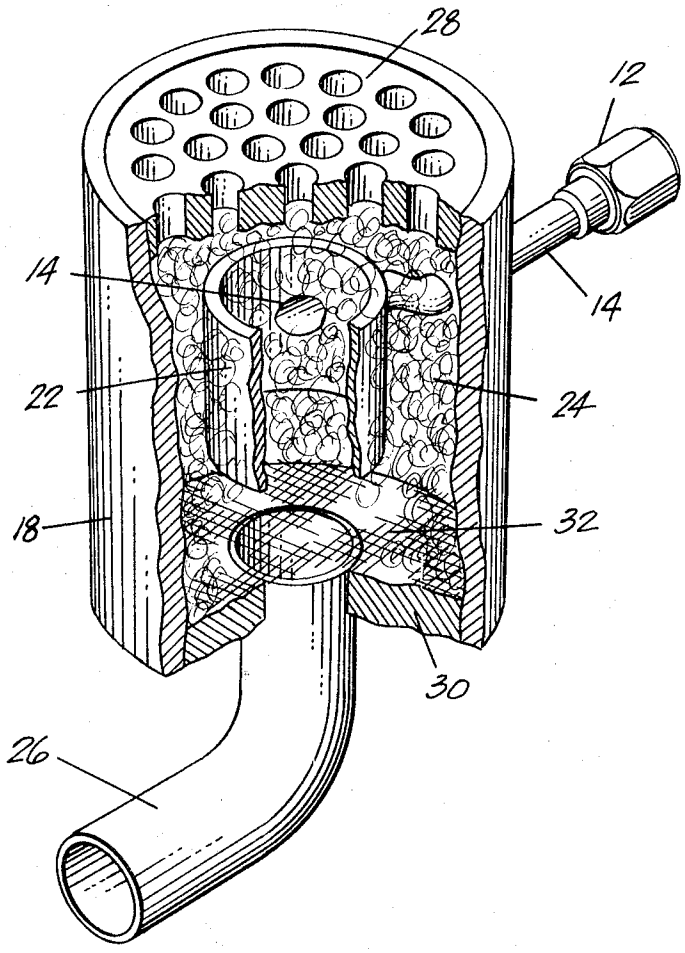
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DEVICE FOR POURING LIQUEFIED GAS

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DEVICE FOR POURING LIQUEFIED GAS

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This invention relates to a device providing the rapid and low-loss removal of liquefied gas from a pressurized vessel to an open container.

Following conventional practice, liquefied gases, as oxygen and carbon dioxide, are stored in pressurized tanks to facilitate transporting and handling and to prevent loss due to evaporation. When it is desired to fill an open Dewar or similar vessel with the liquefied gas a small diameter tube is attached to the valved outlet of the pressure tank. On opening the valve the liquid gas is ejected from the tank outwardly through the tube. Being suddenly relieved of its confining pressure a portion of the gas vigorously boils and evaporates within the tube. As it boils off a substantial quantity of mist or fog is created. Although a portion of the mist consists of condensed atmospheric moisture, a greater portion of it is made up of the vapor of the previously liquefied gas.

The present invention has as its primary purpose the reduction in the loss of the liquefied gas through boil-off. In accomplishing its purpose there is provided both economy and convenience in the near elimination of the massive clouds of fog which heretofore accompanied the pouring operation.

The purpose of this invention is achieved through the provision of a substantially closed expansion chamber serving to confine the boiled-off gas. Within the chamber is provided a condensing media which acts to recondense the gas and to collect the mist entrained in the evaporated gas.

The invention consists essentially of an insulated cylindric expansion chamber substantially filled with a loosely packed fibrous material such as stainless steel wool. Within the chamber is an open ended swirl ring into which the liquefied gas is initially admitted. The liquefied gas from the main pressurized container is led through a short length of tubing tangentially into the swirl ring.

The upper end of the expansion chamber is closed by a perforated cap which permits the exhaust of the small portion of the liquefied gas that has boiled off and which does not get recondensed on the fibrous packing. The lower end of the expansion chamber is closed by a cap having a short outlet spout attached to it.

