Sept. 7, 1937. J. LITHGOW 2,092,174

MEANS FOR UNLOADING BULK SHIPMENTS OF LIQUIDS

Filed May 28, 1934

Fig. 1.

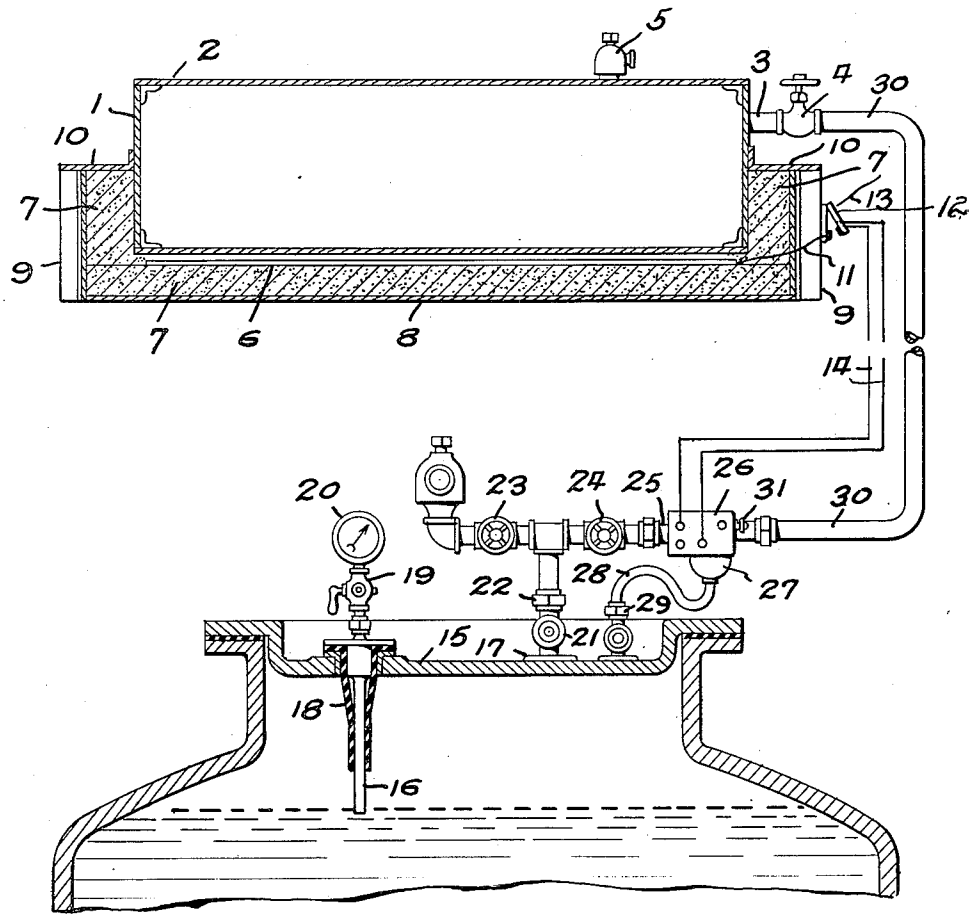


Fig. 2.

INVENTOR,

James Lithgow,

By Glenn S. Noble

ATTORNEY.

Patented Sept. 7, 1937 2,092,174

UNITED STATES PATENT OFFICE

2,092,174

MEANS FOR UNLOADING BULK SHIPMENTS OF LIQUIDS

James Lithgow, Chicago, Ill.

Application May 28, 1934, Serial No. 727,997

2 Claims. (Cl. 62—1)

My invention relates in general to the loading and unloading of bulk shipments of carbonated liquids such as beer, mineral waters, and fruit juices; or other viscous fluids or materials, that would not be affected by contact with carbon dioxide gas. My invention discloses a preferred method of supplying the gas necessary to load or unload a liquid container, similar to container described in my co-pending application Serial No. 725,001 by means of subliming solid carbon dioxide.

An important object of the invention is to supply a source of carbon dioxide gas which will be more economical than the present method of gasifying liquid carbon dioxide.

Another important object of the invention is to lower the shipping and handling costs of the process by eliminating the heavy containers used for the storage of liquid carbon dioxide.

