(No Model.)

J. L. DIBBLE.

AIR VALVE FOR WATER PIPES.

No. 257,853. Patented May 16, 1882.

Fig. 1.

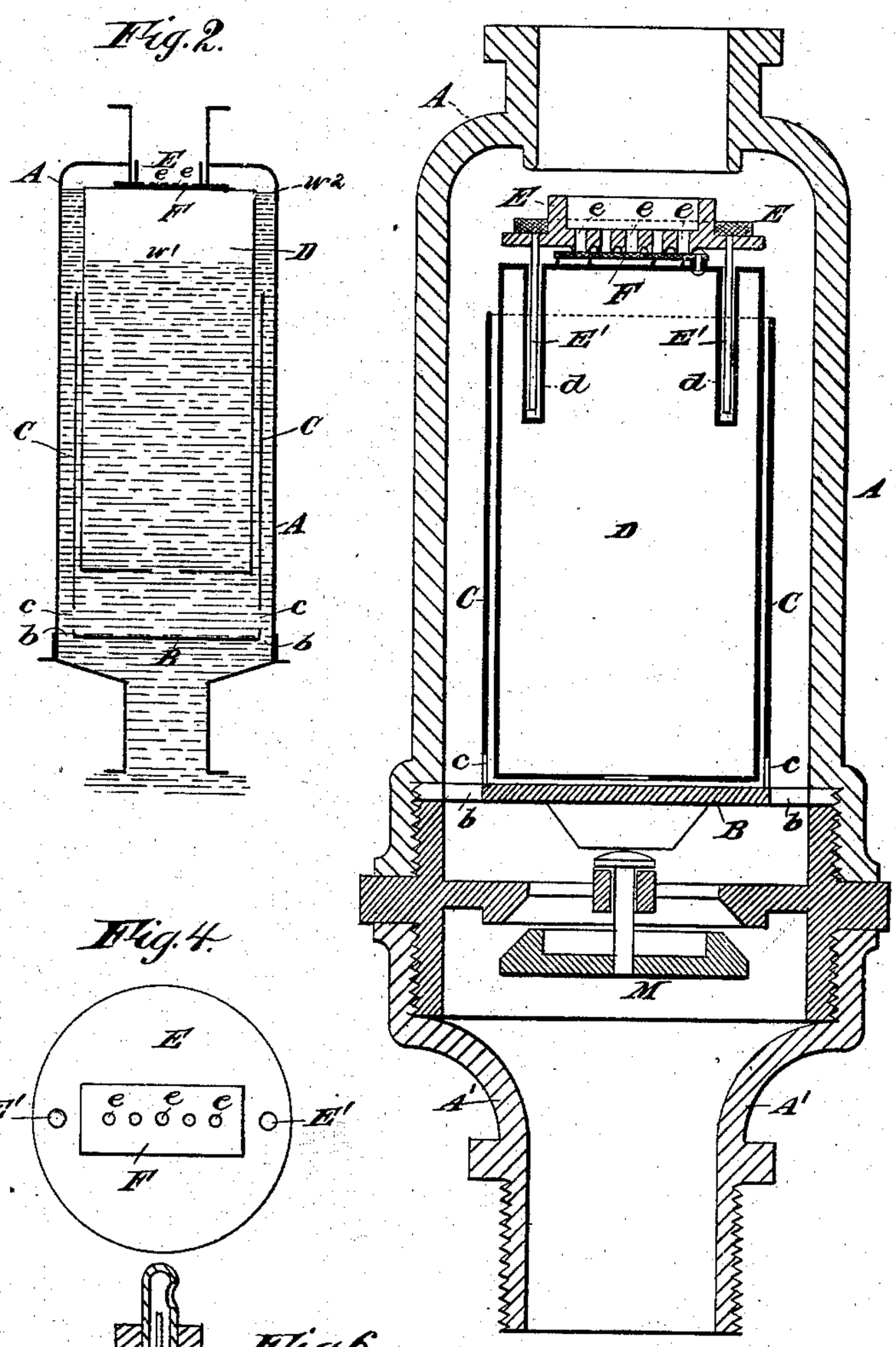


Fig. 2.

Fig. 3.

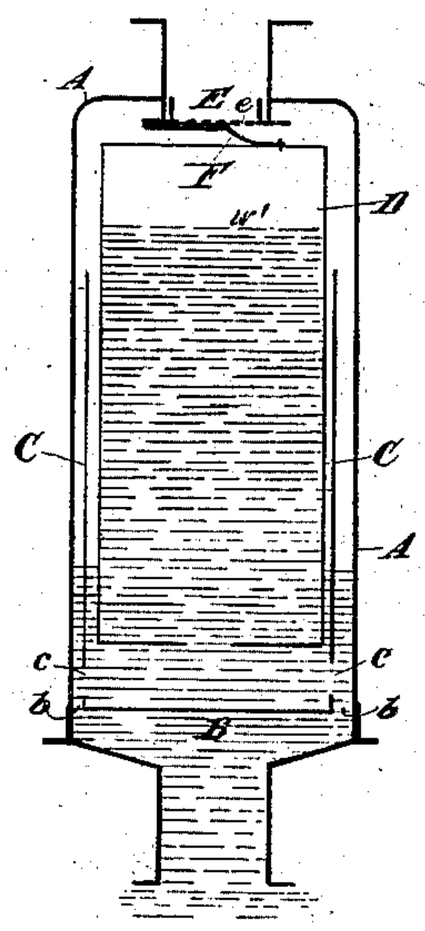


Fig. 4.

