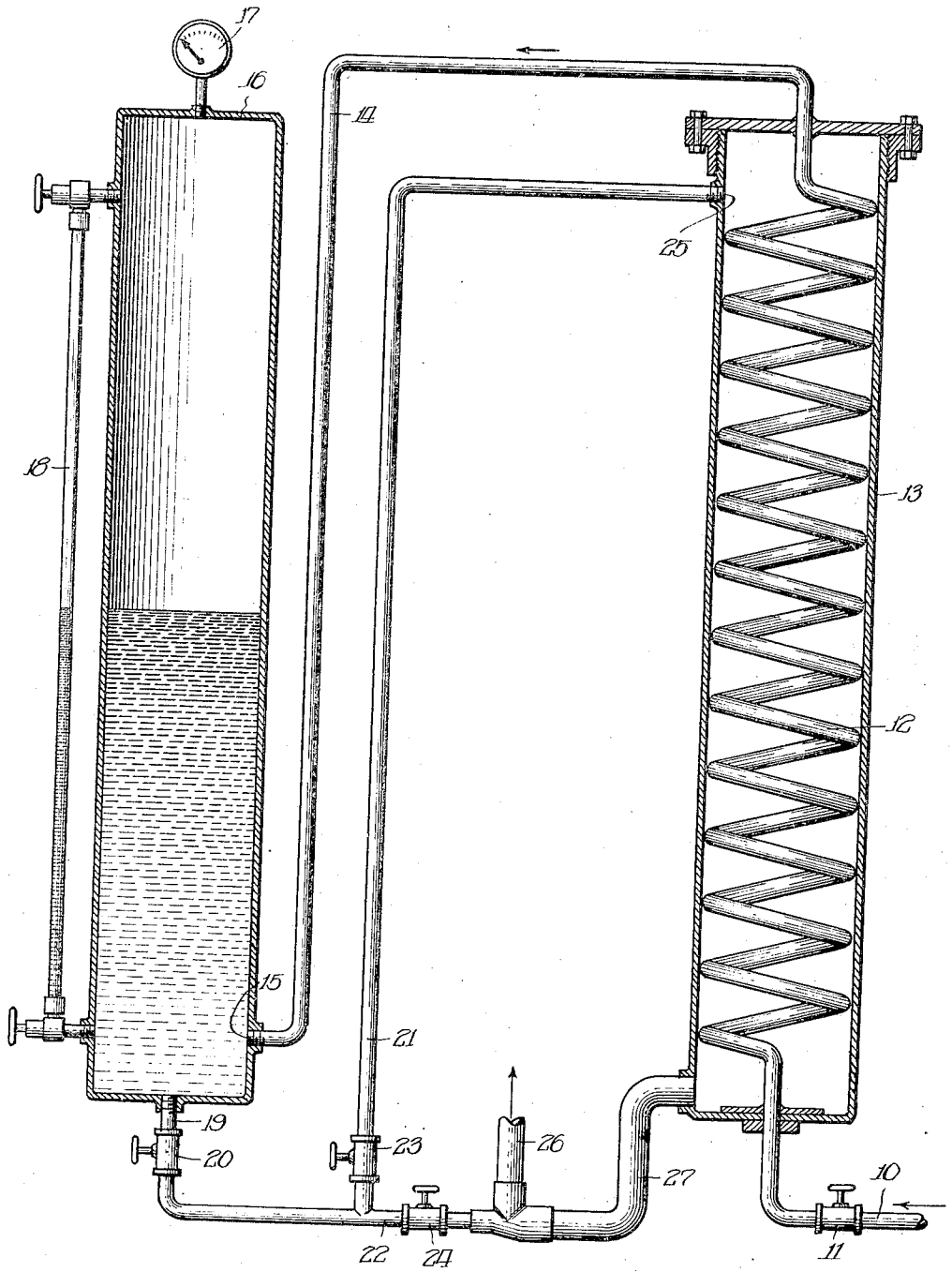
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DEVICE FOR CONTROLLING PRESSURE OF VOLATILE LIQUIDS

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DEVICE FOR CONTROLLING PRESSURE OF VOLATILE LIQUIDS

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This invention relates to an improved method of handling fluids supplied under pressure whereby fluid may be withdrawn from the volume of fluid at a uniform pressure and at a constant rate per unit of time.

In handling substances which are gaseous in ordinary temperatures and pressures, it is often customary where such is possible to transport and store these under pressure in liquid form. This is true for instance, in the case of anhydrous ammonia. Under such conditions, a closed container under pressure containing the particular liquefied gas is subject to varying pressures depending upon the temperature to which the container is exposed. The difficulty therefore, which will be encountered in attempting to withdraw a constant quantity of such fluid is obvious.

In view of the fact that it is extremely desirable to be able to withdraw such fluids, such as for instance, anhydrous ammonia, at a uniform rate per unit of time, the present method and apparatus has been devised for accomplishing this result. It is therefore, an object of this invention to provide a method and an apparatus which serve to produce and maintain a uniform pressure on withdrawn fluids irrespective of external temperature conditions, whereby by proper regulation of the apparatus, a uniform quantity of fluid may be withdrawn per unit of time.

Other objects not specifically enumerated are contemplated for this invention which will readily appear to one skilled in the art as the following description proceeds.

The present illustration is given merely by way of example and is not to be considered as limiting the invention in any respect as the scope of the invention may be determined from the appended claims, and an understanding of this disclosure and an appreciation of the advantages which the invention produces therein.

The process and apparatus of this invention may be more readily understood by referring to the accompanying drawing in which the figure is a diagrammatic representation of the various parts thereof.