An important object of the invention resides in eliminating the troubles inherent in pressure regulators or reducers, when used to handle large volumes of gas.

Another important object of the invention resides in providing a means of subliming a large volume of solid carbon dioxide in a relatively short period of time, and maintain the dimensions of the container within reasonable limits.

Another important object of the invention is to supply an automatic means of controlling the sublimation of the solid carbon dioxide.

Still another important object of the invention resides in automatically controlling the pressure within the container.

Many other advantages will be apparent from the drawing and description.

Fig. 1 shows a sectional view of the solid carbon dioxide container.

Fig. 2 shows a section of a dome cover for a liquid container, similar to the dome cover described in my co-pending application Serial No. 725,001.

In Fig. 1 the solid carbon dioxide container 1 is a metal container designed to receive the desired charge of solid carbon dioxide, preferably of rectangular section, having a removable cover 2 sealingly attached to container by any conventional means, and an outlet pipe 3 sealingly attached to container 1; also a valve 4 of any conventional type sealingly attached to pipe 3. Valve 4 in turn being provided at its outer end with means to connect a hose 30 or other type of conduit. A relief valve 5 is threadingly or otherwise attached to cover 2, or may be attached to container shell if desired.

Along the bottom of container 1 and in close contact with the metal at this point an electric heating element 6 is placed.

The container 1 is insulated by means of insulation 7 over the entire bottom surface, and also part way up its side and end surfaces. The insulation 7 being protected by sheet metal or other protective covering 8. The protective cover 8 and insulating material 7 being easily removable in order to facilitate repairs.

Supports 9 attached to container 1, and also to angle 10 bears the load of the container and contents.

The heating element 6 being wired by means of wires 11 in the conventional manner to a contactor 12. The wires 13 are power lines for supplying current to heater 6, while the wires 14 are the lines which operate the coil of the contactor 12, the flow of current through these wires 14 being controlled by pressure control switch 26 shown in Fig. 2.

In Fig. 2, a section of the container cover 15 is shown, on which is mounted the combined pressure and liquid height gauge 16, also the gas inlet connections 17, which are fully described in my co-pending patent application Serial No. 725,001.

The pressure and height gauge 16 consists in part of a tube 18 extending into container, a three way cock and necessary fittings 19 outside the container, and a pressure gauge 20 threadingly attached to cock 19. When cock 19 is turned in the desired position the gas in the container will exert its pressure on the pressure gauge 20.

The gas inlet connections consist in part of a valve 21, a fitting 22, a valve 23 and a valve 24, the valve having a connection to fit a special fitting 25 which is formed to connect to valve 24 at one end, and to receive the other end of hose 30 or conduit attached to valve 4 in Fig. 1. The fitting 25 is also formed to allow connection of a conventional type pressure control switch 26. The pressure element 27 of the pressure control switch 26 being connected to container cover 15 by means of a tube 28 and a valve 29. The wires 14 being connected in such a manner so as to break the circuit when the pressure in the container reaches a predetermined pressure. The pressure control switch 26 includes an electric switch 31 for regulating the circuit to the heating element 6.

When loading or unloading a container the solid carbon dioxide subliming equipment would be operated as follows:—

The three way cock 19 of the combination pressure and liquid height gauge 16 would be turned to allow the pressure inside the container to exert its pressure on the pressure gauge 20. The special fitting 25 with hose 30 attached would be connected to valve 24. The other end of hose 30 would then be connected to valve 4 on solid carbon dioxide container. The cover 2 removed and a charge of solid carbon dioxide put into the container 1, the cover replaced and securely sealed. The tube 28 connected to valve 29, and then valves 4, 29, 24 and 21 opened. The switch at the power source would then be operated to supply power to the wires 13 and 14.

When loading a container for the transportation of carbonated liquids the container would be filled to overflowing with water to drive out all air, the gas supply would then be applied and the water would then be forced out of container by the gas through the outlet in the container for this purpose.

