

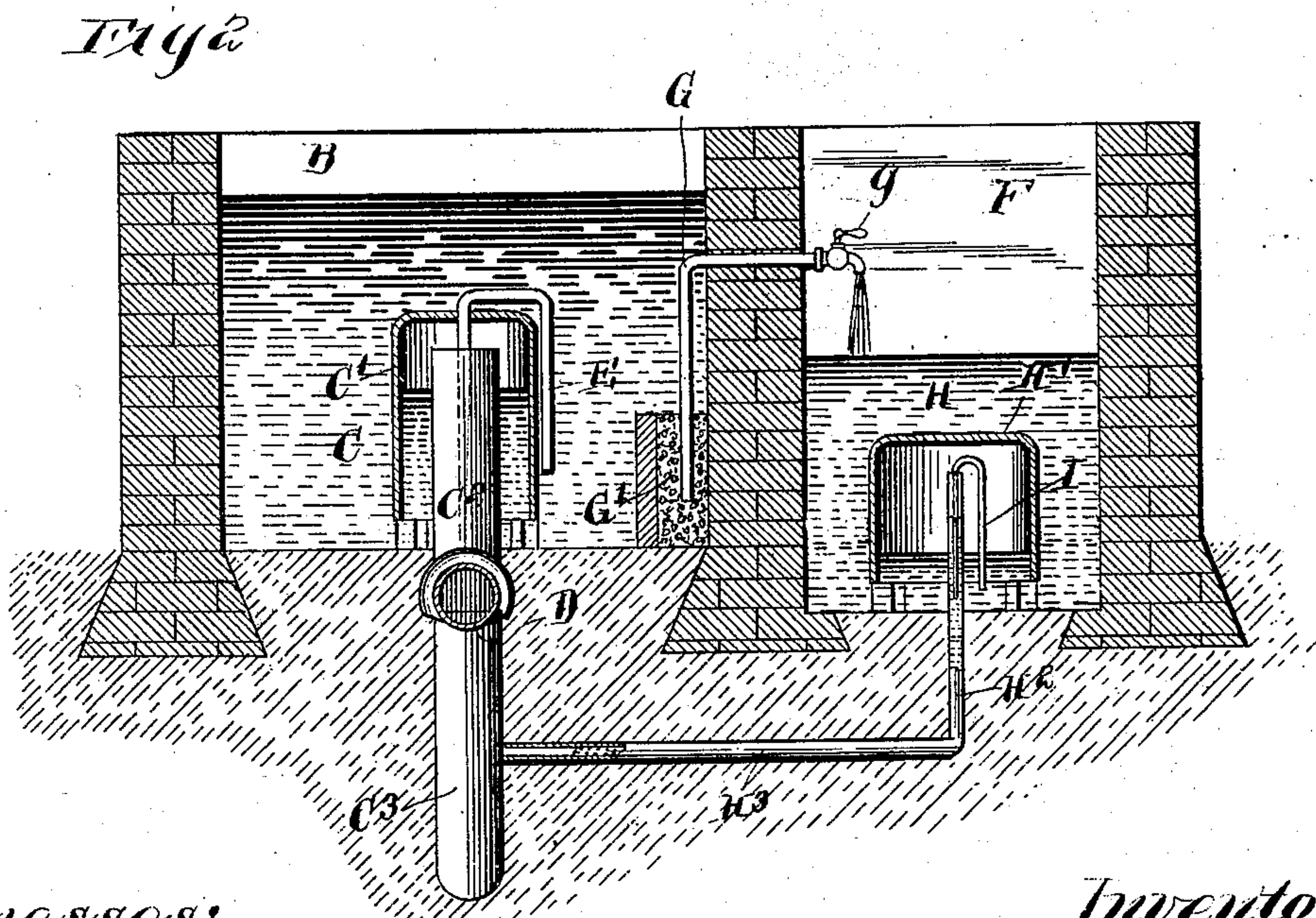
