APPARATUS FOR AUTOMATICALLY DISCHARGING LIQUIDS.

To all whom it may concern:

Be it known that I, ALBERT PRIESTMAN, of Germantown, city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Apparatus for Automatically Discharging Liquids, of which the following is a specification.

This invention relates to automatic siphons which remain air locked until the liquid to be discharged reaches a certain level, when the hydrostatic pressure acts to force the lock and start the siphon. The operation of such apparatus is controlled by air in the siphon pipe, and the present invention relates particularly to improvements in the means for controlling the admission and discharge of such air.

It is of special importance that the introduction and expulsion of the air shall be accomplished without interference by liquid flowing through the siphon, as such interference not only retards the rate of discharge, but is liable also to cause a partial vacuum in the siphon and prevent its subsequent operation. It is also important that the siphon should start when a given head of liquid is reached, no matter how gradual the rise in level may be, and that the air shall be discharged in such manner—as through an opening in the crown of the siphon pipe—that the tumbling of the liquid into the discharged leg of the siphon will tend to expel such air as may be present rather than to intermingle with and entrain it.

While the control of air can be accomplished most effectively through the use of a subsidiary automatically controlled air pipe of small diameter, it is important that the liquid from the siphon should not be permitted to flow through such small pipe, since under those conditions the pipe would be liable to become clogged by particles of matter carried in suspension in the liquid.

It is the object of my invention to control the expulsion and admission of the air by means of a small subsidiary air pipe in such manner as to effect the complete expulsion of the air without intermingling with the water flowing through the siphon, to prevent the breaking of the vacuum in the siphon by the admission of air while the siphon is discharging, to insure the starting of the siphon whenever the given level is reached, and to accomplish these results without the passage of liquid from the siphon through such subsidiary air pipe.

In carrying out my invention, I employ an air pipe leading preferably from the crown or top of the siphon and extending up above the level at which the liquid is to be discharged from the tank and then extending down and terminating in a U shaped water seal. The length of this pipe and its seal is such that it will retain a sufficient column to remain sealed against the hydrostatic pressure of the liquid in the tank acting through the air in the siphon and air pipe, until that level is reached at which the siphon is to operate. The seal will then break and permit the air to be discharged and the siphon to operate. The open end of the seal of this air pipe is so located that the instant any suction is produced in the air pipe, liquid from the discharge will be drawn back into the U seal and thus seal the pipe against the admission of air to the siphon. The necessary admission of air to the siphon after it has discharged to restore it to condition to operate again is effected by other means; the air discharge pipe operates at all times, through its water seal, to prevent the admission of air to the siphon.

In the drawings Figure 1 shows a side elevation of my improved apparatus; Fig. 2 is a vertical sectional view on a reduced scale showing the operation before the siphon starts; and Fig. 3 is a similar view at the moment the siphon has started.

The siphon is arranged with its short leg a in the tank c, from which the liquid is to be discharged, and with its leg b projecting into a well d communicating with the discharge, as by a weir e. f is the air discharge pipe which leads from the crown g of the siphon and extends up above the high water level of tank c at which the siphon is to be operated, and then down into the well d where it terminates in an upturned U-shaped water seal h.

i is an air pipe which extends down into one of the legs of the siphon. Air is admitted through a suitable inlet j in the pipe i, which should be above the high water level of the tank.

The upturned open end of the water seal h is preferably of enlarged diameter as shown at k.
The water seal in \( h \) confines the air in the pipe \( f \) and top of the siphon, and while that air is retained the siphon remains air locked in the usual manner. As the level of the liquid in the tank rises the hydrostatic pressure acting through the short leg tends to expel the air from the top of the siphon, and this pressure also acts to expel the air from this U bend. When that level is reached at which this hydrostatic pressure is sufficient to break the seal in the bend \( h \), the air will be discharged from the crown of the siphon and the flow through the siphon will be established. The U bend \( h \) now acts as a check to prevent air being drawn back through the pipe \( f \) into the siphon by the partial vacuum therein, since the outflowing water, which passes over the top of the seal \( h \), will be drawn back by the suction in the pipe \( f \), thus reestablishing the seal and effectively preventing the entrance of air during siphonage. After the siphon has been discharged, any small pipe may be employed for breaking the vacuum therein and recharging the upper portion with air. For this purpose I have shown the air inlet pipe \( a \) extending down nearly to the end of the leg \( a \). When the liquid in the leg \( a \) falls below the end of this pipe air will rush in and break the vacuum in the siphon.

