(Model.)

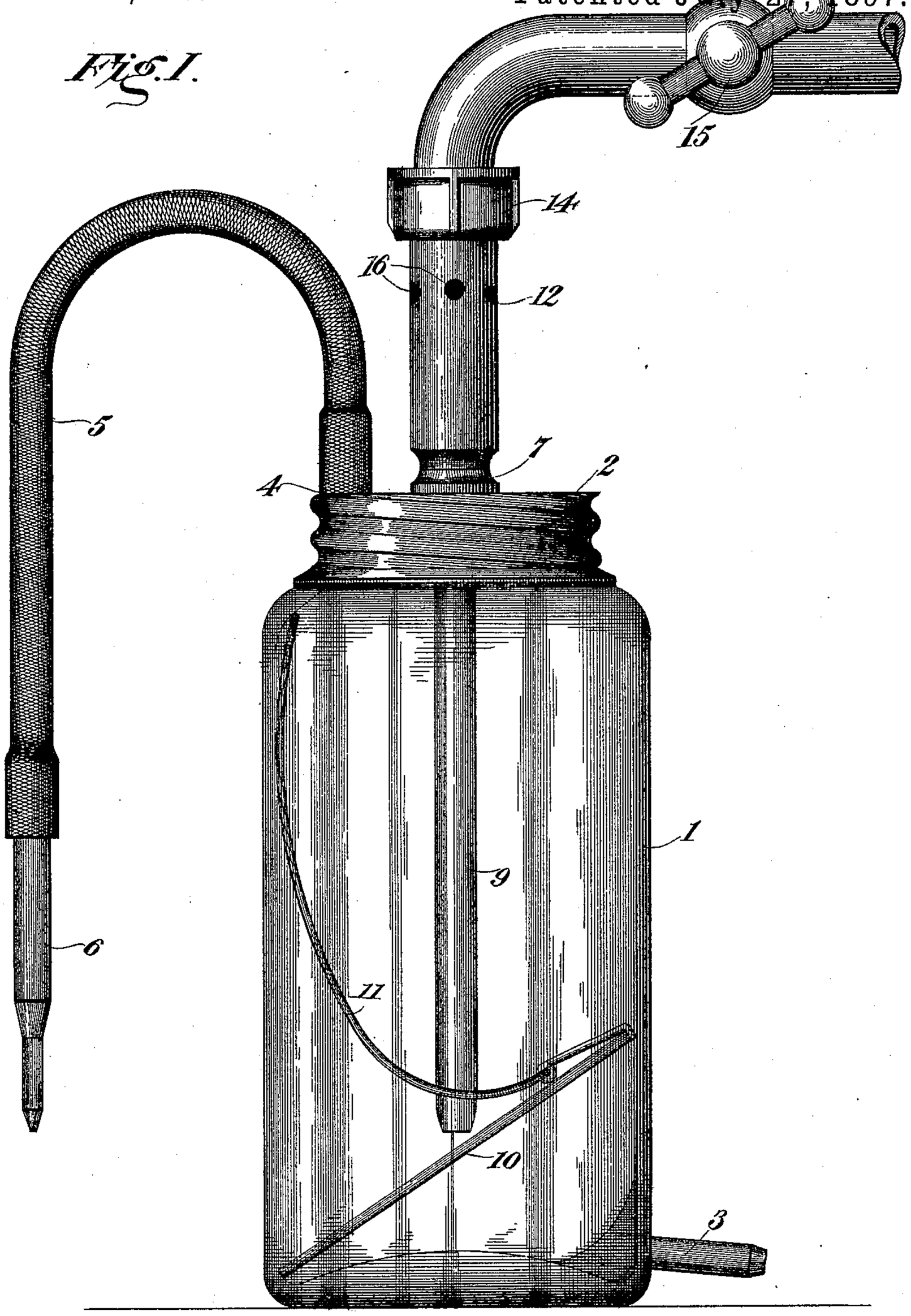
2 Sheets—Sheet 1.

J. HEATON.

APPARATUS FOR COMPELLING FLOW OF GAS BY MEANS OF CURRENTS OF LIQUID.

No. 587,203. Patented July 27, 1897.

Fig. 1.



Witnesses
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(Model.) 2 Sheets—Sheet 2.

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Fig. II.