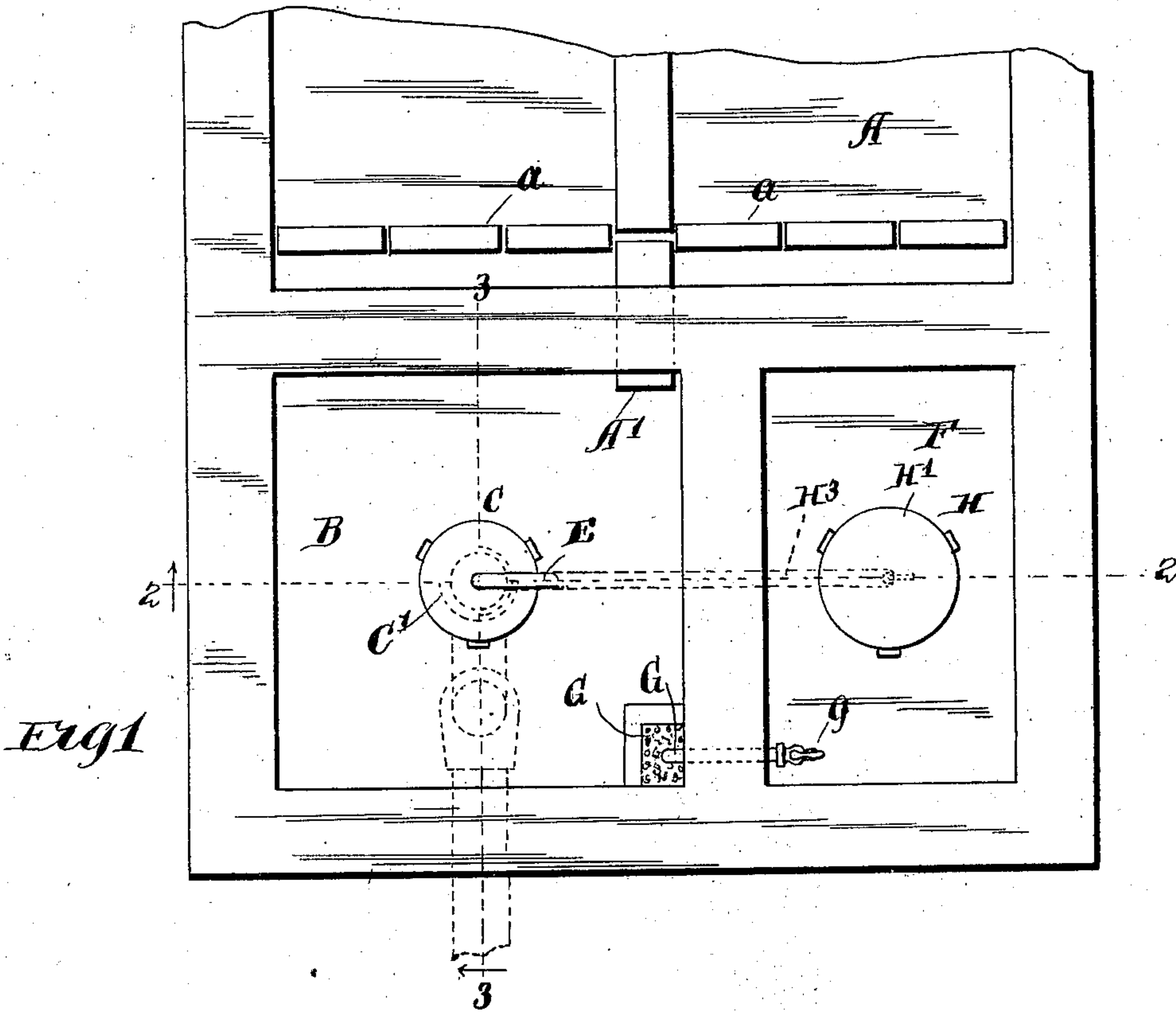
S. W. MILLER.

