.

Referring by numerals to the accompanying drawing which illustrates a practical embodiment of my invention, 10 designates a closed tank that functions as the vaporizing tank and which is filled or partially filled with a suitable refrigerant, preferably a combination of distilled water and anhydrous ammonia. This vaporizing container may be heated in any suitable manner, preferably by being placed over a burner B.

In order to control the heat that is applied to the vaporizing container, a radiator 11, comprising a vertically disposed cylinder formed of sheet metal and provided with vertically disposed corrugations, is disposed about the container 10 and the vertical edges of this radiator are connected by bolts 12.

As a result of the provision of the corrugated radiator, a decided advantage in the application of heat to the container 10 is provided during the generation of gas within the generator, for the radiator provides a series of vertical flues through which the heat from the burner passes during the heating of the refrigerant within tank 10 and said flues are also effective in distributing air over the surface of tank 10 during the absorption process.

This construction permits the radiator to be adjusted vertically on the container 10 and as a result a greater or less degree of heat or cooling fluid may be caused to circulate upwardly over the surface of the container and consequently enabling the heating and vaporizing or the absorption of the liquid within said container to be accurately controlled. Thus the adjustable corrugated member 11 makes it possible to more accurately control the temperature within the refrigerator with which the apparatus is associated.

Arranged in the upper portion of the container 10 is a vertically disposed tube 13 closed at its lower end and positioned within said tube is a thermometer 14. Projecting upwardly from the top of tank 10 is a tube 15, the upper end of which is closed by a removable cap 16. Suspended within this tube 15 is a rod 17, which carries a series of spaced baffle plates 18 and 19. The baffle plates 19 are smaller in diameter than the internal diameter of the tube 15, thereby providing annular spaces between the edge of each baffle plate and the wall of tube 15 and the alternately arranged plates 19 have the same diameter as the chamber within tube 15 and these plates 19 are provided between their outer edges and the suspending rod 17 with apertures 20. As a result of this arrangement the vapor passing upwardly through tube 15 must necessarily take a tortuous path.

During the passage of vapor upwardly through tube 15 the baffle plates 18 and 19 function as dehydrators to separate the water from the vapor and the water after accumulating in the lower end of tube 15 passes back into the tank 10, as hereinafter more fully described.

Arranged centrally within the container 10 is an open ended tube 21, the upper portion of which projects through the top of the container 10 and upwardly a short distance within the lower portion of tube 15, thereby forming a trap 22 in the lower portion of said tube 15. The lower end of tube 21 terminates a short distance above the bottom of container 10.

Arranged within the lower portion of tube 15 is a valve tube 23, the lower end of which is open and said open lower end communicating with the upper portion of the chamber in container 10 and resting on a seat at the upper end of this tube 23 is a ball check valve 24 and fronting same is a wire cage 25. This valve controls the outlet of ammonia gas from the container 10.

Leading horizontally from the upper tube 15 is a tube 26 and the outer end thereof is connected to the upper end of a vertically disposed tube 27, which latter is spaced apart from tube 15 and container 10 and the lower end of said tube 27, which is closed, terminates in a plane slightly above the plane occupied by the bottom of container 10.

Suspended within the upper portion of tube 27 and spaced apart from the wall thereof is a receptacle 28 closed at its lower end and which serves as a sump for collecting the condensation of any ammonia gas that may occur in the upper portion of tube 27.

Inasmuch as this receptacle 28 is filled or partially filled with liquid during operation of the apparatus, it functions to cool the gases that pass downwardly between said receptacle and the wall of the tube 27.

Extending through the wall of tube 27 below the lower end of sump 28 is a short horizontally disposed tube 29, the end thereof within tube 27 being closed, and formed in the lower portion of this tube 29 within tube 27, are apertures 30.

The outer open end of tube 29 is connected to the upper portion of a condenser receptacle 31 and which latter is provided at its top with a normally closed filling nipple 32.

Extending horizontally through the lower portion of the condenser receptacle 31 is a housing 33, within which is arranged a removable drawer 34 that is adapted to receive products that are to be frozen or refrigerated.