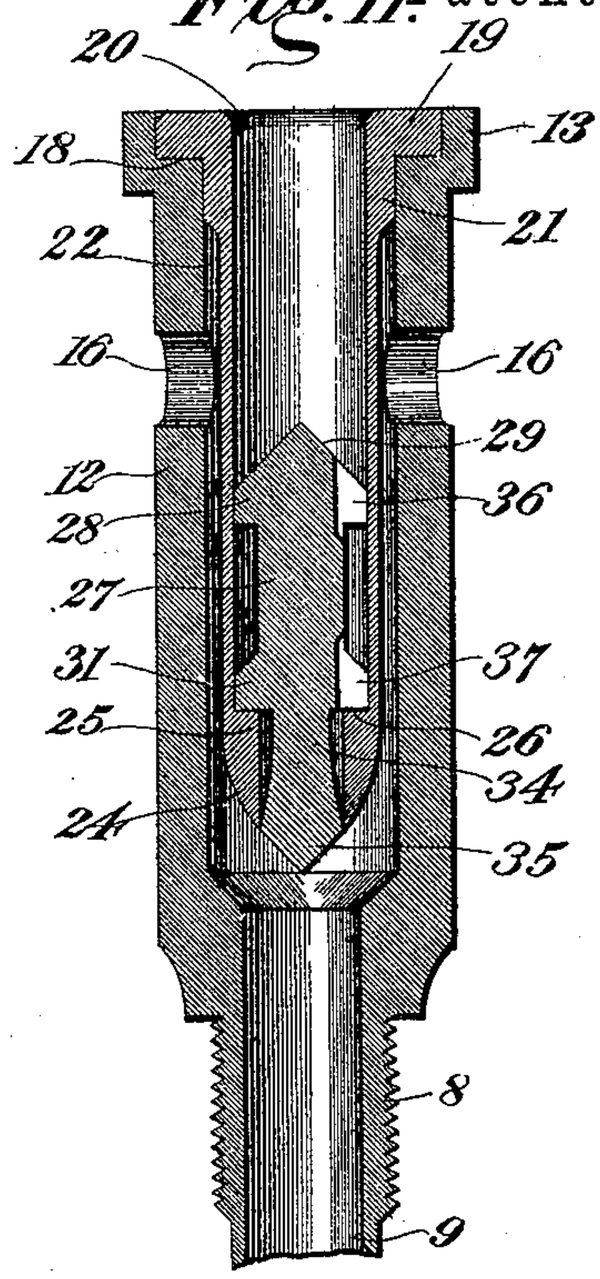


Fig. IV.

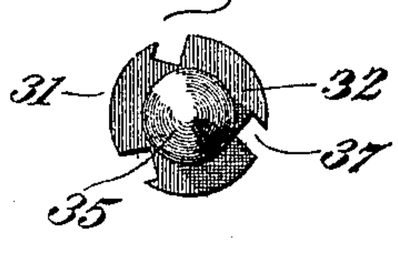


Fig. V.

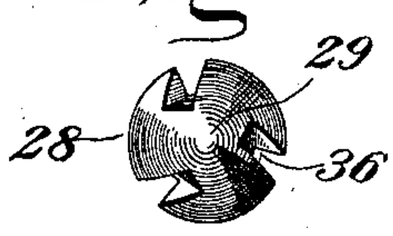
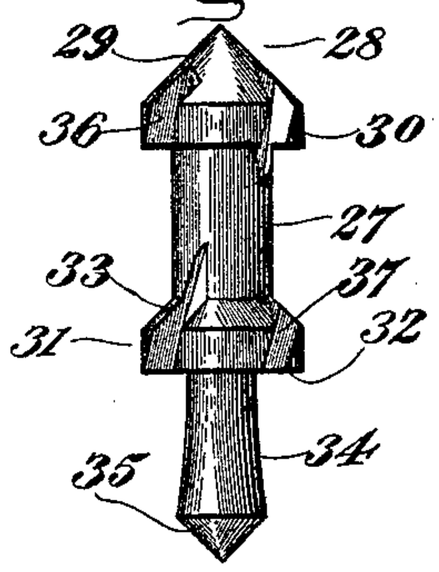


Fig. III.



Witnesses
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UNITED STATES PATENT OFFICE.

JOSEPH HEATON, OF BRUNSWICK, MAINE, ASSIGNOR OF ONE-HALF TO EUGENE THOMAS, OF TOPSHAM, MAINE.

APPARATUS FOR COMPELLING FLOW OF GAS BY MEANS OF CURRENTS OF LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 587,203, dated July 27, 1897.

Application filed November 11, 1896. Serial No. 611,724. (Model.)

To all whom it may concern

Be it known that I, JOSEPH HEATON, of Brunswick, in the county of Cumberland, State of Maine, have invented Improvements in Apparatus for Compelling a Flow of Gas by Means of Currents of Liquids, of which the following is a complete specification, reference being had to the accompanying drawings.

The object of my invention is to produce an apparatus that is designed especially to promote a draft of air by means of a stream of water flowing within confined limits.

My invention may be utilized for producing a flow of air for vaporizing gasolene, for example, for producing a blast for soldering or brazing, for playing upon wind instruments, or for any similar purpose which requires a constant supply of air.