DEVICE FOR CHARGING OR DISCHARGING LIQUID TANKS.

(Application filed June 6, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

Fig 3

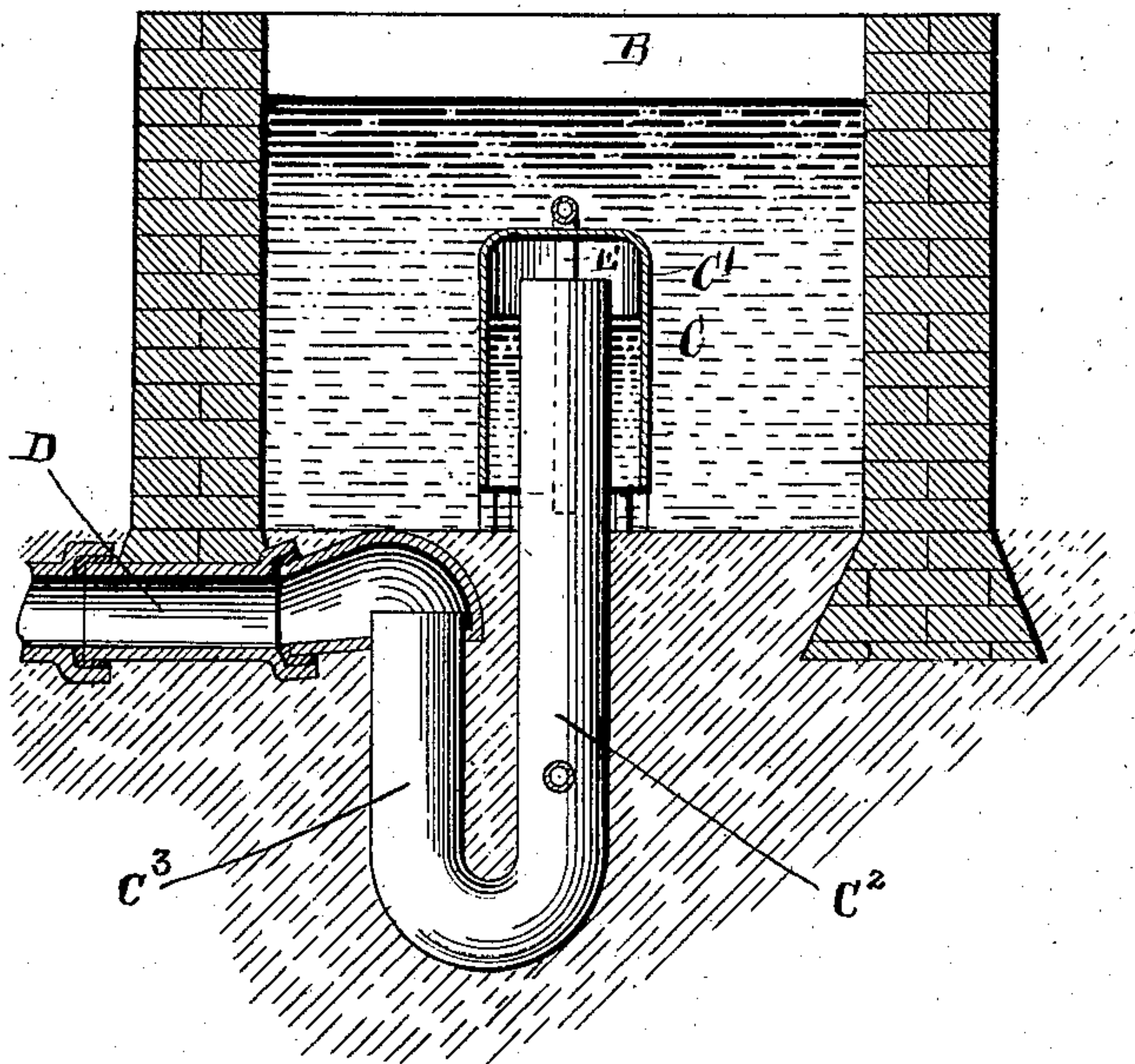


Fig 4

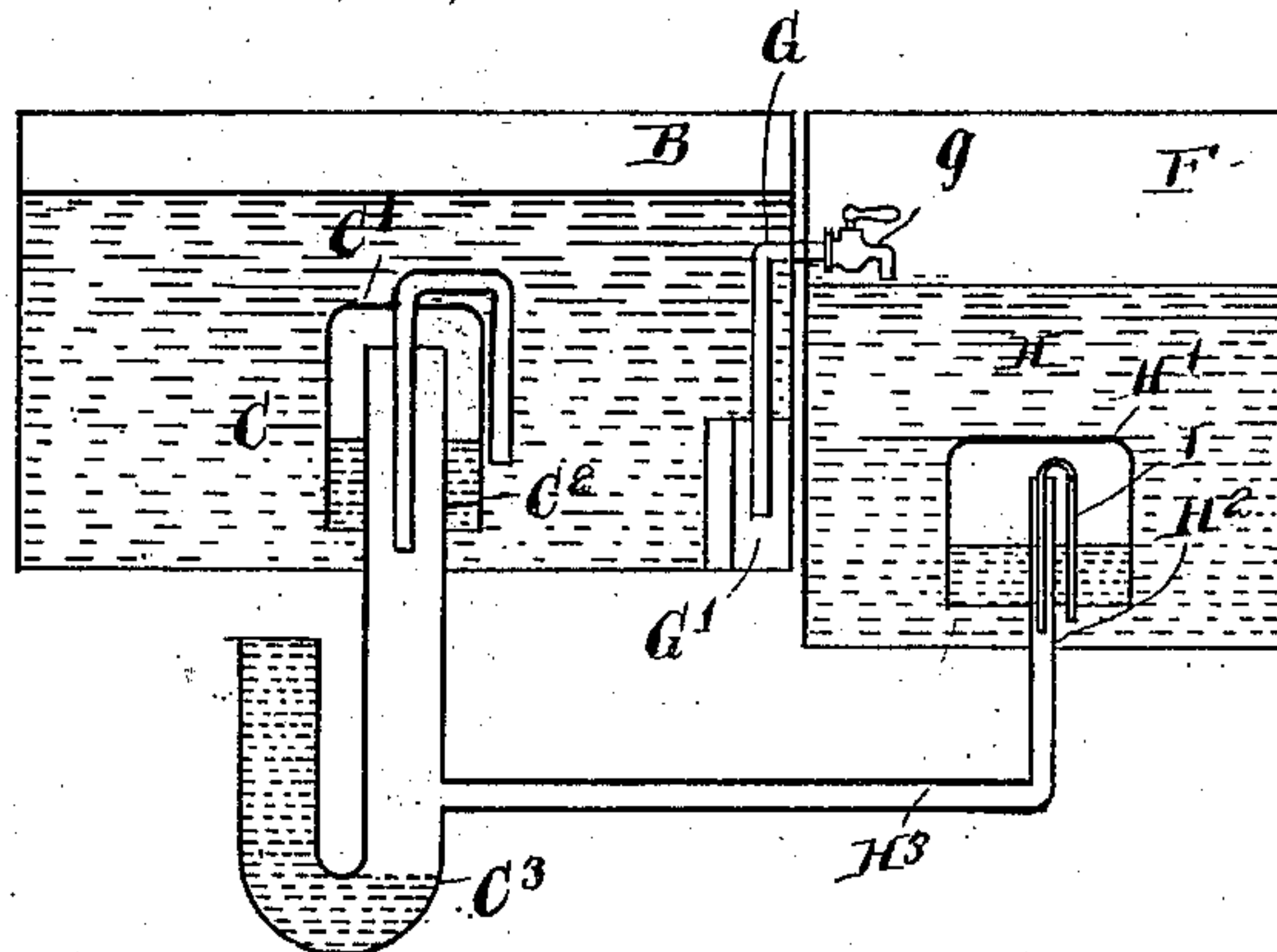
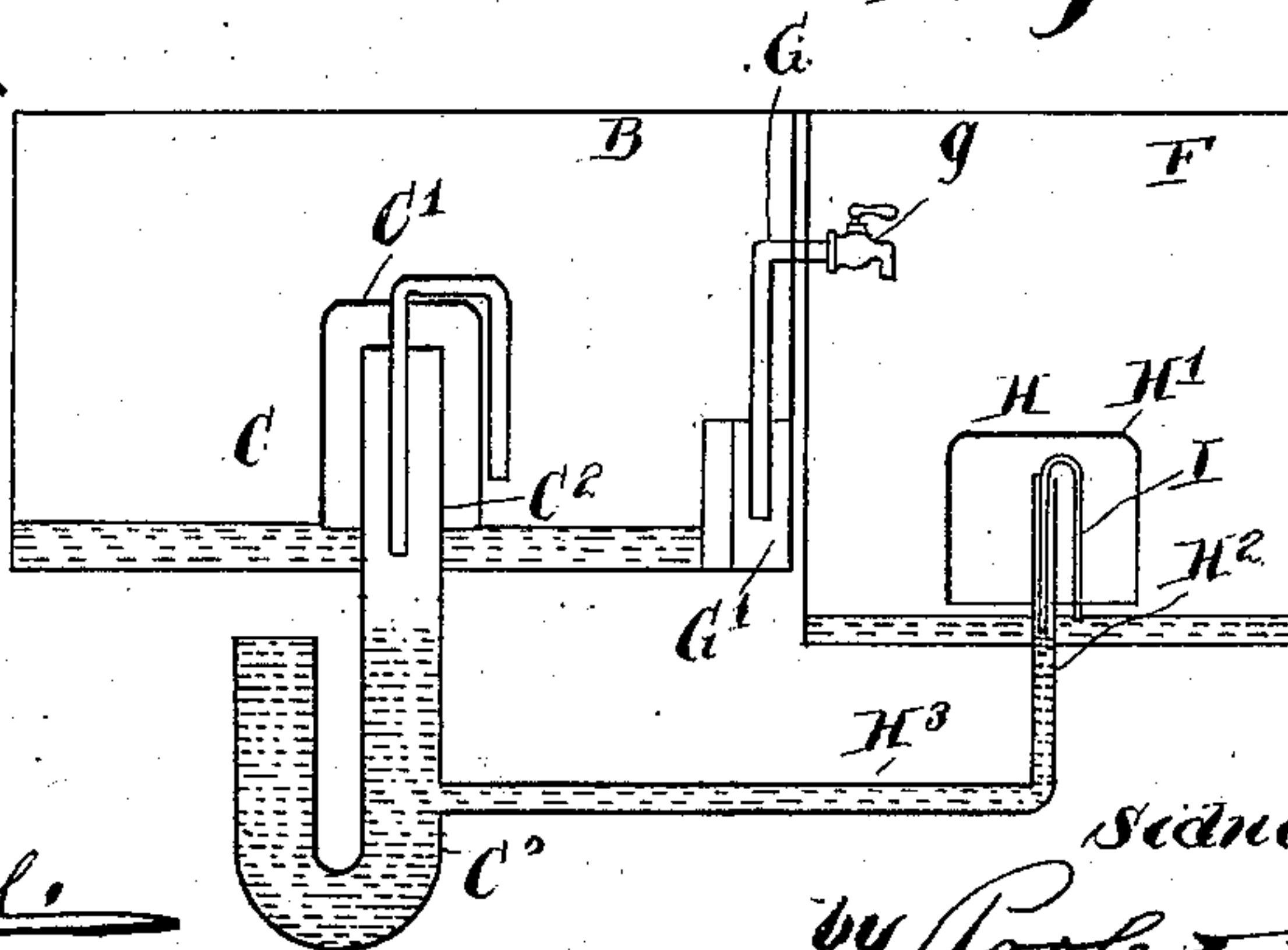


