Jan. 12, 1943. T. A. ST. CLAIR 2,308,122

DISPENSING SYSTEM

Filed Sept. 27, 1940

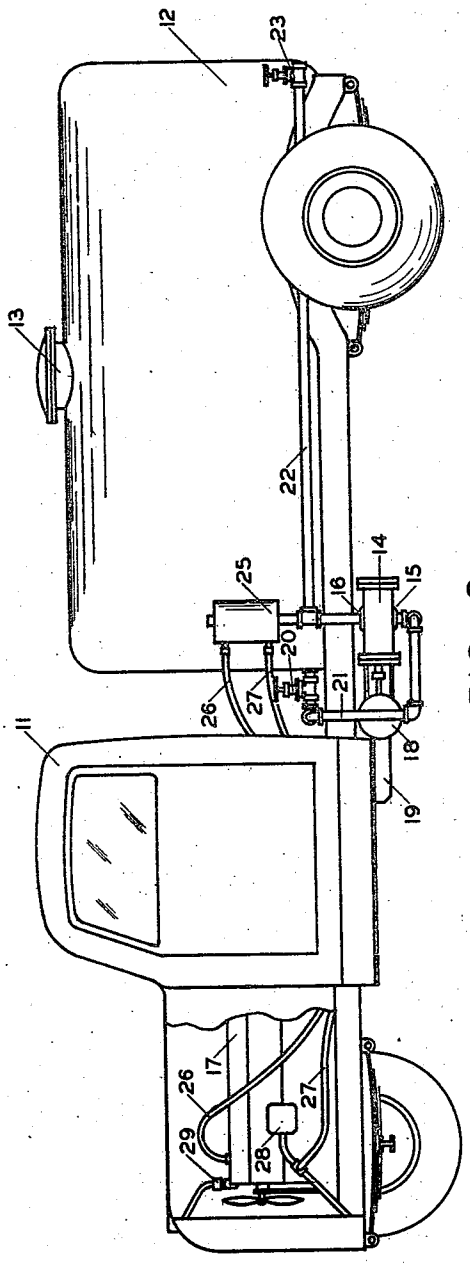


FIG. 2

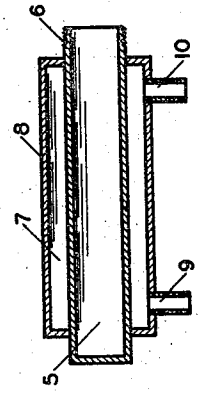


FIG. 1

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Patented Jan. 12, 1943 2,308,122

UNITED STATES PATENT OFFICE

2,308,122

DISPENSING SYSTEM

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Application September 27, 1940, Serial No. 358,729

5 Claims. (Cl. 103—224)

This invention relates to apparatus for reducing surges in pumping equipment.

Pressure surges in discharge piping of reciprocating pumps give rise to severe stresses on the pumping equipment and piping and produce what is known as "water hammer." Water hammer is a series of shocks produced by sudden change in the rate of fluid flow in the pipe. If no relief devices are provided the surges travel along the discharge piping as compressional waves and are expended in compressing the liquid and stretching the pipe walls until they are dampened out by friction.

In the pumping of water, where the problem of pressure surges was probably first encountered, it was found that adequately proportioned air filled surge chambers on the pumping mains serve to absorb almost entirely the shock of water hammer. Means are provided for replacing the compressed air in the surge chambers as it dissolves in the water. Pressure surges present problems in the handling of crude petroleum and petroleum products for which the application of the air-filled surge chamber is not, in many cases, a satisfactory solution. In some instances the nature of the hydrocarbons and the conditions under which they must be handled are such that contamination with air is undesirable or even hazardous. In any case, it has been found that the solubility of gas or air in a liquid hydrocarbon increases rapidly as the pressure is increased and this, in turn, makes it necessary to replenish the supply of gas in the surge chamber quite often. Liquefied petroleum gases, such as propane, butane, or a mixture, are extensively marketed for use as fuels. In the transportation and marketing operations it is necessary to transfer the liquefied gases from one container to another several times before they reach the ultimate consumer. The present practice when using reciprocating pumps to effect the transfer is to provide the pumps or discharge piping with suitable surge chambers filled with compressed air or gas and to replenish the gas at frequent intervals. The maintenance of a suitable quantity of air in the surge chambers is a problem which is especially annoying to the operators of delivery trucks. In some instances it is necessary for the operator to replenish the air supply in the conventional type surge chamber three or four times per day.

An object of this invention is to provide means for reducing pressure surges in the discharge piping of reciprocating pumps.

A further object of this invention is to provide apparatus for use in dispensing volatile liquids and liquefied gases.

The objects of this invention are accomplished by the utilization of vapors from the liquid being pumped to alleviate pressure surges and eliminate the inconvenience and expense of recharging the conventional surge chamber. The vapors are confined in a surge chamber which is maintained at a temperature sufficient to insure the presence of vapors therein. The present invention is particularly applicable for use with a delivery truck but may also be used in connection with other types of equipment.

Figure 1 is an elevational view in vertical cross section of apparatus suitable for carrying out the present invention.

Figure 2 is an elevational view of a delivery truck illustrating a particular application of the present invention.

