L. A. HUFFERD.

APPARATUS FOR SUPPLYING RECEPTACLES WITH LIQUIDS.

APPLICATION FILED OCT. 25, 1916.

1,249,404. Patented Dec. 11, 1917.

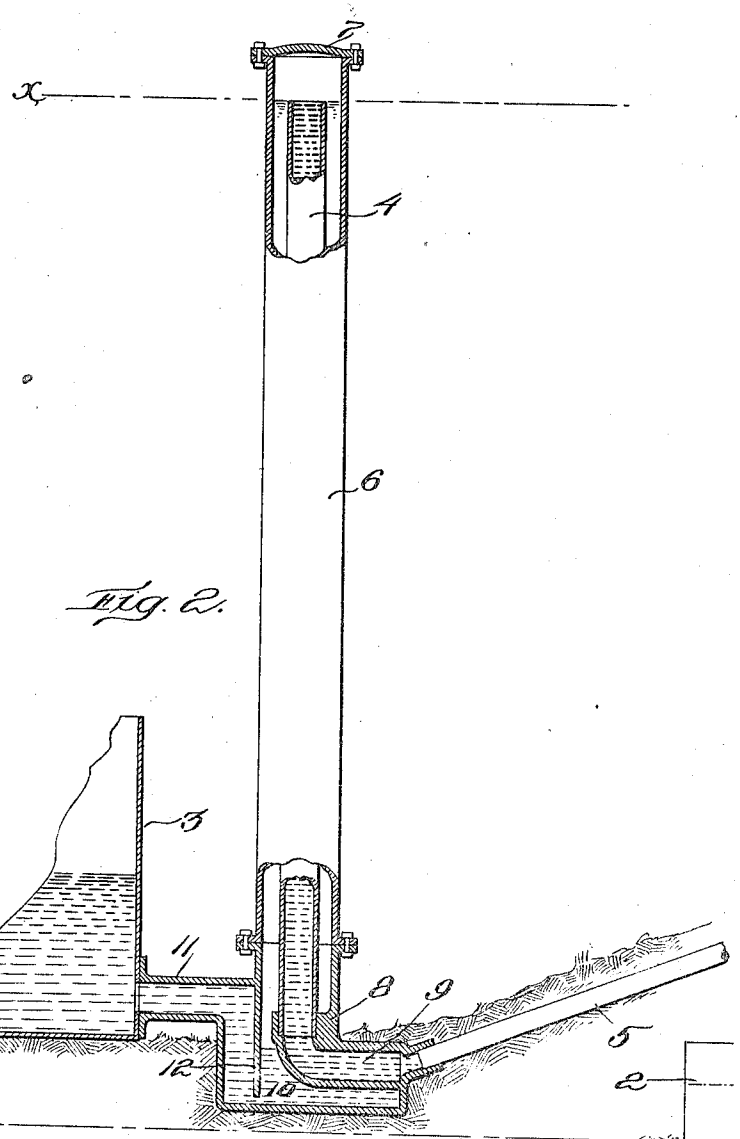


Fig. 2.

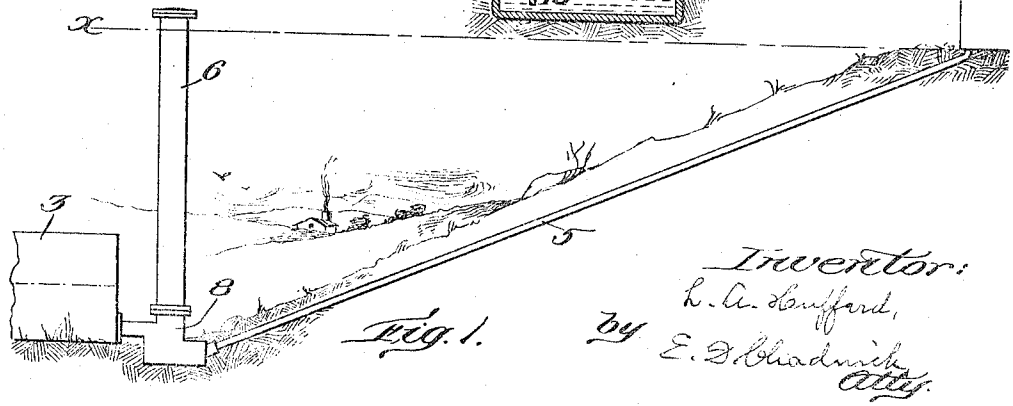


Fig. 1.