Fig 5



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UNITED STATES PATENT OFFICE.

SIDNEY W. MILLER, OF CHICAGO, ILLINOIS.

DEVICE FOR CHARGING OR DISCHARGING LIQUID-TANKS.

SPECIFICATION forming part of Letters Patent No. 702,066, dated June 10, 1902.

Application filed June 6, 1901. Serial No. 63,351. (No model.)

To all whom it may concern:

Be it known that I, SIDNEY W. MILLER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Devices for Charging or Discharging Tanks; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in apparatus for intermittently charging or discharging liquid-tanks and when employed for discharging tanks operates in such manner as to permit the tank whose discharge is controlled thereby after being filled to remain filled for a certain determinate period of time before being emptied.

The invention is herein shown as adapted for intermittently discharging the contents of filter or bacteria beds of a sewage-purifying plant; but it will be obvious from the following that the apparatus may be employed wherever it is desired to intermittently charge or discharge a liquid-tank.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 illustrates a plan view of one end of a tank for containing a filter or bacteria bed and provided with my improved apparatus for discharging the contents of the bed. Fig. 2 is a transverse section on line 2 2 of Fig. 1. Fig. 3 is a vertical longitudinal section on line 3 3 of Fig. 1 looking in the direction indicated by the arrow. Fig. 4 is a diagrammatic view illustrating the water-levels in the several parts of the apparatus just before the apparatus has been brought into action. Fig. 5 is a similar diagrammatic view of the parts, showing the water-levels after the apparatus has been brought into action and the liquid emptied.

