Nov. 18, 1941. R. W. HAVERLEY 2,263,300

SIPHON SYSTEM

Filed May 2, 1940

Fig. 1.

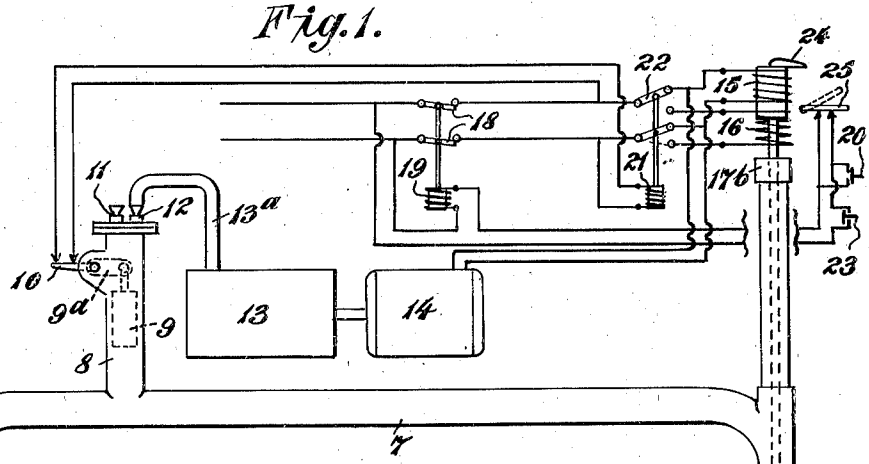



Fig. 3.

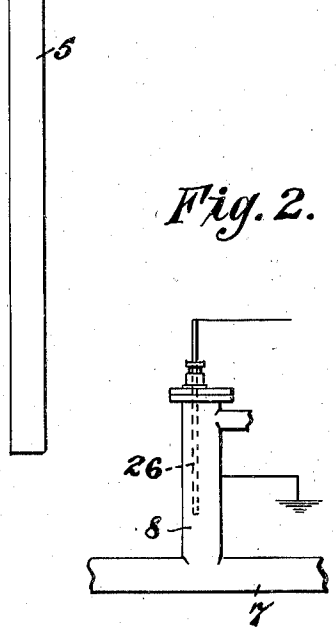
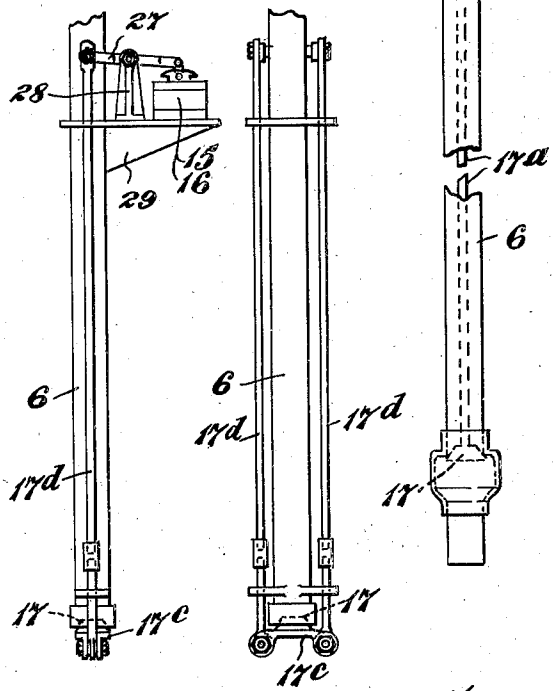



Fig. 2.

Fig. 4.




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Patented Nov. 18, 1941

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# UNITED STATES PATENT OFFICE

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## SIPHON SYSTEM

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Application May 2, 1940, Serial No. 332,995
In Great Britain May 6, 1939

5 Claims. (Cl. 137—20)

This invention has reference to improvements in siphon systems, and is more particularly applicable to a siphon system which is associated with an electrically controlled circuit which is automatically cut out when the siphoning operation is initiated.

The invention is particularly applicable to siphon systems utilised in the handling of solutions of say a high freezing point, or for the transfer of corrosive fluids.

The control means for the siphon system is disposed above the fluid flow line so that the fluid does not make contact with any of the control mechanism, whereby the operative parts of the control mechanism are not brought into contact with the fluid passing through the siphon system, thus obviating undue wear or corrosion of the operative or controlling parts of the system.

The invention consists of a priming and controlling siphon system, characterised by an electric circuit controlling mechanism for automatically cutting out the electric motive power when the siphon system is in operation, the invention being further characterised by an electro-magnetic means for positively operating the outlet valve of the siphon system.

In the drawing:

Fig. 1 is a diagram illustrating the essential features comprising the present invention.

Fig. 2 illustrates an alternative control means for the electric circuit to that illustrated in Fig. 1.

Fig. 3 illustrates a modification of the operating means for the outlet or delivery valve of the siphon system while

Fig. 4 is an elevation at right angles to Fig. 3.

