(No Model.)

H. F. HODGES.

MEANS FOR ELEVATING LIQUIDS.

No. 303,932. Patented Aug. 19, 1884.

FIG. 1.

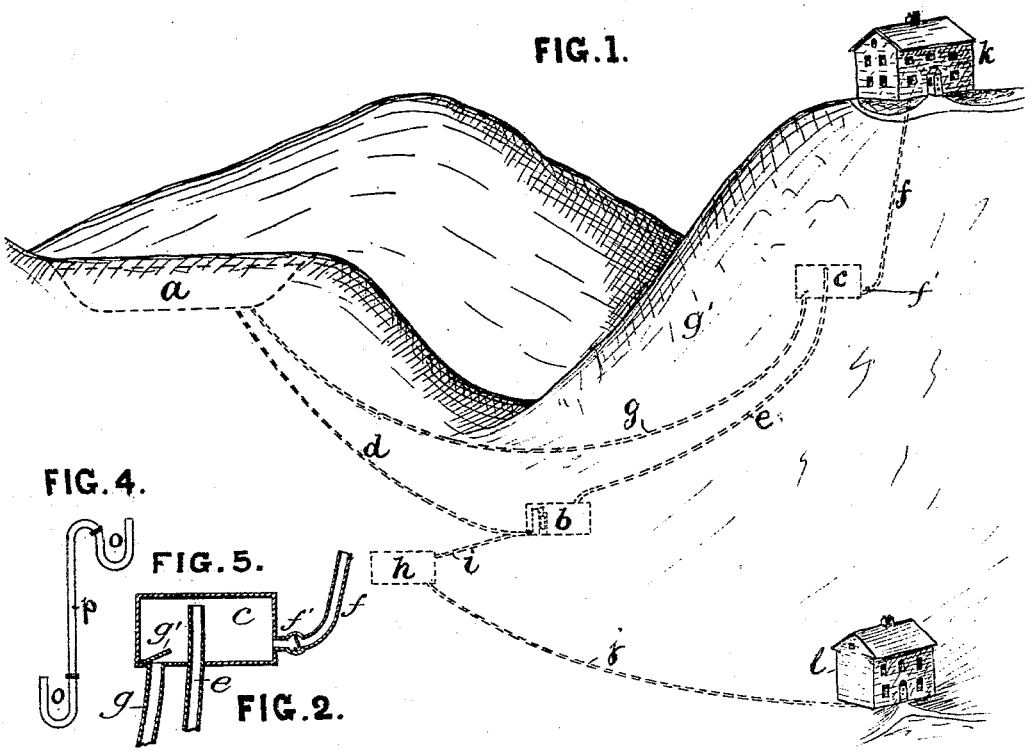


FIG. 4.

FIG. 5.

FIG. 2.

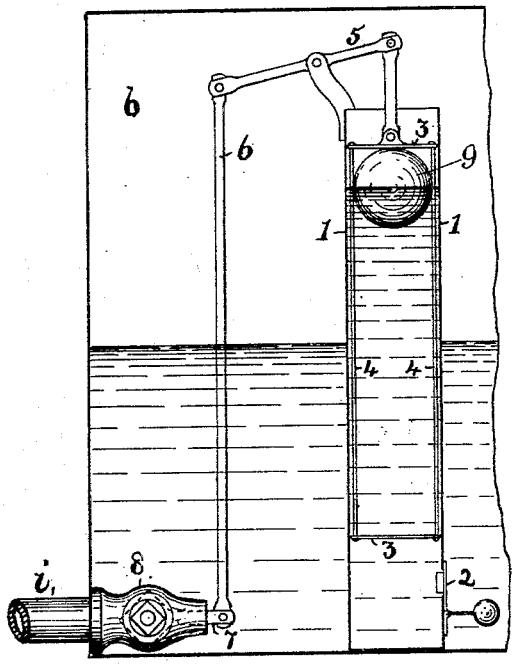
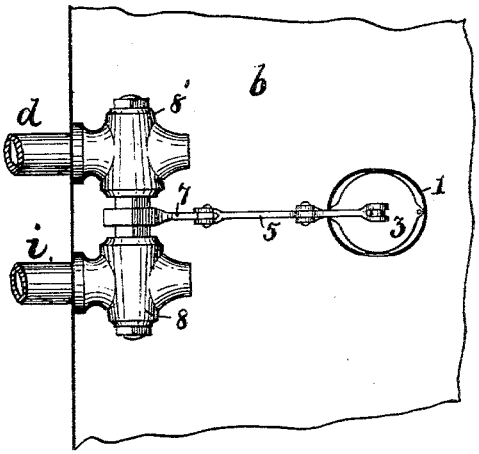


