Dec. 12, 1950 H. C. HOPP 2,533,583

MOBILE REFRIGERATION UNIT

Filed Aug. 12, 1944 3 Sheets-Sheet 1

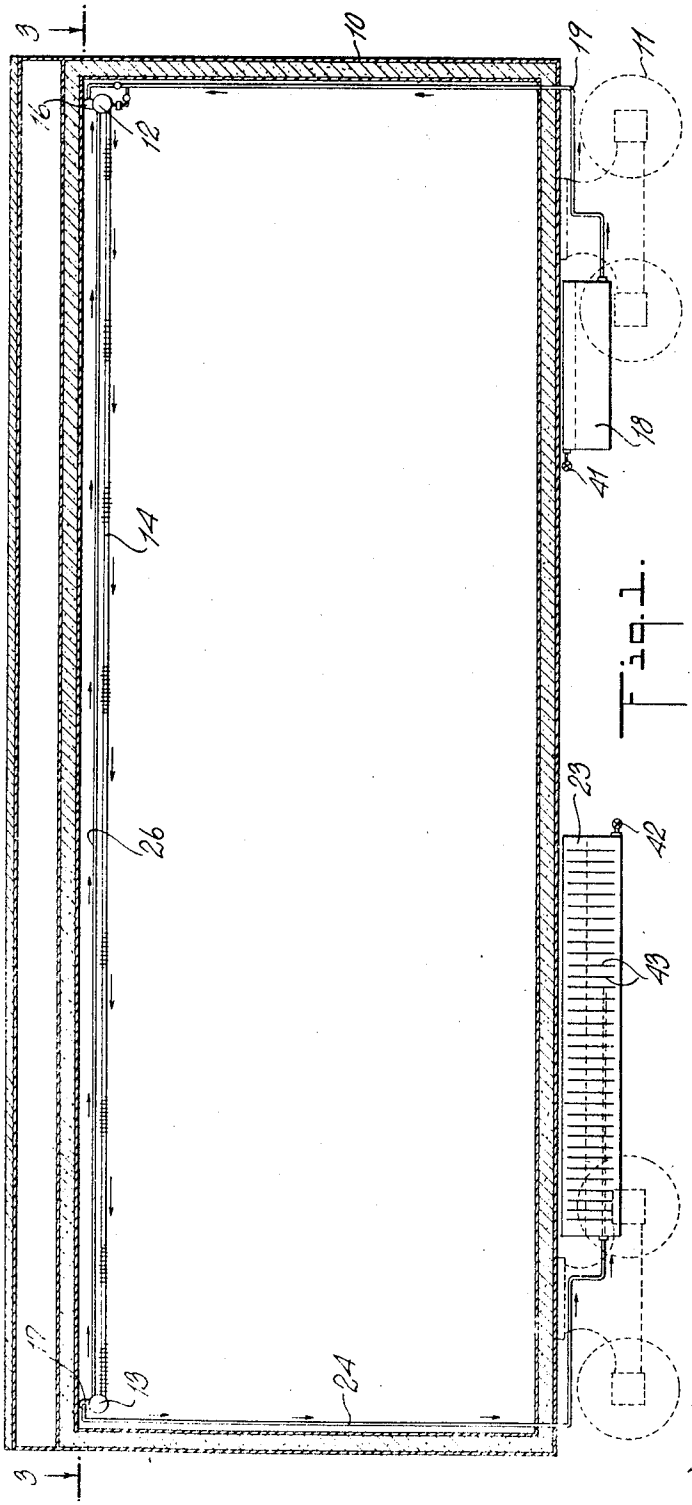


Fig. 1.

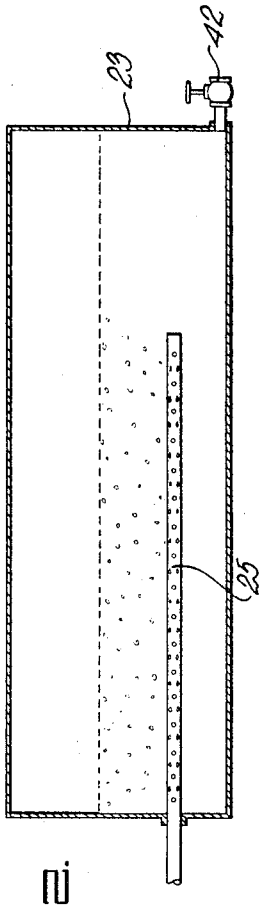


Fig. 2.