The invention will now be described with reference to the accompanying sheet of diagrams in which similar reference numerals indicate similar parts in the different views.

As hereinbefore stated it is to be appreciated that the siphon system is primarily intended for the handling of solutions having say a high freezing point, or for the transfer of corrosive fluids from one receptacle to another. The siphon pipe which is illustrated in the lower part of the diagram Fig. 1 is of the usual construction having an inlet or supply tubular leg **5** and a valve controlled outlet or delivery tubular leg **6**, a pipe **7** connecting the two legs, which pipe **7** in turn is connected to or extends into an upwardly directed tubular chamber **8** within which is freely located a float **9** pivotally suspended from one end of an arm **9a** also located in the float chamber, said arm having connected therewith a contact switch mechanism **10** which forms part of an electric circuit connected to the mains. This float chamber **8** is provided with a relief valve **11** and also an outlet valve **12** which is connected through a pipeline **13a** to a vacuum pump **13**, the pump **13** being driven by a motor **14** coupled thereto, which motor is connected in the said mains circuit.

In the mains circuit there is disposed a pair of electro-magnets or solenoids **15**, **16**, both of which are associated with the valve stem **17a** of the delivery or outlet valve **17** which is disposed within the leg **6** of the siphon, one magnet or solenoid **15** serving to maintain the valve **17** in the closed position while the other magnet or solenoid **16** serves to positively open the valve **17**, the said magnets or solenoids obviously being adapted for alternative energisation according to requirements. The valve stem **17a** is slidably mounted within substantially frictionless glands disposed about the valve stem within the cap **17b** mounted on an upwardly directed extension of the delivery leg **6**, the said glands preferably being spring-loaded to avoid leakage about the valve stem.

Located in the mains circuit is a switch **18** which is operated through an electro-magnet or solenoid **19** which is energised by the operation of a starter push-button **20**; while in the circuit through the switch **10** is another electro-magnet or solenoid **21** which serves to operate a double-acting switch **22** also associated with the mains circuit and the two electro-magnets or solenoids **15**, **16** which positively control the operation of the outlet valve **17**. The starter button **20** is employed for the commencement of the operation while there is preferably incorporated a stop push-button **23** to break the circuit in the event of it being desirable to stop the operation of the vacuum pump before initiation of the flow through the siphon system.

The operation of the priming and controlling siphon system is as follows:

Assuming the mains circuit to be broken and it is desired to commence operation it is first necessary to close the siphon system through the outlet valve **17** and exhaust air from the system in order to create a partial vacuum therein. This operation is effected by pressing the starter push-button **20** which through the electro-magnet or solenoid **19** closes the switch **18** in the mains circuit, thereby energising the other electro-magnet or solenoid **21** which operates the double-acting switch **22** to energise the lifting solenoid **15** associated with the outlet valve stem **17a** in order to ensure that the outlet valve

17 shall be postively held against its seating in the delivery pipe 6. At the same time the circuit through the motor 14 is closed and the motor drives the vacuum pump 13, which serves to create a partial vacuum in the siphon line and in the float chamber 8, thereby causing fluid to flow up the supply pipe 5 along the connecting pipe 7 to the delivery pipe 6 as far as the top of the one way outlet valve 17; at the same time liquid is drawn up within the float chamber 8 until the float 9 is reached and lifted by this liquid. This lifting of the float 9 causes the float arm 9a to open the contact switch 10 associated therewith, thereby de-energising the electro-magnet or solenoid 21 associated with the double-acting switch 22, thus de-energising the valve lifting solenoid 15 and energising the valve lowering solenoid 16 which positively ensures the opening of the delivery or outlet valve 17 of the siphon system, thereby permitting flow to continue while there is a supply of liquid available.

Simultaneous with the de-energisation of the lifting solenoid 15 and the energisation of the lowering solenoid 16, the circuit through the motor 14 is opened through the double-acting switch 22 with the result that the operation of the vacuum pump 13 ceases.

Consequent upon the release of the starter push-button 20, which release would normally tend to open the circuit through the mains switches 18, the opening of this circuit is prevented or delayed until the delivery valve 17 is completely open, when this circuit is broken by means of a trip pawl hereinafter referred to. Associated with the valve stem 17a is a pawl 24 which serves to positively open an automatic switch contact 25 in the mains circuit when the valve 17 reaches the fully opened position, thereby tripping the mains switch 18 upon the de-energisation of the electro-magnet or solenoid 19 associated therewith in the mains circuit.

The relief valve 11 associated with the float chamber 8 is utilised to prevent the vacuum rising above the maximum necessary to lift the float 9 and to prevent admission of liquid from this chamber into the vacuum pump line 13a.