FIG. 3.



Witnesses
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MEANS FOR ELEVATING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 303,932, dated August 19, 1884.

Application filed March 31, 1883. (No model.)

To all whom it may concern:

Be it known that I, HORACE F. HODGES, a citizen of the United States, residing at Chelsea, in the county of Suffolk and State of Massachusetts, have invented a new and Improved Means for Elevating Liquids, of which the following is a specification.

My invention relates to that class of apparatus which is used for elevating liquids from one point to another by means of transferring the pressure or weight of one column or body of liquid transferred to another column or body of liquid at the same or a different elevation by means of a body or column of air interposed between the said bodies of liquid, it being well known that if a liquid be introduced into either of two U-shaped tubes (as indicated for this purpose by Figure 4) it will stand at a level in each branch of said tube; but if the two U-shaped tubes be joined continuously into one, as by the passage *p*, and liquid be introduced into one of the tubes *o*, and then into the other, the liquid will not stand on a level in the two branches of each tube, but will stand higher on the outside branches of said tubes than on the inner branches.

My invention consists in a means for raising liquids from one elevation to another (either continuously, as when two sets of apparatus are used, or intermittently, as when one set is used) automatically—*i. e.*, without the intervention of manual attendance or mechanical appliances, such as pumps, compressed-air or other machines which involve labor to the amount of the force given out.

Fig. 1 represents my invention applied to raising water for service above the level of the source from which it is obtained, at the same time utilizing the waste water for low service. Fig. 2 is an enlarged sectional view showing the method of operating the valves in filling and emptying the tank *b*. Fig. 3 is a top or plan view of Fig. 2. Fig. 4 represents a double-U-shaped tube as an illustration of a principle mentioned. Fig. 5 is an enlarged view of the upper tank, *c*, showing the connection of the supply and discharge pipes.

a is a reservoir, pond, or other source of supply of water.

b is a closed tank located at a point sufficiently below the reservoir *a* to give the necessary head or force of water. The tank *b* is connected to the supply *a* by a pipe, *d*.

c is a closed tank placed on a level with the source of supply *a*, and is connected to the tank *b* by a pipe, *e*, which enters both tanks at the top.

k is the point or height to which it is desired to conduct water from the supply source *a*.

f is a pipe leading from the bottom of the tank *c* to the point *k*, and is provided with a check-valve, *f'*, for preventing a backward flow of water.

g is a pipe leading from the source of supply *a* to the tank *c*, and is provided with a check-valve, *g'*, so arranged that water can flow from the supply *a* to the tank *c*, but not in the opposite direction.

i is a pipe leading from tank *b* to a storage-reservoir, *h*, from which latter leads a pipe, *j*, for low service. Within the tank *b*, I arrange an automatic valve, as shown in Figs. 2 and 3.

1 is a tube closed at the bottom and open at the top, the lower end being fixed to the bottom of the tank, the upper end extending nearly to the upper part of the tank. Near the lower end of tube 1 is a valve, 2, opening outwardly, which is held in a closed position when there is water in the tank by means of a float attached to said valve. Within the tube 1 are two horizontal disks, 3 3, the one placed near the bottom, the other near the top, of tube 1, and connected together by rods 4 4, the whole being suspended from one end of a lever, 5, on the other end of which is a connecting-rod, 6, to the lower end of which is pivoted the valve-lever 7, which operates the shut-off valves 8 and 8'. Valve 8' is placed at the junction of pipe *d* with tank *b*. Valve 8 is situated at the junction of pipe *i* and tank *b*. In the tube 1, between the disks 3 3, is a hollow metal ball or float, 9, of sufficient buoyancy to float on the surface of the water in tube 1 and raise the upper disk 3, and of sufficient weight to depress the lower disk 3 as the water falls in tube 1, thus changing the position of the valves 8 and 8', opening the one and closing the other, the said valves be-

ing so arranged that when the water fills tube 1 that end of lever 5 which is attached to the upper disk 3 is elevated, thus closing the valve 8′ and opening valve 8. When the same part of lever 5 is depressed, the relative positions of the valves will be reversed.

