(No Model.)

Q. N. EVANS.

AUTOMATIC REGULATOR FOR TANKS AND RESERVOIRS.

No. 254,944. Patented Mar. 14, 1882.

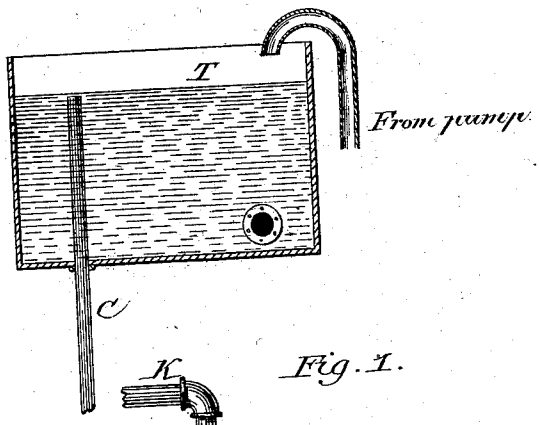


Fig. 1.

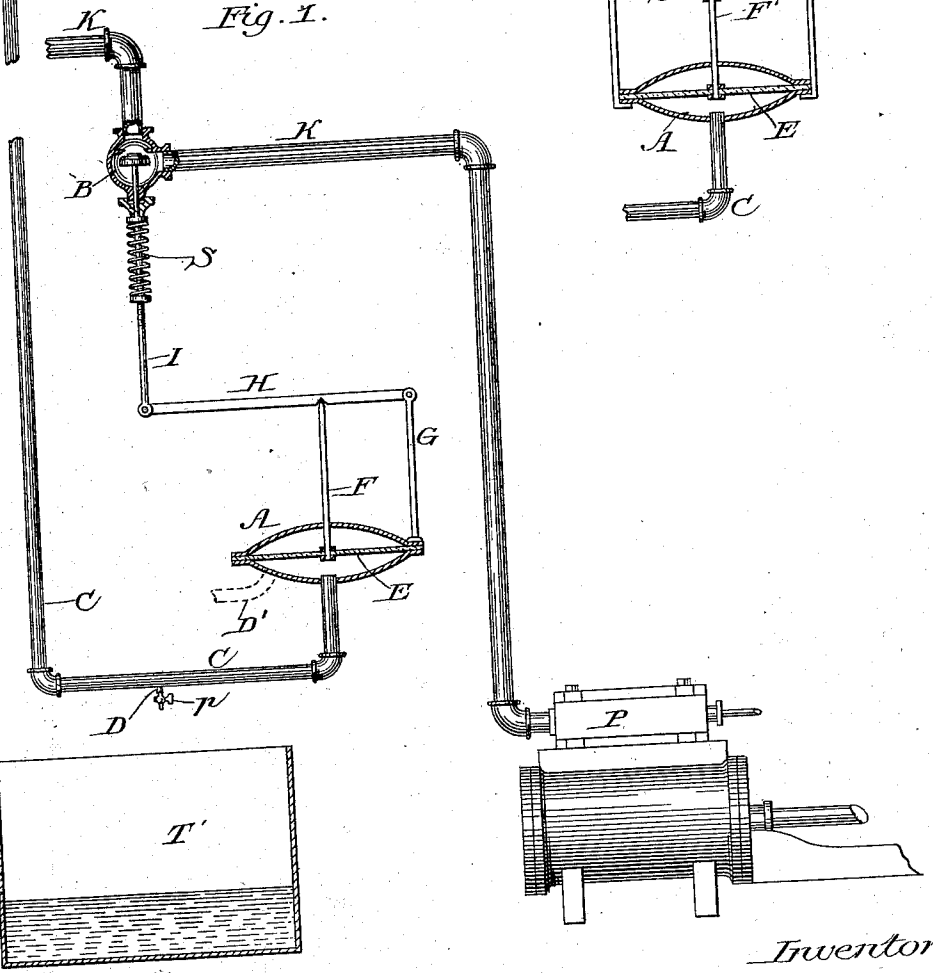
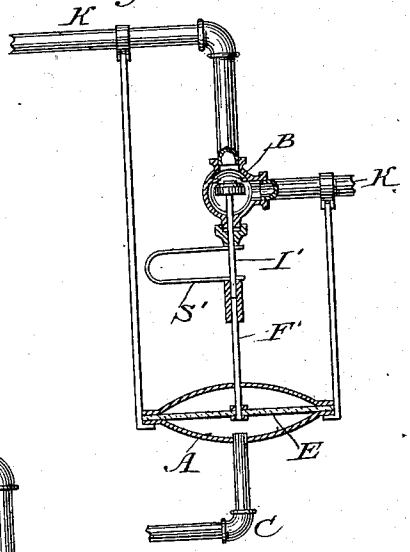


Fig. 2.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC REGULATOR FOR TANKS AND RESERVOIRS.