Referring to the drawings, A represents a tank adapted to contain a filter or bacteria bed to which sewage after leaving the aseptic tank and directed to the tank A in the process of purifying the same is exposed for determinate periods before the tank is emptied by the apparatus hereinafter to be described.

The tank A in practice contains a body of granular material to which the sewage is exposed for the purpose of producing therein a bacteriological effect, as is well known to those acquainted with this art, and it is necessary that the sewage be exposed to this body of material for certain periods of time, depending upon the character of the sewage being treated.

A' designates a discharge-passage leading from the tank into a chamber B, constituting a part of the discharge apparatus, and said discharge-passage may be connected with drain-tiles *a*, laid in the bottom of the tank A, as shown. The chamber B is emptied by an automatic siphon C, which is shown as made generally like the construction illustrated and described in prior United States Letters Patent No. 449,083, granted to me on March 24, 1891. While this particular form of siphon is a convenient one, it is to be understood that I am not limited to the construction herein shown, but may use other suitable forms of such devices.

The siphon C comprises an intake-limb C', the mouth of which is located near the bottom of the tank, and a discharge-limb C². The longer or discharge limb of the siphon discharges through a U-shaped trap when the liquid seal in said trap is broken. The intake-limb C' in this instance has the form of a bell or dome, which surrounds the upper end of the longer leg or discharge-limb C² of the siphon. The upper or discharge end of the trap C³ discharges into a drain D, made substantially like that shown in the said prior patent and which leads to a suitable place for the disposal of the liquid emptied from the tank A.

E designates an auxiliary venting-tube of inverted-U shape, the longer leg of which passes through the upper part of the bell and into the top of the long leg of the siphon C and the shorter leg of which is located outside of and at the side of said bell.

The operation of the automatic siphon is like that of the construction set forth in my prior patent above referred to, with the exception that instead of being automatically started in operation by the liquid head in the tank B means are provided which supplement

the action of the liquid head in said tank for starting said siphon in operation and constructed to delay the operation of said siphon beyond the period of filling of the tank B.

5 For this purpose the chamber B and the discharge-siphon therefor are so proportioned that the highest practical obtainable level of liquid in the chamber B in the usual operation of the system will not start the discharge-siphon C into operation, the pressure produced therein at this time being insufficient to counterbalance the weight of the liquid in the trap C³. The introduction of an additional pressure in said siphon is therefore
10 depended upon to start the siphon in operation, such additional pressure serving to break the seal in the trap, with the result of starting siphonic action.

The auxiliary device for supplementing the
20 action of the siphon C is made as follows:

F designates a chamber or compartment located, as herein shown, at one side of the chamber B and preferably with its bottom at a lower level than that of the chamber B.

25 G designates a small pipe leading from the chamber B and discharging into the chamber F. Said pipe is provided with a controlling-valve *g*, and the induction end of the pipe is preferably located in a mass of filtering material G' at or near the bottom of the chamber B. Located within the chamber F is an auxiliary siphon H. Said siphon consists of a short intake-limb H', the mouth of which is located near the bottom of the tank, and a
30 discharge-limb H². The shorter leg of the siphon, as herein shown, is made of a bell or dome shape and is made of greater diameter proportionately to the discharge-limb of the siphon than the bell or dome C'. The lower
35 end of the longer leg of the auxiliary siphon is extended and communicates with the longer leg of the trap C³ of the principal siphon C by means of a small pipe H³, which enters the longer leg of said trap below the level of the discharge end thereof. Said siphon H is provided with a venting-tube I, which is made of inverted-U form, having one leg longer than the other, the longer leg being inserted into the upper end of the longer leg H² of the
40 auxiliary siphon, while the shorter leg is located outside of said pipe within the bell and having its inner end slightly below the lower margin of said bell. It may be here observed that the venting-tube I may be used in place
45 of the venting-tube E, and vice versa.