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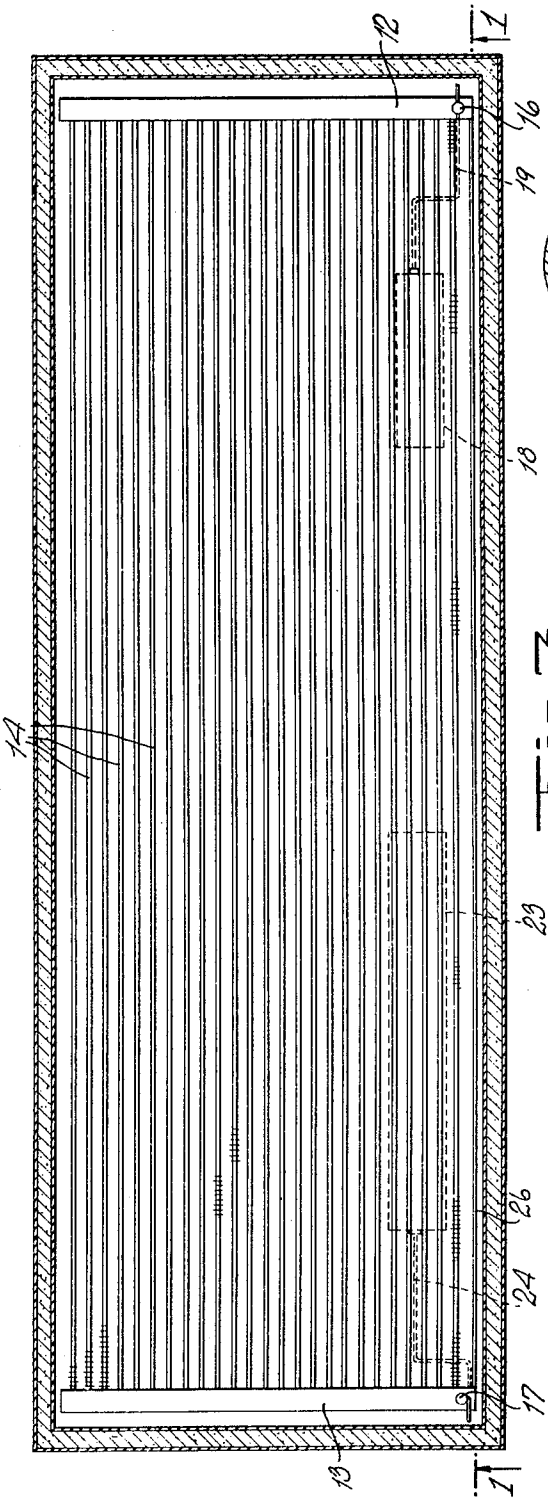


Fig. 3.