SPECIFICATION forming part of Letters Patent No. 254,944, dated March 14, 1882.

Application filed July 12, 1881. (No model.)

To all whom it may concern:

Be it known that I, QUIMBY N. EVANS, a citizen of the United States, residing at Brooklyn, in the county of Kings, State of New York, have invented certain new and useful Improvements in Automatic Regulators for Tanks and Reservoirs; and I do hereby declare the following to be a full, clear, and exact description of said improvements, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, in which—

Figure 1 exhibits a front elevation of the invention with certain of the parts in section; Fig. 2, a detached view of a modified arrangement of throttle-valve in combination with the pressure-regulator.

Reservoir-tanks for containing water, petroleum, acids, or the like, and which are located at some distance above the level of discharge to insure a certain head or pressure upon the escaping liquid, are ordinarily provided with some means whereby the amount of reserve liquid within the tank may be kept substantially constant in volume. If the tank be emptied to a point below the level of such normal volume, a fresh supply of liquid will flow in to restore the waste, and this flow will continue until the desired level or volume is recovered, whereupon it will wholly cease not to be renewed until the liquid shall again waste or escape.

My invention belongs to that class of devices which automatically control the supply of liquids to such storage tanks or reservoirs, said invention consisting of certain improvements in apparatus, substantially as hereinafter set forth, and more particularly defined in claims.

The invention is of special value in connection with the tanks or cisterns used to operate hydraulic elevators or lifts—such as are employed in buildings to shift passengers and goods from stage to stage; but I do not wish to be understood as confining the invention in its practical value to one particular use, inasmuch as it can be successfully adapted to any tank or reservoir, whether it be for water, petroleum, acid, sirup, paper-pulp, or other liquid which it is desired to discharge under a definite pressure or head.

The invention consists specifically in the combination, with an elevated reservoir-tank and a steam-pump or a steam-engine and pump, by which the tank is supplied with fresh portions of liquid, of a pressure-regulator and suitable adjuncts disposed between said tank and engine-pump in such manner that the movements or action of the pump will be timed or controlled by the loss of liquid from the tank.

Entirely separate from the main discharge-pipes of the reservoir-tank T, and leading out from the upper part of said tank at or near the level which is designed to mark the normal or reserved portion of the liquid, is an auxiliary discharge-pipe, C, of comparatively small diameter, which descends to and is connected at its lower end with a pressure-regulator, A. The regulator A is of the usual pattern, it consisting of two dish-shaped plates oppositely clamped together at their projecting rims, and with a sheet or disk of rubber cloth retained between them in such manner as to constitute a tight flexible partition or diaphragm, E, in the chamber formed by the plates.

The pipe C opens into the regulator in the space below the diaphragm, and has connected to it, near said regulator, a pipe, D, of considerably smaller diameter, which at its opposite end discharges into a waste-tank. The liquid collecting in said waste-tank may be returned to the upper or pressure reservoir through the medium of the force-pump, or be otherwise disposed of, as desired.

It is important only that the capacity of the discharge-pipe D shall be considerably less than that of the supply-pipe C for a reason to be presently set forth, wherefore it matters nothing whether the two pipes be directly connected, as represented in drawings, or whether instead the smaller pipe D be made to open out from the lower space or casing of the regulator, as marked in dotted lines at D′.

Secured centrally to the diaphragm E by any convenient manner is a rod, F, which rises vertically through the upper casing of the regulator A and bears against a short horizontal arm or link, H. Said link is pivoted at one end

to a fixed upright or standard, G, that may be attached to the regulator-casing, and at its opposite end is jointed to the extremity of the valve-stem I. The stem I passes through the usual stuffing-box projecting from the globe-casing of the throttle-valve B, and bears at its end the valve by which the supply of steam from pipe K to the steam-engine or pump is controlled. A recoil-spring encircles the valve-stem I, and bears at one end against the stuffing-box, at its opposite against a set-nut screw-threaded to the stem, by which nut the tension of the spring may be varied.