The operation of the device is as follows: As the tank A gradually fills with sewage the level of the liquid in the chamber B rises conjointly with that in the tank A, and at the
50 same time the liquid rises in the bell or the shorter leg C' of the discharge-siphon C. As said liquid rises in the shorter leg of the siphon it compresses the air which is confined between the same and the liquid in the trap C³. Suitable controlling devices will in practice be provided in connection with the mains
55

for supplying sewage to the tank A, so that when a certain predetermined level of the liquid is reached therein the supply of liquid will be shut off. The same effect may be produced by providing the chamber B with an overflow B^a, located near the top of said chamber and which prevents the water rising beyond a certain level in said chamber. Said overflow B^a may be employed where it is not objectionable to discharge the liquid outside the chamber B; but, as before stated, in practice it will be preferable to supply the tank A through a suitable controlling device which will regulate the amount of liquid discharged into said tank. At the time the liquid-supply to the tank is shut off the head in the tank B is not sufficient to bring the siphon C into operation. While the chamber B is being filled and after the level of the liquid has reached the highest point of the pipe G, leading to the chamber F, said latter chamber will begin to slowly fill. As the pipe G is much smaller than the pipe A', through which the chamber B is filled, and as the chamber F does not start to be filled until after the chamber B is almost filled, a much longer time is required to fill the chamber F than that required to fill the chamber B. Said tank A and chamber B therefore stand filled during the completion of the filling of the chamber F, and during this time the sewage in the tank A is being subjected to the filtering material therein. The time required for filling the chamber F may be regulated by the valve *g*, whereby the tank A may stand filled for a longer or shorter time, as required. During the time the chamber F is being filled the liquid rises in the bell H' or shorter leg of the auxiliary siphon and compresses the air in said siphon and in the connecting-pipe H³, leading to the trap of the principal siphon C. The pressure thus produced in the auxiliary siphon and connecting-pipe H³ continues until it is sufficient to overcome the pressure in the principal siphon, at which time the water in the longer leg of the auxiliary siphon and the connecting-pipe H³ is forced into the trap of the principal siphon. After the water has been forced from the longer leg of the auxiliary siphon and the pipe H³ the pressure in the auxiliary siphon is communicated to the principal siphon and causes the water both at the trap and in the bell C' to be depressed, and the transmission of such pressure is continued until, combined with the pressure already existing in the longer leg of the principal siphon, it is sufficient to overcome the seal in the trap C³ and start the siphon C in operation. Thereafter the operation of the principal siphon is like the prior construction shown in the aforesaid patent, the siphon continuing its operation until the chamber B is emptied to the level of the mouth of the shorter leg of the siphon. After the principal siphon is set in operation the auxiliary siphon

begins to operate to empty the chamber F, the liquid therein being discharged by the auxiliary siphon through the trap of the principal siphon. At the completion of the operation of both of said siphons the venting devices are brought into operation and the siphons completely vented. The water-levels are indicated in Fig. 2 in the shorter limbs of the siphons and in the longer leg of the auxiliary siphon and connecting-pipe H^3 just before the pressure is sufficient in the auxiliary siphon to force the water out of the pipe H^3 and break the seal therein. Before this occurs the water in the pipe H^3 constitutes a seal to prevent the escape of air from the principal siphon to and through the auxiliary siphon, and of course after such clearing of the pipe H^3 occurs the pressure in the auxiliary siphon counterbalances the pressure in the main siphon and prevents such escape.

The diagrammatic view in Fig. 4 illustrates the level of the liquid in the trap C^3 after the chamber B has been filled and when the chamber F has been nearly filled, the seal in said trap being almost overcome. Said view is merely illustrative, but serves to indicate in a general way the action of the siphon. This view also shows the water-levels in the shorter legs of both siphons. This condition occurs after the water has been forced out of the pipe H^3 , so that said pipe is empty. It will also be noticed that the level of the liquid in the shorter leg of the main siphon has been depressed below the level indicated in Fig. 2, the pressure from the auxiliary siphon after the pipe H^3 has been emptied acting in both directions to depress the liquid in the shorter leg of the principal siphon and the trap thereof. After the water in the trap C^3 has been depressed below the level of the end of the pipe H^3 , which discharges into said trap, the pressure within the siphon C and its trap drives the water backwardly a little distance into the pipe H^3 , which causes the level of the water in the pipe H^2 to rise, as indicated in Fig. 2; but owing to the size of the pipe H^3 and the consequent friction therein the air will not be permitted to escape from the siphon C through the pipe and auxiliary siphon. A seal is therefore maintained in said pipe H^3 , which prevents premature operation of the siphon C. Obviously the sloping of the outer end of the pipe H^3 below the horizontal will produce the same result even though a larger pipe than shown be employed. As the pipe H^3 , connecting the auxiliary siphon H with the trap of the principal siphon, enters the trap below the discharge end of said trap, and therefore below the liquid-level in the trap after an operation of the siphon has occurred and ceased, as shown in Fig. 5, the escape of air through said pipe H^3 and siphon H when pressure is again created in the siphon C is prevented. The pipe H^2 will manifestly be made of such length or arranged to rise above the pipe H^3 such distance that the column of water in said pipe H^2 will give, when