In the pouring operation in which the present invention is utilized, the initial liquefied gas flow immediately reduces the fibrous wool to the temperature of the gas. In this manner the wool becomes an ideal condenser and filter for the gaseous mist. The condensed gas drains to the bottom of the expansion chamber where it joins the main liquid flow through the outlet tube. This outflow is gentle in contrast with the turbulent fog bound flow that was characteristic of the pouring operation prior to my invention.

It is reasonably estimated that by the use of the present invention the rate of flow of liquefied gas into a Dewar vessel can be doubled while the loss of gas through evaporation is reduced one-half.

These and additional features and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawing in which:

The figure is a perspective view, with portions broken away to show the interior, of the presently preferred embodiment of my invention.

Referring to the drawing, the invention is shown as having an internally threaded coupling nut **12** which attaches to the valved outlet of a pressurized liquefied gas container (not shown). Leading away from the nut **12** is a short length of tubing **14** which passes through the wall and into the interior of the expansion chamber **18**. This chamber **18** is a long cylindrical member preferably having walls formed of a good heat insulating material.

There is suspended centrally within chamber **18** an annular swirl ring **22** affixed to the end of the inlet line **14**. As seen in the drawing, the inlet line **14** intersects the swirl ring **22** at an angle such as to cause the liquefied gas to enter the swirl ring **22** tangentially. Thus the entering fluid flow is caused to swirl within the ring **20** to facilitate the dissipation of its energy. The swirl ring **22** further assures a more uniform flow of the evaporated gas through the interior of the expansion chamber **18**.

Within chamber **18**, including the interior of swirl ring **22**, there is loosely packed a mass of a fibrous material **24**. For better efficiency the material **24** should be stainless steel wool or other non-absorbent and non-corroding material. The fibrous material **24** is employed since it provides an extremely large surface area on which the evolving mist can collect and be condensed. During the pouring it will be obvious that the temperature of the material **24** almost immediately is reduced to the temperature of the liquefied gas. The accumulated condensate gravitates to the bottom of chamber **18** and thereby further provides an absorbent bath for the expanding mist of gas. The action of the fibrous material **24** and the condensate is thus seen to be cumulative.

At its top, the expansion chamber **18** is fitted with a perforated cap **28** which vents to the atmosphere. From the lower end of chamber **18** extends an outflow tube **26** fitted into a mating hole in the bottom plate **30**. Both the cap **28** and the plate **30** are formed of insulating material as are the side walls of the chamber **18**.

As a precautionary measure a filter screen **32** is placed across the bottom plate **30** and the opening to exit tube **26**. This screen **32** will prevent any loose fibers of the steel wool **24** from passing out of the device with the liquefied gas.

With the present construction, all the boil-off from the liquefied gas is caused to pass through a large volume of the matted fibrous material **24**. In this manner a high percentage of this mist or fog is recondensed. It will be apparent then that the configuration of the expansion chamber **18** and the swirl ring (or baffle) **22** can be varied with respect to each other to provide other forms of the invention.

While only a single form of my invention is described it will be obvious that it is capable of modification and change within the scope of the following claims.

I claim:

1. A device for the removal of liquefied gas from a zone of high pressure to a zone of reduced pressure comprising:

an expansion chamber having an upper cap and a lower closure cap;

vent means in the upper cap freely communicating the interior of the expansion chamber with the atmosphere;

an inlet duct discharging liquefied gas from the zone of high pressure into the expansion chamber at a region remote from the vented cap;

liquid outlet means at the lower end of the chamber;

a fibrous material loosely packed within and substantially filling the interior of the expansion chamber; and

baffle means within the expansion chamber dispersing the liquefied gas and its vapors discharged from the inlet duct.

2. A device as defined in claim 1 wherein the baffle means comprises a swirl ring centrally within the expansion chamber and wherein the inlet duct discharges the liquefied gas tangentially to the interior of the swirl ring.

3. A device as defined in claim 1 wherein the liquid outlet means includes a duct receiving fluid through an opening in the lower closure cap; and

filter screen means across the opening in the lower closure cap precluding the passage therethrough of any of the fibrous material.

4. A device as defined in claim 1 wherein the fibrous material is non-absorbent, non-corroding steel wool.

5. A device as defined in claim 1 wherein the expansion

chamber, the upper cap and lower cap are formed of materials having a low thermal conductivity.

6. A device as defined in claim 1 wherein the vent means in the upper cap includes a plurality of perforations to permit the ready escape of the vapors from the expansion chamber.

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