The operation of the apparatus is as follows: The reservoir-tank being full and the stop-cock *p* in pipe D open, a continuous flow of liquid into the regulator A and out through the discharge-pipe D will ensue, and will continue until for any cause the level of liquid in the reservoir shall sink below the orifice of pipe C, whereupon the current will cease. During this period of flow, however, it must be evident that the head of the liquid entering the regulator A from the pipe C, and the superior capacity of that pipe to the discharge-pipe D, will operate to force the diaphragm E against the upper casing, and with it to lift the vertical rod F, the link H, and the valve-stem I, so that the valve at the end of the stem will close tightly against its seat and arrest the supply of steam to the engine P. When the flow of liquid to the supply-pipe C, and in consequence the plenum pressure on the diaphragm E is at an end, the diaphragm will drop to the lower space of the regulator, being aided therein by the recoil-spring and the pressure of the steam upon the head of the valve. With the fall of the diaphragm there is likewise a shift in position of the valve-stem, which throws the throttle open, allows steam to pass to the engine, the pump to be operated, and a fresh supply of liquid returned to the reservoir-tank. This inflow of liquid will continue until the normal volume is restored, whereupon the pipe C will again fill, the pressure on the diaphragm be renewed, and it with connected parts reversed to their former position, shutting off the steam and arresting the action of the pump.

It will be noted that the volume of liquid flowing from the reservoir to and through the regulator represents but a small part of the full storage capacity, so that this main portion of liquid escapes and is applied to the purposes designed quite independently from the limited current to the pressure-regulator. Likewise observe that the outflow to the regulator occurs not simply when there is any volume of liquid within the reservoir, but only when that volume reaches a certain height, this intermittent movement in the current, and consequently in the action of the pump, being most economical in use of steam and in duty of engine and pump, and exactly timed to the demands of the reservoir.

To simplify structure the diaphragm and projecting vertical rod may be made to act directly on the throttle-valve, as shown in Fig. 2, the intermediate standard and cross-link shown in Fig. 1 being dispensed with, while the vertical rod F′ and valve-stem I′ are directly connected by means of a set-nut or sleeve, which incloses the opposing ends of the rod and stem, and is cut with a right and left hand screw-thread to permit of close adjustment of these parts, and as well to regulate the tensions of the plate-spring S′, bent in U form, and which bears against the set-nut and stuffing-box, respectively. The spring, like that shown in Fig. 1, operates to throw down the diaphragm within the regulator-case, and so to open the throttle-valve, whenever the pressure flow of water to and from the regulator has ceased. Equally good results are obtained whether the connection between the diaphragm and throttle-valve be such as shown in Fig. 1 or in Fig. 2, nor is the success of the apparatus dependent upon any peculiarities in structure of the reservoir or pipes, steam-valves, engines, or pumps.

When the supply-pipe C descends in course below the level of the regulator A, forming a U-like bend, it is advisable to locate the discharge-pipe D either in the regulator or at about its height on the feed-pipe C, thus permitting the free escape of air which might otherwise accumulate in the bend of the pipe and retard the action of the apparatus.

In lieu of a steam-engine, any other form of motor may be employed to operate the pump, in such event the diaphragm and connections being arranged to shift a collar-clutch in and out of gear on the drive-shaft of the motor, as is practiced with wind-wheels, water-wheels, electro-motors, and the like.

I do not make claim broadly to the combination, with a steam-engine, of a pressure-regulator, which acts on the throttle-valve to control the steam-supply; nor to the combination, with a steam-engine and pump, of a boiler, a system of steam-heating radiators, a hot-water well, and a pressure-regulator; nor to the combination, with a steam-engine and pump, of a boiler and a pressure-regulator communicating with said boiler in the steam and water spaces thereof.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a reservoir-tank and a pump for supplying the same with liquid, of a steam-engine or equivalent motor, and an automatic regulator to control the throttle or operating-clutch of the motor, said regulator being governed in movement by the flow to and through it of a limited and intermittent current of liquid from the tank, substantially as set forth.

2. The combination, with a reservoir-tank and automatic regulator, of the supply-pipe C and the discharge-pipe D, of less diameter therewith, substantially as described.

3. The combination, with a reservoir-tank,

of the supply-pipe C, the discharge-pipe D, of less diameter therewith, the regulator A, throttle-valve B, steam-pipe K, and engine P, substantially as herein set forth.

4. In combination with the reservoir-tank, automatic regulator, and supply and discharge pipes, substantially as described, the valve-stem I, provided with the retraction-spring, the steam-pipe, and engine-pump, substantially as described.

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