the water is forced backwardly into the pipe H^3 , sufficient pressure to more than counterbalance the pressure produced in the main siphon by the head of water in the receptacle B, as otherwise the pressure in the main siphon would force the water out of the pipes H^2 and H^3 , with the result of breaking the seal formed by the water in said pipes and permitting premature operation of the main siphon. It will be noted, furthermore, that by reason of the connections described between the auxiliary and principal siphons the auxiliary chamber F will always be emptied below the level of the mouth of the intake-limb of the siphon H and permit the siphon to be ventilated, thereby insuring uniform sequence of operations so long as the liquid is delivered to the tank A with practical uniformity.

I claim as my invention—

1. The combination with a tank or receptacle, of a siphon having a sealed trap at its discharge end, said trap being so proportioned that the maximum liquid head in said tank is insufficient to start the siphon in operation, of means for producing pressure in said siphon to start the operation thereof comprising a pipe communicating with said siphon and having a sealed discharge end, and means acting to produce air-pressure in said pipe which pressure is transmitted to the siphon to force the seal in the trap thereof.

2. An apparatus for the purpose set forth comprising a chamber, a siphon having a sealed trap at its discharge end, and means for starting the siphon into operation embracing a second receptacle or tank and a siphon connected with the same and provided with a sealed discharge end which communicates with the main siphon.

3. An apparatus for the purpose set forth comprising a chamber, a siphon having a trap at its discharge end and means for starting the said siphon into operation comprising a second chamber to which water is supplied from the source supplying the first chamber, a siphon in said second chamber provided with a sealed discharge end which communicates with the first-named siphon.

4. An apparatus for the purposes set forth comprising a main chamber, a main siphon having a trap at its discharge end and means for starting said main siphon comprising a second chamber, and a siphon in said second chamber the discharge end of which extends into the said main siphon below the level of the water seal of the trap at the discharge end of said main siphon.

5. The combination with a principal siphon and an auxiliary siphon which latter discharges into and through the principal siphon, of means affording a seal between said principal siphon and the discharge-limb of the auxiliary siphon.

6. An apparatus for the purpose set forth comprising a principal chamber, a discharge siphon-head in said chamber being insufficient to start said siphon into operation, an

auxiliary chamber, and a siphon in the auxiliary chamber, the discharge-limb of which enters the trap of the principal siphon below the normal liquid-level thereof after each operation of the siphon.

7. The combination with a tank or receptacle, of a siphon therein having a sealed trap at its discharge end, the said trap being so proportioned that the maximum liquid head in the tank is insufficient to start the siphon into action, and means for producing pressure in said siphon to start the same, comprising a pipe communicating at one end with the siphon and having a sealed discharge end, a chamber with which the other end of the pipe communicates, and means connected with said pipe in said chamber acting to produce pressure in the pipe and to transmit the same to the siphon upon the rise of water in said chamber, said parts being constructed

to empty said chamber through said pipe when the siphon is brought into action.

8. An apparatus for the purpose set forth comprising a chamber, a siphon having a sealed trap at its discharge end, said trap being so proportioned that the maximum liquid head in the tank will not start the siphon into action, and means for starting the siphon into operation embracing a second receptacle or tank and a siphon connected with the same and provided with a sealed discharge end which communicates with the main siphon.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 28th day of May, A. D. 1901.

SIDNEY W. MILLER.

Witnesses:

W. L. HALL,

GERTRUDE BRYCE.