By referring to the drawing, it will be noted that the apparatus of the present invention is illustrated as embodying an inlet pipe 10, having a control valve 11. The inlet pipe 10, is connected to a source of fluid under pressure in liquid form which may be considered as a suitable supply of the fluid to be withdrawn. This supply may be tanks or drums in which the fluid is supplied by the manufacturer, or it may be a tank car or any other suitable container.

The supply pipe 10, at its other end connects with a coiled pipe 12, located in a sealed tank 13. In the present illustration, the supply pipe enters at the bottom of the tank, joins with the coil which leaves the tank at the upper end thereof. The upper end of the coil is connected by a pipe 14, which communicates with the inlet opening 15 located in the lower portion of a tank 16. The tank 16, is provided with a pressure gauge at its upper portion and a liquid sight gauge 18, along one side thereof. Tank 16, is provided with a discharge pipe 19, connected with the bottom thereof and provided with a control valve 20. The discharge pipe 19, connects with the branched pipes 21 and 22, provided with the control valves 23 and 24, respectively.

The branch pipe 21, communicates as at 25, with the interior of the tank 13 at its upper end, whereas the branch pipe 22 communicates with the discharge pipe 26 which leads to any suitable outlet where the gas is to be withdrawn.

The lower end of tank 13, is provided with a pipe 27, which connects the interior of the tank with the discharge pipe 26. The operation of this apparatus is as follows:

The quantity of fluid to be withdrawn is estimated and the valve 11 is adjusted to admit to the apparatus, substantially that quantity, the quantity supplied, however, will vary slightly under varying conditions of pressure in the supply tank from which the fluid is withdrawn. However, the withdrawn fluid passes upwardly through the coil 12 and subsequently passes through the pipe 14, into the tank 16. Sufficient fluid is permitted to enter the apparatus here described before any fluid is withdrawn from the pipe 26 whereby to establish sufficient pressure in the system and

in the tank 16 to maintain a portion at least, of the gas in liquid form. Under preferred conditions of operation the quantity of liquid in tank 16 may be that represented in the showing of the drawing.

With the apparatus so set, the withdrawing action is next commenced, which may be accomplished by the passage of liquid through either or both of the valves 23 and 24. It is necessary in this regard, to adjust the valve 20, to that degree of opening which will not interfere with the control provided by the adjustment of the valves 23 and 24.

It will be obvious that that portion of the fluid which passes through the valve 24 will escape directly to the discharge pipe 26, without further effect or control. On the other hand, that portion of the fluid, which passes through the discharge pipe 26, will find its way through the pipe 21 to the upper portion of the tank 13, where it comes into heat transferring association with the coiled pipe 12 and its contained fluid. A refrigerating action therefore, takes place with the result that the evaporated and expanded fluid absorbs heat from the fluid contained in the pipe 12, entering the apparatus, with the result that the temperature of the fluid entering the apparatus is reduced and the pressure correspondingly lowered. The fluid which enters the tank 13, may then pass out of the bottom thereof through pipe 27, and discharge pipe 26.

In conducting the operation of the apparatus the pressure gauge 17 will be closely watched and the regulating valves 23 and 24 will be adjusted to vary that quantity of withdrawn fluid which is passed to expand in heat absorbing relationship with the coil. By varying this quantity it will be readily apparent that the pressure within the tank 16 may be maintained constant. By providing a constant pressure as above described, it will be obvious to those skilled in the art that a uniform quantity of fluid per unit of time may be withdrawn from the outlet pipe 26, and furthermore that by adjusting the inlet valve 11 with respect to the adjustments of the discharge valves 23 and 24, a quantity of fluid may be supplied to the apparatus equal to that withdrawn from the apparatus.

It is therefore possible to conduct a continuous withdrawing operation, and by merely controlling the valves 23 and 24 to maintain a uniform discharge of the fluid.

This apparatus has utility in many uses and may be mentioned by way of illustration that it has been put in practice in connection with withdrawing anhydrous ammonia for use in the manufacture of fertilizers. Knowing that the supply of withdrawn fluid is uniform per unit of time, it is a relatively simple matter to determine the actual quantity desired for use by proper measuring devices.

I claim:

1. The method of withdrawing liquefied fluids, normally gaseous from a container under pressure which consists in permitting the passage of the fluid from a body of fluid under liquefying pressure, into a closed space at a certain rate and withdrawing said fluid from said space at substantially the same rate while maintaining a sufficient uniform pressure in said space to hold said fluid at least partially liquefied, and maintaining said uniform pressure by permitting the expansion of a determined quantity of said withdrawn fluid in heat transferring association with the fluid passing to said space.

2. The method of withdrawing liquefied fluids, normally gaseous from a container under pressure which consists in permitting the passage of the fluid from a body of fluid under liquefying pressure, into a closed space at a certain rate and withdrawing said fluid from said space at substantially the same rate while maintaining sufficient pressure in said space to hold said fluid at least partially liquefied, and permitting the expansion of a determined quantity of said withdrawn fluid in heat transferring association with the fluid passing to said space while controlling the quantity of said expanded fluid in accordance with requirements to maintain a uniform pressure in said space.

3. An apparatus of the character described comprising a coil, a chamber surrounding said coil, a pressure tank, said coil being connected to said pressure tank and said pressure tank being connected to said chamber, a discharge pipe in communication with said pressure tank and with said chamber, and means for controlling the connection opening between said pressure tank and chamber and said pressure tank and outlet pipe.

4. The method of withdrawing anhydrous ammonia from a tank of liquid ammonia at a uniform rate which comprises permitting the ammonia to escape into a closed system and withdrawing said ammonia from said system at substantially the same rate and utilizing the heat absorption properties of at least a portion of said ammonia upon the evaporation and expansion for lowering the temperature of the ammonia in the closed system in a manner to maintain a constant temperature therein.

Signed at Chicago, Illinois, this 19th day of May, 1930.

HERMAN B. SIEMS.