Inventor:
L. A. Hufford,
by E. D. Bradwick
Atty.

UNITED STATES PATENT OFFICE.

LOT A. HUFFERD, OF DETROIT, MICHIGAN.

APPARATUS FOR SUPPLYING RECEPTACLES WITH LIQUIDS.

1,249,404. Specification of Letters Patent. Patented Dec. 11, 1917.

Application filed October 25, 1916. Serial No. 127,612.

To all whom it may concern:

Be it known that I, LOT A. HUFFERD, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Apparatus for Supplying Receptacles with Liquids, of which the following is a specification.

The object of my invention is to provide a simple and practical apparatus which will automatically operate to keep a receptacle supplied with liquid from a higher receptacle and maintain substantially constant a predetermined difference of level between the bodies of liquid in the two receptacles. Such an apparatus is useful for various purposes, the specific embodiment of my invention hereinafter described being particularly adapted and intended for the purpose of keeping a watering trough constantly supplied with water from a reservoir located at a higher level.

In the accompanying drawing illustrating my invention,

Figure 1 is an elevation of my apparatus as preferably constructed and arranged for the purpose above referred to; and

Fig. 2 is a similar view on a larger scale and partly in section, showing the principal parts of the apparatus.

In Fig 1 of the drawing, 2 indicates the supplying receptacle, which is represented as a tank but may be a pond, reservoir, stand pipe or any other source of supply of water or other liquid located at an elevation above the receptacle to be supplied. The latter receptacle is indicated at 3, and may be assumed in the present case to be a watering trough for horses, hogs or other animals. 4 indicates an upright pipe connected at its lower end with the tank 2 by means of a pipe 5 and having its open upper end located within another upright pipe 6, which surrounds the pipe 4 and is closed at its upper end by means of a detachable cap 7 or otherwise, so that when the lower end of the pipe 6 is sealed with water as hereinafter described said pipe provides a closed air chamber in which the upper portion of the pipe 4 is located. The lower ends of the pipes 4, 5 and 6 are shown as secured to a hollow supporting base 8 which is shaped to provide an open passage 9 connecting the pipes 4 and 5 and another open passage 10 leading from the lower end of the pipe 6 through a branch 11 to and into the trough 3 at a point below the water level intended to be maintained therein.

In the particular apparatus illustrated the connections 5 and 11 lead from and to the receptacles 2 and 3 respectively at or closely adjacent to the bottoms of the latter and the upper ends of the pipes 4 and 5 are located at the same level, as indicated by the broken line x, although these details are not essential as will presently appear. Assuming that this arrangement is employed, however, the operation is as follows: Starting with all the parts empty except the tank 2, as soon as the water is allowed to enter the pipe 5 from said tank it flows down the pipe and thence upward through the pipe 4 to the top of the latter, at which point it is subjected to a static head equal to the difference in level between the upper end of said pipe 4 and the level of the water in the tank 2, whatever the latter level may be. Consequently the water overflows from the pipe 4, passes down through the pipe 6 and flows from the same into the branch 11 and eventually into the trough 3, and as the flow continues the water rises in the trough 3 and also in the lower end of the pipe 6 or its continuation 10, which is sealed by the water contained in it. The result is that the air trapped in the pipe 6 is gradually compressed by the rise of the water at its lower end, the pressure of this trapped body of air being exerted equally on the water in the pipe 4 and on the water at the lower end of the pipe 6. Under these conditions the flow continues until the air pressure in said pipe 6 becomes sufficient to balance the static head of the water in the tank 2 with respect to the upper end of the pipe 4, whereupon the flow stops and the same pressure acting on the water at the lower end of the pipe 6 maintains the water in the trough 3 at such a level that its static head with respect to the water level at the lower end of said pipe 6 is equal to the static head of the water in the tank 2 with respect to the upper end of the pipe 4. A condition of equilibrium is thus reached which remains undisturbed so long as the water levels in the receptacles 2 and 3 are unchanged, but as water is consumed from the trough 3 the lowering of the level therein reduces its static head with respect to the water at the lower end of the pipe 6 and thereupon the air pressure in said pipe raises the level in the trough