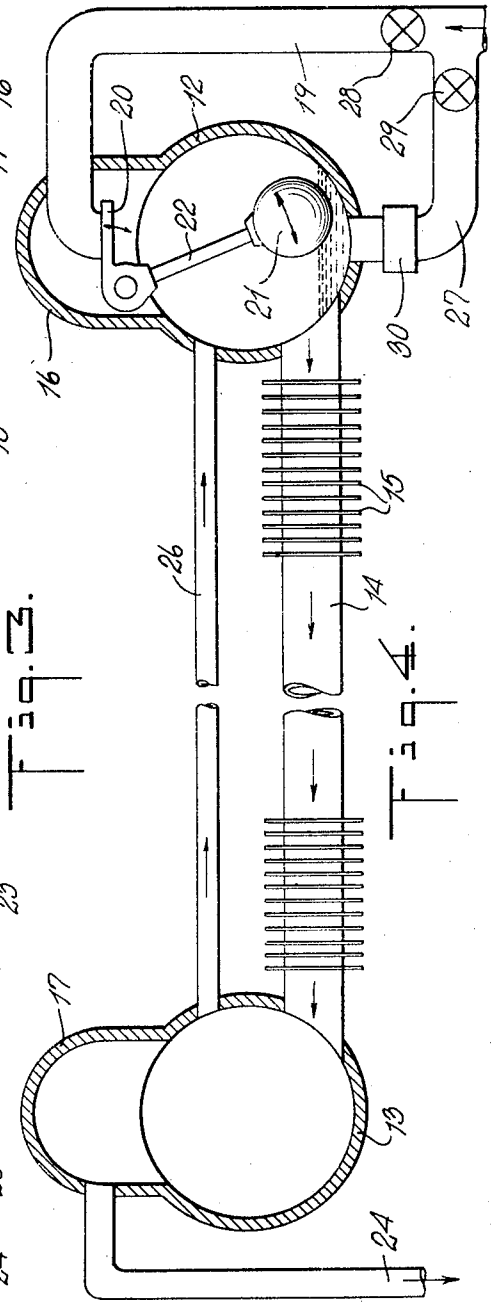


Fig. 4.

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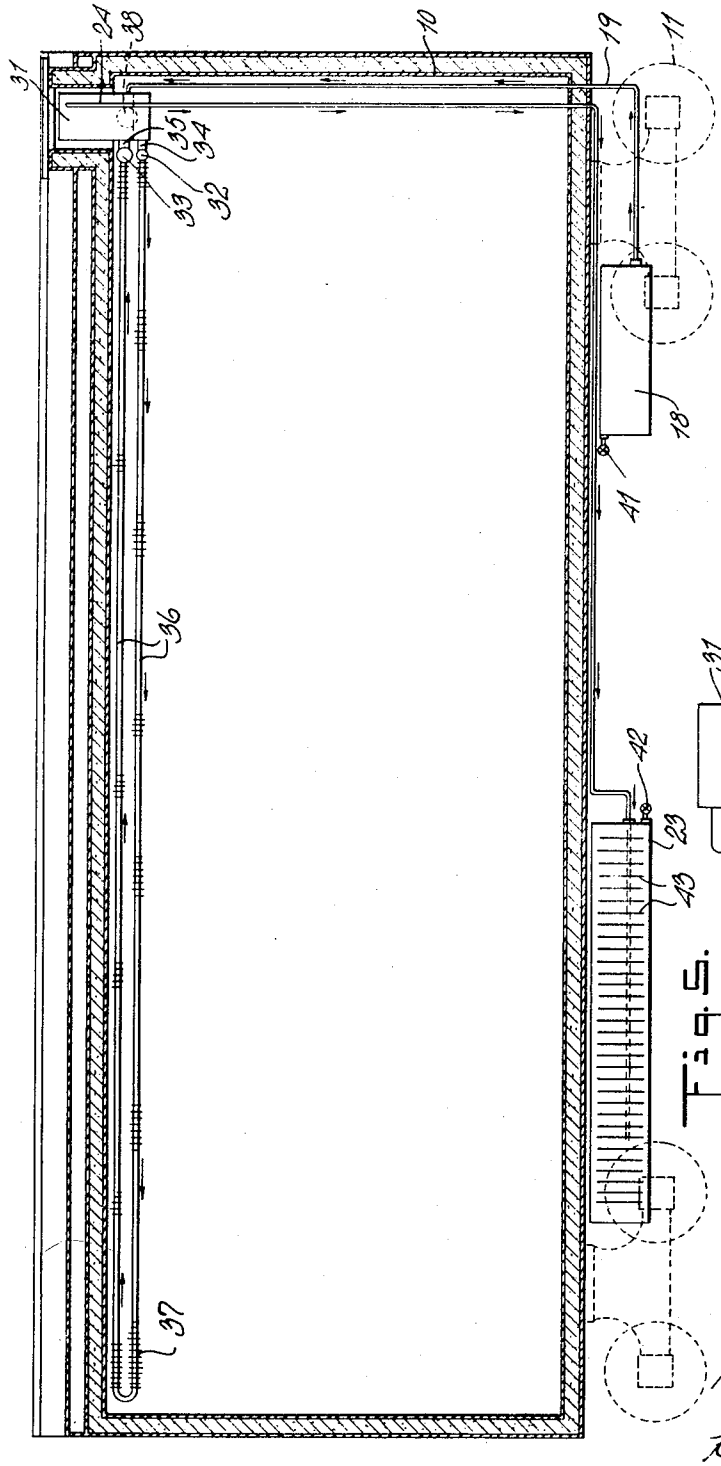


Fig. 5.