Arranged in the wall of container 31, preferably at a point below tube 29 is a safety blow-off plug or valve 35 and arranged above and in front thereof is a hood or deflector 36 which prevents gases from passing directly upward or outward in the event that said plug or valve should open under excessive pressure.

Arranged within the outer portion of tube 26, adjacent to the point where the same joins the upper end of tube 27, is an upright baffle plate 37.

In the operation of my improved refrigerator, the container 10 is positioned above a suitable heater, for instance, a burner B and the lower portion of pipe 27 and the condenser receptacle 31 are placed in a suitable receptacle X that contains a sufficient amount of water to entirely submerge container 31 and the lower portion of tube 27. A considerable portion of the heat and products of combustion that pass outwardly from the bottom of container 10 will pass upwardly between the corrugated member 11 and the side wall of container 10, thereby conserving the heat and by adjusting member 11 vertically upon member 10, the heat that is applied to said member 10 and the liquid contained therein may be accurately regulated. The thermometer 14 provides means for readily ascertaining the temperature within the vaporizing container 10.

The pressure of the vapor resulting from the heating of the liquid within container 10 unseats valve 24 and this vapor passes

upwardly through the tortuous path formed by the baffle plates 18 and 19 in vertical tube 15 and the condensation of any of these vapors will pass downwardly from the baffles and accumulating in the trap 22.

As the condensed fluid arises above the open end of tube 21 it will pass downwardly therethrough to unite with the body of liquid in the receptacle 10.

The ammonia gas after passing upwardly through tube 15, passes outwardly through tube 26 over baffle 37, thence downwardly through the narrow annular space between tubes 27 and 28, thence through apertures 30 and thence through tube 29 into the chamber within condenser receptacle 31.

Inasmuch as container 31 is submerged in water, the gas entering said container will be condensed to a liquid since its heat has been transmitted to the water and as a result of the pressure built up by the heating of condenser 10.

After the desired amount of refrigerant has been driven out of tank 10 by the vaporization of said refrigerant and which action will be indicated by thermometer 14, tank 10 is removed from the burner and it may be then cooled for a few moments by being immersed in water so as to hasten the return of the refrigerant to the tank.

Container 31 is now placed inside a refrigerator or other cooling chamber with the tank 10 on the exterior thereof and as the tank 10 cools, the pressure therein will be lowered, thereby causing the refrigerant to again vaporize and return to the absorbent within the tank 10, which has a great attraction for the refrigerant.

The gas must return to tank 10 through tube 21, inasmuch as it cannot pass valve 24 on the top of tube 23. The gas passing through tube 21 to the absorbent is taken up faster for the reason that tube 21 extends beneath the surface of the absorbent within tank 10 and such arrangement produces agitation within the absorbent, which causes the temperature to be lowered in cylinder 31 and the contents of tray 34, as well as causing lower temperature in the refrigerator or chamber within which tank 31 is located.

By adjusting the position of radiator 11 on tank 10, the return of the gas to said tank may be hastened or retarded and by so doing, the temperature in the refrigerator or chamber in which cylinder 31 is located may be very accurately regulated.

After the greater part of the refrigerant gas has returned to tank 10 and which action may be determined by the rising of the temperature in the refrigerator and cylinder 31, also by absence of gurgle caused by the absorption of gas by the liquid within tank 10, the apparatus is ready to be reheated for a succeeding operation. After several heatings it may be necessary to drain the accumulated water content from the condenser cylinder 31 and tube 27 back to tank 10 since it is impossible to generate the gas without a certain amount of water passing into the cylinder 31.

The operations just described may be carried on indefinitely since there is no loss of the contents of the apparatus.

A refrigerating apparatus of my improved construction is comparatively simple, is very compact and may be economically employed for domestic and household purposes.