My invention, adapted for the several uses above specified, includes an active element and a storage-reservoir. The operation of the active element resembles somewhat that of a steam-injector, but performs automatically the distinctive function of preventing the rise of the level of the water within the reservoir beyond prescribed limits.

In the accompanying drawings, Figure I is a side elevation of my apparatus complete and connected to a source of water-supply under pressure. Fig. II is a longitudinal central vertical section of the active or operative members of my device, on a somewhat magnified scale, showing the valve set in the valve-seat. Fig. III is a side elevation of the valve removed, on a magnified scale. Fig. IV is a lower end view thereof. Fig. V is an upper end view thereof.

Referring to the figures on the drawings, 1 indicates a reservoir of suitable shape, size, and dimensions, that illustrated being made of glass. I prefer to provide it with a removable top or, as illustrated, an ordinary screw-cap 2, which permits access to the interior of the reservoir as required.

3 indicates a liquid-discharge outlet located near the bottom of the reservoir.

4 indicates an air-discharge outlet communicating with the upper interior portion of the reservoir. The air-discharge outlet is designed to convey air from the interior of the reservoir away for use. It may therefore be provided with a section of flexible hose 5, secured to it at one end, and provided at the other end with a nozzle 6.

The means of utilizing the air from the interior of the reservoir may be varied as widely as the use to which the apparatus may be applied demands.

In the upper part of the reservoir, preferably in the central portion of the cap 2, I provide an internally-screw-threaded collar 7, within which fits the screw-threaded neck 8 of a tube 9, that extends down into the reservoir toward the bottom thereof and in close proximity to an inclined partition 10, which may be retained in place, as by a spring-frame 11, confined within the reservoir, so as to exert the necessary resilient action against the upper edge of the partition.

Above the neck 8 I provide upon the tube 9, and preferably integral with it, an enlarged tubular head 12, which may be provided at its upper end with a flange 13 for retaining an ordinary screw-cap 14, which is adapted to screw upon the end of an ordinary water-plug or hydrant, for example.

A cock 15 is illustrated in Fig. I of the drawings as representing a source of water-supply under pressure.

Below the flange 13 of the head 12 I provide in the wall of the head a series of apertures or air-supply inlets 16.

In the upper end of the head 12 I provide an annular recess 18, within which fits the flanged head 19 of a valve-case 20. Immediately underneath the head 19 I provide an enlarged neck 21, which, fitting snugly within the bore of the head 12, confines the valve-case concentrically within the bore, so as to define around the valve-case, between it and the interior walls of the head 12, a uniform cylindrical air-chamber or air-passage 22. The length of the valve-case is less than the length of the bore of the head 12, so that the air-passage 22 finds ready communication with the bore of the tube 9.

The exterior end 24 of the valve-case is preferably rounded, as illustrated. The bore of the valve-case is contracted at its lower end by a flange 25, the interior side walls of whose orifice constitute a valve-seat 26.

Within the valve-case I provide a valve of peculiar construction. It consists of a cylindrical body part 27, terminating at its upper end in an enlarged head 28, that is provided with a conical upper surface 29 and with a base 30, defined by a plane at right angles to the axis of the cylinder 27. The cylinder 27 is provided at its lower end with a flange 31, corresponding in shape and dimensions with the head 28, having a flat base 32 and inclined upper surface 33.

34 indicates an inversely-tapered projection that extends from the center of the base 32 of the flange 31 and terminates in a conical tip 35, which fits within the valve-seat 26 and extends through it beyond the end of the valve-casing. The edges of the head 28 and the flange 31 are cut, respectively, by oblique recesses 36 and 37.

The operation of my apparatus is as follows: The parts being assembled, as shown clearly in Figs. I and II, water under pressure is admitted through the cock 15 and passes exclusively thence into the interior of the valve, through which, with the flow controlled by the action of the valve therein, it passes into the tube 9, and through it against the face of the partition 10. Passing around the partition, it accumulates so as to form a water seal around the inner end of the discharge-outlet 3, through which the excessive accumulation of water escapes. The flow of the water from the valve-case 20 into the air-passage 22 and from it into the tube 9 produces a constant suction of air through the air-supply inlets 16 into the air-passages 22, whence it is drawn with the water into the tube 9 and discharged from it into the interior of the reservoir 1. The discharge of the commingled water and air against the partition 10 serves to break up all air-bubbles and to prevent the escape of any air shut up within the water through the discharge-outlet 3. The air drawn into the reservoir 1 is a constant current and may be drawn off through the air-discharge outlet 4 for immediate use, or it may be allowed to accumulate within the reservoir 1 until the equilibrium of the active forces is accomplished.

The valve illustrated and described operates to automatically prevent the rise of the water in the bottom of the reservoir 1, which might otherwise fill the interior of the reservoir to the exclusion of the air and finally be discharged through the nozzle 6.