The location of the outlet to the pipe \( f \) in the top or crown of the siphon provides for a free and complete discharge of the air, and the water tumbling through to the long leg, when the siphon starts, will act to expel the air through this outlet and so to empty it.

The upward extension of the pipe \( f \) from the crown of siphon above the high level of the liquid in the tank renders it impossible for liquid to flow through the air pipe, and consequently a small pipe may be used, which is best suited for the purpose, without liability of clogging by particles of matter contained in the liquid.

As shown in the drawings the open top of the seal \( h \) preferably extends just above the level of the liquid in the well \( d \) when the siphon is not discharging, see Fig. 2, but when the seal is broken and the liquid is discharging from the well, the seal pipe will become submerged as shown in Fig. 1 so that the suction in the air pipe will draw back liquid into the pipe and reestablish the seal as heretofore described. As the volume of liquid thus admitted must be sufficient to enable the water seal to be maintained even though the partial vacuum is sufficient to draw up the column to a substantial height in the air pipe \( f \), I employ the enlargement \( k \) on the open end of the seal \( h \).

What I claim as new and desire to secure by Letters Patent is as follows:—

1. In apparatus for automatically discharging liquids, the combination of a siphon pipe, and an air discharge pipe leading from the crown of said siphon pipe and extending up above the normal level at which the liquid is to be discharged and having a liquid seal on its discharge end.

2. In apparatus for automatically discharging liquids, the combination of a siphon pipe, and an air discharge pipe leading from the crown of said siphon and extending up above the normal level at which the liquid is to be discharged and having a liquid seal on its discharge end controlled by the liquid discharged through said siphon.

3. In apparatus for automatically discharging liquids, the combination of a siphon pipe having its discharge end submerged in a well, and an air pipe leading from the crown of said siphon pipe and extending up above the normal level at which the liquid is to be discharged and terminating in a U shaped liquid seal in said well.

4. In apparatus for automatically discharging liquids, the combination of a siphon pipe having its discharge end submerged in a well, and an air discharge pipe leading from the crown of said siphon pipe above the level of the liquid on the supply side at which level said siphon is set to operate, and thence down into said well and terminating in a U shaped bend therein to form a liquid seal for said pipe controlled by the liquid discharged through said well.

5. In apparatus for automatically discharging liquids, the combination of a siphon pipe and an air discharge pipe leading from the longer leg of said siphon pipe and extending up above the normal level at which the liquid is to be discharged and having a liquid seal on its discharge end of a length proportional to the hydrostatic head to be attained in the tank controlled by said siphon before its operation.

6. In apparatus for automatically discharging liquids, the combination of a siphon pipe, and an air discharge pipe leading from the longer leg of said siphon pipe and extending up above the normal level at which the liquid is to be discharged and having a liquid seal on its discharge end of a length proportional to the hydrostatic head to be attained in the tank controlled by said siphon before its operation, the open end of said liquid seal being submerged in the liquid discharging from said siphon.

7. In apparatus for automatically discharging liquids, the combination of a siphon pipe, an air discharge pipe leading from said siphon and extending up above the normal level at which the liquid is to be discharged and having a liquid seal in its discharge end, the open end of said seal being located below the surface of the liquid when discharging and having an enlargement or liquid receiver on its open end.
8. In apparatus for automatically discharging liquids the combination of a siphon having its discharge leg submerged in a well, an air discharge pipe leading from the crown of said siphon and extending up above the normal level at which the liquid is to be discharged and terminating in a U shaped liquid seal located in said well, and an air pipe independent of said air discharge pipe for admitting air to said siphon.

In testimony of which invention, I hereunto set my hand.

ALBERT PRIESTMAN.

Witnesses:
R. M. Kelly,
Ernest Howard Hunter.