With reference to the drawing, the numeral 5 designates the chamber in which vapors are to be maintained as an elastic cushioning medium to reduce the pressure surges in the discharge piping. The chamber 5 has a threaded portion 6 by which it may be attached to the piping in the manner of the conventional air filled surge chamber. The vapors confined in the chamber 5 are maintained at a temperature sufficient to prevent their condensation at the pressures developed in the surge chamber during the operation of the pump. In the embodiment illustrated in the drawing the proper temperature is maintained in the chamber 5 by supplying a heating fluid 7 in heat exchange relation with the vapor in chamber 5. The heat exchanger comprises the chamber 5 and a concentrically arranged shell 8 having a fluid inlet 9 and a fluid outlet 10. The heating fluid 7 is contained in the annular space between the chamber 5 and the shell 8. The heat exchanger may take other forms which will be apparent to those skilled in the art. Figure 1 merely illustrates one embodiment which has been found to be satisfactory in carrying out the present invention. The heating fluid 7 may be liquid, vapors, or gases. For example, hot water, steam, and exhaust gases from internal combustion engines are suitable for use as the heating fluid 7.

Figure 2 illustrates the use of the apparatus of Figure 1 with pumping equipment in conjunction with a liquefied gas delivery truck. The delivery truck designated generally by the numeral 11, has mounted thereon a container 12 for liquefied gas. The container 12 is provided with a suitable filling hatch 13 through which it may be

filled with liquefied gas from the bulk storage tanks, not shown in the drawing.

Means to transfer the liquefied gas from the container 12 to the customer's containers, not shown in the drawing, include a pump 14 having an intake 15 and a discharge 16. The pump may be driven by the motor 17 of the truck through the means of a suitable driving mechanism 18 and the power take-off 19 which is attached to the truck transmission. Safety devices and auxiliary equipment forming no part of this invention and not shown in the accompanying drawing, may be used with the pump 14. Such devices are shown and described in the Patent 1,897,167 to Rosswell W. Thomas.

An intake conduit comprising the piping 21 and the eduction valve 20 at the outlet of the container 12 provides communication between the container and the intake 15 of the pump. The discharge conduit 22, connected to the discharge 16 of the pump, terminates near the rear of the container 12 at the valve 23. A suitable conduit, not shown in the drawing, is attached to the discharge conduit 22 at the valve 23 when the liquefied gas is to be transferred from the container 12 to another container.

The apparatus for reducing the pressure surges, shown in Figure 1 and previously described herein, is designated generally by the numeral 25 of Figure 2 and is in communication with the discharge conduit 22 and with the discharge 16 of the pump. Heating fluid is supplied to the heat exchanger forming a part of the apparatus 25 through the conduit 26 and is withdrawn from the heat exchanger through the conduit 27. Figure 2 of the drawing illustrates a particular installation in which the heating fluid used is water from the cooling system of the truck motor 17. In this installation the hot water is taken from the top of the motor 17 through the conduit 26, passed through the heat exchanger of the apparatus 25, and the water returned to the lower part of the motor through the conduit 27. Circulation of the water from the truck motor 17 through the apparatus 25 is facilitated by the water pump 28 which is a part of the present automotive motors and by the thermostat-controlled valve 29 in the cooling system. The valve 29 is preferably set to maintain the water temperature in the motor at or above 160° F. under normal operating conditions.

By trial it has been found that satisfactory results are obtained when pumping liquefied petroleum gases from one container to another container if the volume of chamber 5 is approximately twice the displacement of one end of the pump cylinder. The volume of chamber 5 should be substantially larger when higher pressures are involved and may be determined approximately by one skilled in the art. The apparatus has been successfuly operated with liquefied petroleum gases and has resulted in some instances in decreasing the delivery time as much as twelve per cent.

I claim:

1. Portable apparatus for dispensing volatile liquids comprising a pump, a surge chamber associated with the discharge of the pump and having a volume approximately twice the displacement of one end of the pump, a prime mover for driving the pump, and means for utilizing heat liberated by the prime mover for heating the surge chamber.

2. Portable apparatus for dispensing volatile liquids comprising a pump, a surge chamber connected to the discharge of the pump having a volume approximately twice the displacement of one end of the pump, an internal combustion engine for driving said pump, and means for utilizing heat from the engine for maintaining vapor in the surge chamber including a concentrically arranged shell surrounding said chamber.

3. Portable apparatus for reducing pressure surges in pumping equipment comprising in combination with a pump, a discharge conduit, a surge chamber having a volume approximately twice the pump displacement associated with the discharge conduit, an internal combustion engine for driving said pump, and means for supplying heating fluid from said engine in heat exchange relationship with said chamber comprising a concentrically arranged shell surrounding the surge chamber having a fluid inlet and outlet connected to the engine.

4. Portable apparatus for dispensing volatile liquids comprising a motor driven vehicle, a pump, a discharge conduit for said pump, a heat exchanger including a surge chamber having a volume approximately twice the pump displacement and a concentrically arranged shell surrounding the surge chamber for utilizing heat from the vehicle motor for maintaining vapor in the said surge chamber, said heat exchanger connected to the discharge conduit and to the vehicle motor, and means for transmitting motion from the vehicle motor to the pump.

5. Portable apparatus for dispensing volatile liquids comprising a pump, a surge chamber associated with the discharge of the pump, a prime mover for driving said pump and means for utilizing heat liberated by the prime mover for heating the surge chamber.

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