In operation, tank *b* being empty, the shut-off valve 8′ is open and shut-off valve 8 closed, and the tank *c* is filled with water, through pipe *g*, from the supply *a*, and to a level with the water in said supply. Water being admitted into pipe *d* passes into tank *b*, through valve 8′, forcing the air through pipe *e* into the top of tank *c*. The water in tank *c*, being heavier than the air, is forced downward and up the pipe *f* with a force exactly equivalent to the pressure of the water in the tank *b*, the air in pipe *e*, between tanks *b* and *c*, acting as a practically weightless medium for the transference of said pressure. In other words, the column of water in pipe *d* will balance an equal column of water in pipe *f*, regardless of the difference in level of the two tanks or the length of pipe *e;* and the pipe *f* being shorter than pipe *d*, water will run from pipe *f* at the point *k* until tank *c* is empty. The check-valve in pipe *g* is also closed by the same means—*i. e.*, the pressure—thus preventing water from flowing back to the source of supply. If the pipe *f* is closed at the top, the water in tank *c* and pipe *f* and the air in tanks *c* and *b* and pipe *e* will balance or hold in check the pressure of water in pipe *d*, and therefore water is prevented from flowing from the supply source into tank *b*. This is in case water is not required for use at the point *k*. As the water flows into tank *b* from pipe *d*, the ball-float on valve 2 causes said valve to close, thus preventing the water from entering tube 1. When, however, the water reaches above the open top of tube 1, said tube quickly fills with water, causing the float 9 to rise and lift the upper disk 3 and lever 5, thus closing shut-off 8′ and opening shut-off 8, when the water in tank *b* escapes into reservoir *h*, through pipe *i*, where it can be stored and utilized for low service, as at the point *l*, or for other purposes. As the water recedes from tank *b*, water from the supply *a* will enter into tank *c* through the pipe *g*, to take the place of the air which is drawn through pipe *e* into tank *b*, thereby filling tank *c* while tank *b* is being emptied. When the water in tank *b* falls below the level of the float controlling valve 2, the latter opens, allowing the water in tube 1 to escape, when the float 9 in the tube 1 quickly falls and depresses the lower disk 3, and with it the lever 5, thus opening the shut-off 8′ and closing the shut-off 8, when the operation above described is repeated.

It will be obvious that the apparatus above described is equally applicable to other liquids besides water, and that the falling liquid is not necessarily the same as that which is elevated.

I am aware that the expansion of air compressed by various means has been used to effect purposes for which the apparatus above described may be employed; but the action of my apparatus does not depend upon the compression of the air, the same being in fact detrimental to its action.

What I claim as my invention is—

1. The combination, with a source of supply, *a*, and tank *c*, of a pipe, *d*, a tank, *b*, containing an automatic device for controlling the filling and emptying of the same, a pipe, *e*, pipe *g*, and pipe *f*, substantially as and for the purpose set forth.

2. The combination of the pipe *d*, tank *b*, containing an automatic device for controlling the filling and emptying of the same, the pipe *e*, tank *c*, pipe *g*, pipe *f*, reservoir *h*, and pipes *i* and *j*, substantially as and for the purpose set forth.

3. In combination with the tank *b*, an automatic device for controlling the emptying and filling of the same, consisting of the valves 8 8′, lever 7, rod 6, lever 5, disks 3 3, rods 4 4, valve 2, and tube 1, containing float 9, substantially as and for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HORACE F. HODGES.

Witnesses:
J. H. ADAMS,
E. PLANTA.