Referring now more particularly to Fig. 2 of the diagrams, as an alternative means of controlling the electric circuit there may be substituted for the float 9 and the float arm 9a and the contact switch mechanism 10, an insulated electrode 26 disposed in what has been termed the float chamber 8, which electrode serves when the liquid in this chamber rises and makes contact therewith to complete the circuit through the electrode to energise the electro-magnet or solenoid 21 associated with the double-acting switch 22, and thereby effect the same sequence of operations as hereinbefore described.

Since the solenoid 21 is to be energized upon completion of the circuit through the electrode 26 in the modification shown in Fig. 2, it is necessary that the connections of the double-acting switch 22 be reversed when this modification is employed. With the connections of the double-acting switch so reversed, the energization of the solenoid 21 upon completion of the circuit through the electrode 26 will cause the circuit through the solenoid 15 and the motor 14 to be broken, and will cause the circuit through the solenoid 16 to be completed.

Referring now more particularly to the modification illustrated by Figs. 3 and 4, instead of disposing the valve stem 17a within the delivery leg 6 of the siphon system the control of the delivery valve 17 may be effected through an external arrangement of what may be termed the valve stems or valve rods, in that the delivery or outlet valve 17 is connected by means of a yoke 17c to a pair of valve or link rods 17d disposed on either side and parallel with the delivery leg 6. These stems or rods at their upper end are pivotally connected to a forked rockable lever 27 fulcrummed on a bracket 28, the other or single arm of the said lever 27 being pivotally connected to the moving member of what may be termed the double-acting or two-way solenoid 15, 16 mounted on a bracket 29.

It will be appreciated that the push-buttons 20 and 23 can be conveniently mounted on the front of a panel behind which is disposed the switch contacts electro-magnets or solenoids and the other control mechanism of the electric circuit, and that from this panel there may be provided a convenient pipe connection to the pump 13, and electric lead connections to the other parts of the electrically-controlled mechanism such as the motor 14 and the valve operating solenoids 15 and 16.

I claim:

1. An automatically primed and controlled siphon system comprising a siphon having inlet and outlet legs and a junction between them, a closed chamber connected to said junction and extending thereabove, a float in said chamber, electrical contacts controlled by said float, a vacuum pump controlled by said contacts for producing a predetermined liquid level in said chamber by exhausting air therefrom, and a solenoid-actuated valve at the lower end of said outlet leg, having means controlled by said contacts for positively holding said valve shut until said liquid level is attained and means controlled by said contacts for positively forcing said valve open when said liquid level is attained.

2. An automatically primed and controlled siphon system comprising a siphon having inlet and outlet legs and a junction between them, a closed chamber connected to said junction and extending thereabove, an electrode located at a predetermined level in said chamber, a vacuum pump controlled by an electrical circuit through said electrode and liquid in said chamber for producing a predetermined liquid level in said chamber by exhausting air therefrom, and a solenoid-actuated valve at the lower end of said outlet leg, having means controlled by said circuit for positively holding said valve shut until said liquid level is attained and means controlled by said circuit for positively forcing said valve open when said liquid level is attained.

3. An automatically primed and controlled siphon system comprising a siphon having inlet and outlet legs and a junction between them, a closed chamber connected to said junction and extending thereabove, electrical contacts controlled by the liquid level in said chamber, a vacuum pump controlled by said contacts for producing a predetermined liquid level in said chamber by exhausting air therefrom, a solenoid-actuated valve at the lower end of said outlet leg, having means controlled by said contacts for positively holding said valve shut until said liquid level is attained and means controlled by said contacts for positively forcing said valve open when said liquid level is attained, a resettable switch that energizes said contacts when reset, and means controlled by said contacts for opening said switch to deenergize said contacts when said liquid level is attained.

4. An automatically primed and controlled siphon system comprising a siphon having inlet and outlet legs and a junction between them, a closed chamber connected to said junction and extending thereabove, electrical contacts controlled by the liquid level in said chamber, a vacuum pump controlled by said contacts for producing a predetermined liquid level in said chamber by exhausting air therefrom, a valve at the lower end of said outlet leg, an elongated rod for operating said valve extending upward therefrom, a solenoid-operated device controlled by said contacts, said device comprising means to apply force at the upper end of said rod for positively holding said valve shut until said liquid level is attained and also comprising means to apply force at the upper end of said rod for positively forcing said valve open when said liquid level is attained.

5. An automatically primed and controlled siphon system comprising a siphon having inlet and outlet legs and a junction between them, a closed chamber connected to said junction and extending thereabove, electrical contacts controlled by the liquid level in said chamber, a vacuum pump controlled by said contacts for producing a predetermined liquid level in said chamber by exhausting air therefrom, a valve at the lower end of said outlet leg supported by a yoke, elongated rods connected to said yoke and extending upward outside of said outlet leg, a solenoid-operated device controlled by said contacts, said device comprising means to apply force at the upper ends of said rods for positively holding said valve shut until said liquid level is attained and also comprising means to apply force at the upper ends of said rods for positively forcing said valve open when said liquid level is attained.

REX WILLIAM HAVERLEY.