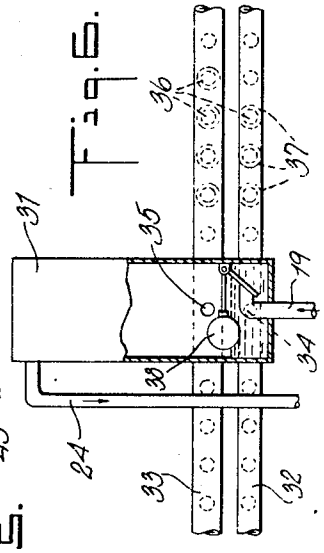


Fig. 6.

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2,533,583

UNITED STATES PATENT OFFICE

2,533,583

MOBILE REFRIGERATION UNIT

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Application August 12, 1944, Serial No. 549,156

11 Claims. (Cl. 62—5)

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This invention relates to mobile refrigeration units.

In the patents to Oliver C. Irwin, No. 2,316,791 and 2,316,792, there are disclosed mobile refrigeration units wherein a portion of an absorption type refrigeration system is carried by the unit while the remainder of the system is non-mobile. The equipment of the mobile unit consists of a refrigerant holder, an evaporator and an absorbent holder in combination with means whereby the evaporator and absorber may be periodically resupplied with fresh refrigerant and absorbent respectively from the non-mobile portion of the system.

An object of this invention is a mobile refrigeration unit of the Irwin type in which the arrangement of the refrigerating equipment carried thereby is such as to provide maximum storage space within the unit.

In a mobile refrigeration unit embodying the invention, only the evaporator is contained within the body of the unit. The refrigerant holder and the absorbent holder are located exterior of the unit body and may, if desired, be supported beneath the body. Suitable pipes connect the evaporator between the refrigerant holder and the absorbent holder and means are provided for controlling the flow of liquid refrigerant from the refrigerant holder to the evaporator. With this arrangement, the entire space within the unit body except that occupied by the evaporator is available for storage.

Other objects, novel features and advantages of this invention will become apparent from the following specification and accompanying drawings, wherein:

Fig. 1 is a section through a railway car embodying one modification of the invention, the section being taken on the line 1—1 of Fig. 3;

Fig. 2 is an enlarged vertical section through the absorber;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged section on the line 4—4 of Fig. 1;

Fig. 5 is a view similar to Fig. 4 of a modification, and

Fig. 6 is a fragmentary elevation of a portion of the modification of Fig. 5.

Referring now to the modification of Figs. 1 to 4 inclusive, 10 designates the body of a railway car equipped with suitable running gear 11, the body being suitably heat insulated. Two headers 12 and 13 respectively are mounted within the body near the ceiling thereof, the

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header 12 being arranged near the right end of the body and the header 13 being arranged near the left end of the body. A plurality of pipes 14 run longitudinally of the body 10 and communicate at one end with the lower portion of the header 12 and at the other end with the lower portion of the header 13, these pipes being equipped with thin circular fins 15.

The header 12 is provided with a dome 16 and the header 13 is provided with a similar dome 17. At the right end of the body 10 a tank 18 is supported below the floor of the body 10 and exterior thereof. A pipe 19 leads from the tank 18 to the dome 16. Within the dome 16 is pivotally supported a valve 20 adapted in one position to engage and close the end of the pipe 19. A float 21 is attached to the valve 20 by a stem 22, the float being so arranged as to actuate the valve 20 in accordance with the liquid level in the header 10 to control flow of liquid through the pipe 19.