I do not wish to confine myself to the limits of a particular theory of operation and advance the following theory only as that which appears to me at the present time to be the correct one.

The valve in the valve-case 20 remains normally closed under the action of gravity. Water passing into the interior of the valve-case is met by the resistance of the valve, and consequently exerts the full force of its pressure upon it. The force of the water tending to hold the valve in its seat is exerted against the conical surface 29 of the head 28 upon the valve and the inclined upper surface 33 of the flange 31 thereof. Equal pressure, however, is communicated through the water entering the recesses 36 and 37 against the base 30 of the head 38 and the base 32 of the flange 31.

The shape and combined area of the bases 30 and 32 afford a greater resistance to the force of the water than the conical surface 29 of the head and the inclined surface 33 of the flange 31. Consequently the valve is lifted by the force of the water from its seat when the water rushes through the orifice defined by the flange 25 in the end of the valve-case and escapes into the air-passage 22 and thence into the tube 9 in the manner above set forth.

The valve is no sooner raised and the water allowed to slip by it than the pressure upon the different parts of the valve is equalized, and the valve through gravity again sinks to its normal position, only to be operated again in the manner already described.

The opening and closing of the valve under the force of the pressure of water and of gravity is but momentary in each instance, producing a palpitating action in the valve, which permits a substantially constant flow of water into the air-passage 22 in quantity sufficient to suck in the necessary quantity of air, but so gaged to the size of the outlet 3 as to prevent the rise of the water in the reservoir against the air-pressure in the upper part thereof beyond the required limits. The valve being raised from its seat in the manner previously described, the water passing through the oblique passages 36 and 37 to find an exit through the valve seat 26 imparts to the valve a slight rotatory movement, whereby the position of the valve in its seat is changed with each palpitation of the valve, thereby insuring the requisite fit of the parts and the proper operation of the apparatus.

As above set forth, it is difficult to assign with certainty a precise mode of operation to my valve, but that it is operative, as shown and described, to produce the result claimed for it is clearly demonstrated in practice.

With the valve in place the apparatus remains continuously operative and the level of the water within the reservoir remains stationary. If the valve becomes clogged or if it is removed, the apparatus becomes practically inoperative and the reservoir promptly fills with water.

What I claim is—

1. The combination with a reservoir, liquid-discharge outlet, and tube communicating therewith, of a valve-case located within the tube so as to define an air-passage around it within the tube, air-inlets in the walls of the tube, and a valve within the valve-case, adapted automatically to control the level, within the reservoir, of water passing through the valve-case into the reservoir, substantially as set forth.

2. The combination with a reservoir, liquid-discharge outlet, and tube communicating with the interior of the reservoir, of a valve introduced into the interior of the tube, so as to define an air-passage around it within the tube, air-inlets in the tube, communicating with the air-passage, and a palpitating, pressure-controlled valve located within the valve-case, substantially as set forth.

3. The combination with a reservoir, liquid-discharge outlet, and tube communicating with the interior of the reservoir, of a valve-case located within the tube and defining therein an air-passage around it, air-inlets communicating through the walls of the tube with the air-passage, a valve located within the case, and provided with a base and head, the base presenting a greater opposition to the pressure within the case than the head, substantially as set forth.

4. The combination with a reservoir, mechanism for discharging commingled air and water into the same, and a partition within the reservoir against which the same discharges, of a liquid-discharge outlet communicating with the lower part of the reservoir underneath the partition, substantially as set forth.

5. The combination with a tube provided with air-inlets, of a valve-case located within the same, the exterior diameter of the case being less than the interior diameter of the tube, and a palpitating valve working in the end of the case, substantially as set forth.

6. The combination with a tube provided with air-inlets, of a valve-case located within the same, the exterior diameter of the case being less than the interior diameter of the tube, and a valve operatively located within the end of the case, and provided with a base and head, the base presenting greater opposition to pressure within the case than the head, substantially as set forth.

7. The combination with a tube provided with air-inlets, of a valve-case provided with a valve-seat, located within the same, the exterior diameter of the case being less than the interior diameter of the tube, a valve operatively located within the end of the case, and provided with a head and flange, whose combined areas nearer the valve-seat, respectively, present greater opposition to pressure within the case than the areas of their other sides, and oblique recesses in the head and flange, respectively, substantially as and for the purpose specified.

8. A valve consisting of a body part, head, flange and inversely-tapered projection, of inclined upper surfaces upon the head and flange, respectively, flat bases upon the opposite sides thereof, respectively, and recesses in the edges of the head and flange, respectively, substantially as set forth.

In testimony of all which I have hereunto subscribed my name.

JOSEPH HEATON.

Witnesses:
JAMES L. DOOLITTLE,
JOSEPH H. RAUSSEAU.