and by so doing diminishes its own pressure, which is immediately restored by a flow from the tank 2 which continues until a condition of equilibrium is again reached. If the water in the tank 2 rises its increased head results in a further flow from the top of the pipe 4, an increased compression of the air in the pipe 6 and a corresponding rise of the water in the trough 3, while if the water in the tank 2 falls the compressed air in the pipe 6 forces the water downward in the upper end of the pipe 4 and by its resulting expansion permits a corresponding fall in the level of the water in the trough 3. Thus under all conditions the trough 3 is kept supplied with water from the tank 2 so long as any water remains in the latter, the level of the water in said trough being always such that its head with respect to the water at the bottom of the pipe 6 is the same as the head of the water in the tank 2 with respect to the top of the pipe 4. The level of the water in the trough 3 with respect to the level of the water in the tank 2 will of course depend upon the extent to which the water has to rise in the passage 10 and pipe 6 in order to produce enough compression of the trapped air to balance the head of water in the tank 2 with respect to the upper end of the pipe 4, and this will depend in turn upon the relation between the volume of trapped air and the transverse dimensions of the space in which the water rises.

It will be seen from the foregoing description that if either of the pipes 5 and 11 should enter the corresponding receptacle at a point above its bottom the water contained in such receptacle below the point at which the pipe entered would have no effect on the operation of the apparatus and could be disregarded, although in such case the absolute depth of water would not necessarily be the same in both receptacles. It will also be seen that if the upper end of the pipe 4 were located below the upper end of the pipe 5 the operation would be the same except that a greater depth of water would be maintained in the trough 3, since water from the tank 2 would flow out of the top of the pipe 4 until the compressed air pressure thereby developed became sufficient to balance not only the head of water in the tank 2 above the upper end of the pipe 5 but also a head equal to the difference in level between the upper ends of the pipes 4 and 5.

The principal functions of the pipe 4 are to provide means for counterbalancing in part the head of water in the tank 2 and to prevent air from escaping into the pipe 5 and thence out through the tank 2 in case the water level in the tank falls, and these results are most conveniently secured in the manner illustrated, namely, by employing an upright pipe 4 of suitable length and connecting the pipe 5 to its lower end. This arrangement is not essential, since there are various other ways of accomplishing the same result, but it is particularly desirable because it is free from check valves or other moving parts which might rust and stick or otherwise get out of order. It is also desirable to cause the water leaving the pipe 6 to pass around the lower end of a baffle plate 12 or equivalent partition extending downward to a point below the branch pipe 11, in order that the volume of air in the pipe 6 may not be unduly diminished by loss through the branch pipe 11 and the trough 3 by reason of expansion during hot weather. With this arrangement, the air space in the pipe 6 will of course be sealed as soon as the water rises to the lower end of the baffle plate 12.

The receptacles 2 and 3 may obviously be located one above the other or at any lateral distance from each other or from the pipe 6, the length of the pipes 5 and 11 being immaterial to the operation of the apparatus in the manner described.

I claim:

1. In an apparatus of the character described, the combination of a supply receptacle, a receptacle to be supplied, an intermediate chamber connected to the latter receptacle and adapted to be sealed by the liquid flowing thereto, thereby providing a closed air space within said chamber, and pipe connections arranged to transfer the liquid from the supply receptacle to said chamber and including means for partially balancing the static head of the liquid in said supply receptacle.

2. In an apparatus of the character described, the combination of a supply receptacle, a receptacle to be supplied, an intermediate chamber connected to the latter receptacle and adapted to be sealed by the liquid flowing thereto, thereby providing a closed air space within said chamber, and pipe connections arranged to transfer the liquid from the supply receptacle to said chamber and terminating in an upright portion having its upper end located in said air space, above the level of the liquid in the chamber.

3. In an apparatus of the character described, the combination of a supply receptacle, a receptacle to be supplied, an intermediate chamber connected to the latter receptacle and adapted to be sealed by the liquid flowing thereto, thereby providing a closed air space within said chamber, a pipe having an open upper end located in said air space at a point substantially level with the outlet from the supply receptacle, and connections between said outlet and the lower end of said pipe.

4. In an apparatus of the character de-

scribed, the combination of a supply receptacle, a receptacle to be supplied, an intermediate chamber having an open connection leading therefrom to the latter receptacle and containing a baffle extending downward to a point below the outlet from said connection, a pipe having an open upper end located in said chamber above the intended level of the liquid therein, and connections between the supply receptacle and the lower end of said pipe.

Signed by me at Detroit, Michigan, this 21st day of October, 1916.

LOT A. HUFFERD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."