At the left end of the body 10, a tank 23 is supported beneath the floor of the body and exterior of said body. A pipe 24 leads from the dome 17 to the lower portion of the tank 23 and extends thereinto a considerable distance. The pipe 24 is closed at the end thereof in the tank 23 but is provided with a plurality of small apertures 25 establishing communication between the interior and exterior of the pipe.

A pipe 26 leads from the upper portion of the header 13 to the upper portion of the header 12 with the juncture of the pipe 26 and the header 12 being above the level maintained in the header 12 by the float valve arrangement 20, 21, 22. A pipe 27 leads from the pipe 19 to the bottom of the header 12. A valve 28 in the pipe 19 and a valve 29 in the pipe 17 are provided for selectively directing liqiud flow either into the dome 16 or into the bottom of the header 12. A needle valve 30 is provided in the pipe 27.

The headers 12 and 13 together with the pipes 14 and 26 constitute the evaporator of an absorption refrigeration system. The tank 18 contains anhydrous ammonia while the tank 23 contains a weak solution of aqua ammonia. The anhydrous ammonia in the tank 18 is subjected to its own vapor pressure which causes the flow of anhydrous ammonia through the pipe 19 to the dome 16 with the valve 28 open and the valve 29 closed. The influx of anhydrous ammonia into the header 12 is controlled by the float valve arrangement 20, 21, 22 so as to maintain the liquid level in the header 12 just high enough to keep the mouth of the pipes 14 covered with liquid

ammonia. The anhydrous ammonia in the pipes 14 evaporates in the usual manner and the vaporized ammonia collects in the dome 17 from which it is conducted through the pipe 24 to the tank 23 in which it passes through the apertures 25 into the weak ammonia solution or the absorbent. Some liquid ammonia may collect in the header 13 but flow thereof to the tank 23 is prevented by provision of the pipe 26 which returns liquid from the header 13 to the header 12 thereby preventing the liquid level in the header 13 from reaching the level of the exit from the dome 17 to the pipe 24.

Under certain circumstances, the float valve arrangement may be omitted and the refrigerant be introduced into the header 12 through the needle valve 30 by way of the pipe 27. For this type of operation, the valve 28 is closed and the valve 29 is opened.

In the embodiment illustrated in Figs. 5 and 6, a vertical tank 31 is arranged in the upper portion of the body 10 near one end thereof. A pipe 19 leads from the refrigerant holder 18 to the lower portion of the tank 31 while a pipe 24 leads from the upper end of the tank 31 to the absorbent holder 23. Transverse headers 32 and 33 are connected to the tank 31 by pipes 34 and 35 respectively, the header 32 being at lower level than the header 33 and the pipe 34 communicating with the bottom of the tank 31 while the pipe 35 communicates with the tank 31 at a higher level. A plurality of U-shaped pipes 36 have one end connected to the header 32 and the remaining end connected to the header 33, the pipes extending longitudinally of the car with one leg of the U being at a higher elevation than the remaining leg. These pipes are equipped with fins 37. A float valve 38 controls the flow of liquid from the tank 18 through the pipe 19 so as to maintain the level of liquid within the tank 31 sufficiently high completely to close the pipe 34 while leaving the pipe 35 unobstructed. Liquid refrigerant under the effect of its own vapor pressure flows through the pipe 19 to the tank 31 and into the lower legs of the evaporator 36. Vaporized refrigerant is collected in the upper part of the tank 31 from which it is led by the pipe 24 to the absorber 23.

The tanks 18 and 23 are provided respectively with valve-controlled coupling members 41 and 42 which may be connected to suitable pipes or hose for the purpose of replenishing the charge of anhydrous ammonia in the tank 18 and for withdrawing spent absorbent from the tank 23 and introducing fresh absorbent thereinto. Also, the tank 23 preferably is equipped with cooling fins 43.

With respect to each embodiment, the arrangement is such that maximum storage space is made available within the body 10. The only parts of the refrigerating apparatus contained within the body are the coils constituting the evaporator and the flow control means. The arrangement of these members at the top of the body makes the entire floor area available for storage.