It will be understood that minor changes in the size, form and construction of the various parts of my improved refrigerating apparatus may be made and substituted for those herein shown and described without departing from the spirit of my invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. In a refrigerating apparatus, a refrigerant vaporizing container, a vertically corrugated radiator surrounding and mounted for vertical adjustment upon said container, a condensing receptacle, a substantially inverted U-shaped tube connecting said vaporizing container with said condensing receptacle, an open ended tube extending from the lower portion of the chamber in said vaporizing container to the interior of said inverted U-shaped tube at a point above the end thereof that is connected to said vaporizing container, a valve controlled inlet from the upper portion of the vaporizing chamber into the lower portion of the leg of the inverted U-shaped member that is connected thereto, which valve is located above the upper end of the open ended tube that extends from the vaporizing container into the inverted U-shaped tube and a receptacle suspended from the other leg of the inverted U-shaped tube and spaced apart from the wall thereof.

2. In a refrigerating apparatus, a refrigerant vaporizing container, a corrugated radiator surrounding and mounted for vertical adjustment upon said container, a condensing receptacle, a substantially inverted U-shaped tube connecting said vaporizing container with said condensing receptacle, an open ended tube extending from the lower portion of the chamber in said vaporizing container to the interior of said inverted U-shaped tube at a point above the end thereof that is connected to said vaporizing container, a valve controlled inlet from the upper portion of the vaporizing chamber into the lower portion of the leg of the inverted U-shaped member that is connected thereto, which valve is located above the upper end of the open ended tube that extends from the vaporizing container into the inverted U-shaped tube, a plurality of spaced baffle

plates arranged in the leg of the inverted U-shaped tube above said valve and a receptacle suspended in the other leg of said inverted U-shaped member and spaced apart from the wall thereof.

3. In a refrigerating apparatus, a vaporizing chamber, a vertically corrugated radiator surrounding and mounted for vertical adjustment upon said chamber, a tube arranged in said chamber and leading from the lower portion thereof through the top of the chamber, a vapor conduit leading from the upper end of said tube, said conduit being closed at its lower end to form a trap about the upper end of said vapor outlet tube, a series of spaced baffle plates suspended within said vapor conduit above the upper end of the tube that projects into the lower end of said vapor conduit, a tube leading from the upper end of the vaporizing chamber upwardly into the lower portion of said vapor conduit, the upper end of which tube terminates in a plane above the upper end of the first mentioned tube and a downwardly seated check valve carried by the upper end of said second mentioned valve.

4. In a refrigerating apparatus, a vaporizing chamber, a vertically corrugated radiator surrounding and mounted for vertical adjustment upon said chamber, a tube arranged in said chamber and leading from the lower portion thereof through the top of said chamber, a vapor conduit leading from the upper portion of said tube, said conduit being closed at its lower end to form a trap about the upper end of said vapor outlet tube, a tube leading from the upper end of the vaporizing chamber upwardly into the lower portion of said vapor conduit, a series of baffle plates suspended within said conduit above said trap, the upper end of which tube terminates in a plane above the upper end of the first mentioned tube and a downwardly seating check valve carried by the upper end of said second mentioned valve.

5. A refrigerating apparatus, comprising a vertically disposed cylindrical vaporizing chamber, a vertically corrugated radiator surrounding and mounted for vertical adjustment upon said container, an inverted U-shaped vapor conduit having the lower end of one of its legs secured to the upper portion of said vaporizing chamber, an open ended tube leading from the lower portion of the vaporizing chamber into the lower portion of the leg of the inverted U-shaped tube that is connected to said vaporizing chamber, a tube leading from the upper portion of the vaporizing chamber into the lower portion of the chamber in the leg of the conduit that is attached to said vaporizing chamber, the upper end of said last mentioned tube terminating in a plane above the upper end of the first mentioned tube, a downwardly seating check valve arranged at the upper end of the second mentioned tube, a series of spaced baffle plates suspended within the leg of the vapor conduit that is connected to said vaporizing chamber, a baffle plate located in the horizontal leg of the inverted U-shaped vapor conduit, an open ended receptacle suspended within the other leg of the inverted U-shaped vapor conduit and an absorption receptacle connected to the lower portion of the vertical leg of the vapor conduit at a point below the closed lower end of the open upper ended receptacle.

In testimony whereof I affix my signature.

JOY D. GLASS.