After filling with water the container would be at atmospheric pressure, therefore, the electrical switch part of the pressure switch 26 would be closed thereby allowing current to flow by means of wires 14 through coil of contactor 12 closing same, thereby allowing current to flow through heating element 6 by means of wires 13. The solid carbon dioxide would absorb heat from heating element, thereby causing sublimation of the solid carbon dioxide. The gas from the carbon dioxide flowing through the means provided into the container and driving out the water therein. During this operation should the pressure within the liquid container rise higher than the predetermined working pressure, the electrical switch part 31 of the pressure switch 26 will be opened by the internal pressure of the container through the pressure element 27, tube 28 and valve 29; thereby cutting off the current from wires 14 and coil of contactor, opening contactor 12 and cutting out the power supply to the heating elements. This in turn lowers the sublimation rate of the solid carbon dioxide.

After discharging the water in the above manner, the pressure in the container is raised to the desired pressure, usually 15 pounds per sq. in., before loading the carbonated contents. The pressure switch 26 automatically cutting off the heat in the aforementioned manner when the desired pressure has been reached.

The power lines are then disconnected at their source, and valves 4 and 21 closed, fitting 17 removed and valve 21 sealed.

When unloading a container filled with carbonated liquid the procedure would be the same as for loading, with the exception that the carbonated liquid would be discharged instead of water, also that the equipment would be shut off whenever the contents had been discharged through the means provided in the container for that purpose.

It will be seen that in the case of a container for the transportation of liquids in bulk, such containers usually having a capacity of 10,000 gallons, the amount of gas required to load or unload it is very large. This has been found by test to be approximately 600 pounds. It is also known that the cost to the consumer in the case of liquid carbon dioxide is approximately twice as much as solid carbon dioxide. It is evident that this would result in a considerable saving to the consumer, especially when he may load as many as 30 tank cars of this type in one day.

It is evident that, the automatic control when loading and the fact that the time required to sublime a given amount of carbon dioxide can be determined, are distinct advantages.

When loading a container of the type aforementioned the operator usually desires to complete the operation in four hours. By applying a means of heating by heating elements, this can be accomplished in a solid carbon dioxide container no larger than the actual dimensions of the charge itself; a surface area of 28 square feet. If this was attempted by means of transmission of heat between inside of container and atmosphere, this would require a container with a surface area of more than 720 square feet with an outside temperature of 90° F. It is evident that because of the large surface area required to sublime the solid carbon dioxide in four hours, and the small surface area of contact between the container and the material that that method would be very impractical if not impossible. By using the heating element method a selector switch could be easily applied, whereby the wattage of the element could be altered at will, and thereby the rate of sublimation of the solid carbon dioxide.

If liquid carbon dioxide was used to load a container of this size, freezing of the pressure reducing valves or regulators would result, owing to the large volume of gas used and the fact that the pressure would be reduced from high pressure to atmospheric pressure.

The drawing and description has disclosed a heating element consisting of electric heating elements, it will be easily seen that gas, oil or other fuels could be used for this purpose, and such could be controlled automatically in a manner similar to that herein disclosed, for instance the pressure switch 26 could just as easily operate a solenoid valve, as control the contactor 12, and thereby control the flow of gas or other fuels.

The electric heating element 6 as shown in Fig. 1 could easily be placed in contact with the sides, ends and bottom of container 1, and would probably be more efficient, but owing to the low cost of power the small saving in cost is offset by the saving on construction and maintenance.

It is thought that the numerous advantages of the invention will be understood from the foregoing description and it is obvious that numerous changes may be made in the form, construction, and arrangement of the several parts without departing from the spirit or scope of my invention or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating my invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:—

1. A means of subliming solid carbon dioxide to unload a container for the transportation of liquids, or the like in bulk by the sublimed gas, comprising a container, heating elements to speed the rate of sublimation, a contactor to apply and shut off power to said heating elements; a selector switch to control the wattage of the elements, a pressure switch operated by the internal pressure in said liquid container, said pressure switch operating the aforementioned contactor, a tube or conduit between said pressure switch and said liquid container, together with a gas hose or conduit between solid carbon dioxide container and liquid container.

2. Means for unloading a container for the transportation of liquids by the sublimed gas produced by subliming solid carbon dioxide, comprising a container for the solid carbon dioxide, electric heating elements coacting with the container to increase the rate of sublimation, means for supplying electricity to said heating elements, a pressure switch operated by the pressure in said liquid container to control the electricity supplied to the heating elements, a conduit between said pressure switch and said liquid container, and a conduit between said solid carbon dioxide container and said liquid container.

JAMES LITHGOW.