Although the invention has been disclosed as embodied in a railway car, it is to be understood that it is equally applicable to trucks, trailers and any form of mobile unit. Furthermore, although the absorbent and refrigerant holders have been disclosed as supported beneath the vehicle body, the invention contemplates arrangement of these holders elsewhere of said body exterior thereof. In addition, while it is preferable to arrange the evaporator adjacent the body ceiling, the evaporator may be differently located as desired or required. Also, it is to be understood that various modifications may be made in the embodiments above described without in any way departing from the spirit of the invention as defined in the appended claims.

I claim:

1. A mobile refrigeration unit comprising a body mounted on wheels, a refrigerant holder and an absorbent holder supported by said body, an evaporator supported within said body, pipes for conducting liquid refrigerant from the refrigerant holder to the evaporator and vaporized refrigerant from said evaporator to the absorbent holder, means for regulating the flow of liquid refrigerant to said evaporator to maintain a predetermined liquid level therein, and means whereby the refrigerant holder and the absorbent holder may be periodically supplied with fresh refrigerant and absorbent respectively.

2. A mobile refrigeration unit comprising a body mounted on wheels, a refrigerant holder and an absorbent holder supported by said body, a first header and a second header within said body, substantially U-shaped pipes having one end connected to the first header and the remaining end connected to the second header, a tank within said body adjacent the ceiling near one end, pipes connecting said headers to the tank at different elevations, a pipe for conducting liquid refrigerant from the refrigerant holder to the lower portion of said tank, a pipe for conducting vaporized refrigerant from the upper end of said tank to said absorbent holder, and means for regulating the flow of liquid refrigerant to said tank.

3. A mobile refrigeration unit according to claim 2 in which the headers extend transversely of the car body adjacent the ceiling near one end and the U-shaped pipes are arranged longitudinally of the body near the ceiling.

4. A mobile refrigeration unit according to claim 1 in which one or both holders are located beneath the body of said unit.

5 A mobile refrigeration unit according to claim 2 in which one or both holders are located beneath the body of said unit.

6. A mobile refrigeration unit according to claim 2 in which the headers extend transversely of the car body adjacent the ceiling near one end and the U-shaped pipes are arranged longitudinally of the body near the ceiling and one or both holders are located beneath the body of said unit.

7. A mobile refrigeration unit according to claim 2 in which the means for regulating the flow of liquid refrigerant to said tank include automatic means to maintain the level of the liquid refrigerant in said tank above the point of entry of the lower pipe to said tank and below the level of the point of entry of the upper pipe to said tank.

8. A mobile refrigeration unit according to claim 2 in which the headers extend transversely of the car body adjacent the ceiling near one end and the U-shaped pipes are arranged longitudinally of the body near the ceiling and in which the means for regulating the flow of liquid refrigerant to said tank include automatic means to maintain the level of the liquid refrigerant in said tank above the point of entry of the lower pipe to said tank and below the level of the point of entry of the upper pipe to said tank.

9. A mobile refrigeration unit comprising a

body mounted on wheels, a refrigerant holder and an absorbent holder supported by said body, a first header and a second header within said body, substantially U-shaped pipes having one end connected to the first header and the remaining end connected to the second header, a tank within said body adjacent the ceiling near one end, connections from said headers to the tank at different elevations, a pipe for conducting liquid refrigerant from the refrigerant holder to said tank, a pipe for conducting vaporized refrigerant from said tank to said absorbent holder, and means responsive to the liquid level in said tank for regulating the flow of liquid refrigerant thereto.

10. A mobile refrigeration unit comprising a body mounted on wheels, a refrigerant holder and an absorbent holder supported by said body, a first header and a second header within said body, substantially U-shaped pipes connected at one end to the first header and at the remaining end to the second header, a tank within said body adjacent the ceiling near one end, connections from said headers to said tank at different elevations, connections for supplying liquid refrigerant from the refrigerant holder to said tank, connections for conducting vaporized refrigerant from said tank to said absorbent holder, and means for regulating the flow of liquid refrigerant to said tank to maintain a predetermined level of liquid refrigerant in the tank.

11. A mobile refrigeration unit according to claim 10 in which the headers extend transversely of the body and the U-shaped pipes are arranged longitudinally of the body near the ceiling.

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