Fig. 5.

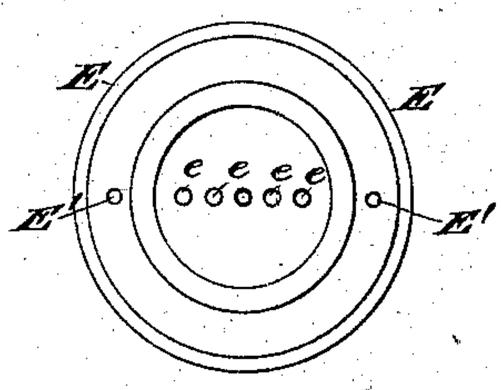


Fig. 6.

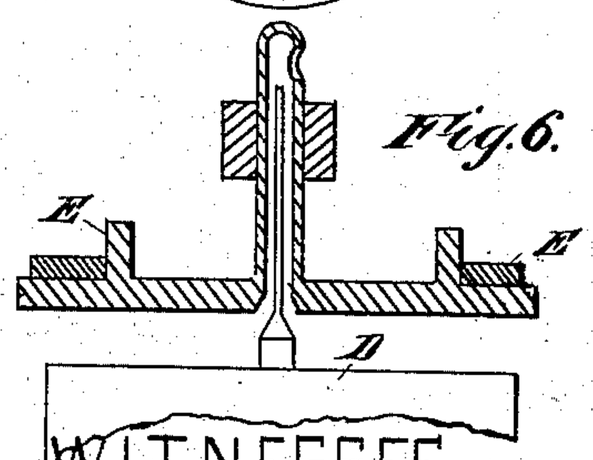
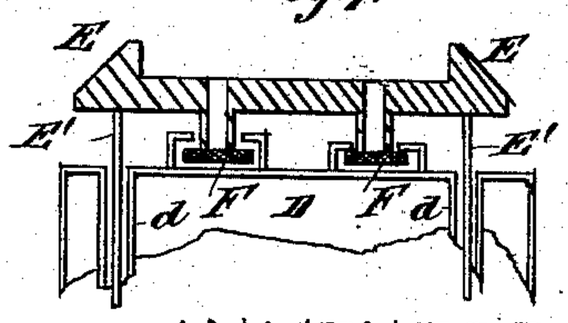


Fig. 7.



WITNESSES.

B. E. D. Stafford

Charles K. Searle,

INVENTOR.

John L. Dibble,

by his attorney

J. L. Stetson.

UNITED STATES PATENT OFFICE.

JOHN L. DIBBLE, OF BROOKLYN, NEW YORK.

AIR-VALVE FOR WATER-PIPES.

SPECIFICATION forming part of Letters Patent No. 257,853, dated May 16, 1882.

Application filed January 25, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. DIBBLE, of Brooklyn, Kings county, in the State of New York, have invented certain new and useful Improvements in Air-Valves for Water-Pipes; and I do hereby declare that the following is a full and exact description thereof.

Great difficulty is experienced in many systems of water pipes and mains caused by the accumulation of air at the higher points obstructing the passage of the water and destroying the steadiness of the flow. Especially is this true of force-mains and systems of pipes supplied by direct pumping without the intervention of stand-pipes or reservoirs. On filling a new line of pipes or a portion that has been emptied for repair or other purpose it is important to furnish means of egress for the contained air. This is now in part accomplished by opening such fire-plugs, hydrants, &c., as may be on the line or by tapping the pipe at the high points. Some kinds of wa-pipes, while calculated to withstand the heaviest hydraulic pressure, are not so well fitted to bear an external pressure such as would be the result of a vacuum in the pipes caused by a large and sudden discharge of water at a lower point, as in cases of rupture.

The object of the invention is to furnish an automatic device that, placed at a proper high point or bend in the pipe, will afford ready means for the egress of the contained air when the pipes are being filled, prevent the gradual accumulation of air at that point at subsequent periods, and permit the free admission of air to the interior of the pipes in case they should by any means be emptied of their denser contents.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a central vertical section through the entire apparatus, showing the condition when the main valve is open. This is the condition which obtains when air is being drawn in or being discharged freely, or when the parts are at rest with no water in the pipe. Figs. 2 and 3 are outline sections of the same, showing the device in action in two conditions. Fig. 2 shows the main valve shut with the water at a high level around the float, pressing the float up against it. Fig. 3 shows the main valve shut, but with the water around the float at a low level, so that the float is not supported by the water, but sinks with sufficient force to open a secondary valve. This condition obtains when air accumulates around the float and lowers the water so that the float is no longer supported by the water. The accumulated air is in this condition free to escape through one or more small apertures. Fig. 4 is a plan or top view of the float-valve with a strip of rubber, which serves as a secondary valve to stop certain small openings in the main valve. Fig. 5 is a plan of the main valve. Fig. 6 is an outline of a portion showing a modification. Fig. 7 is an outline of a portion showing another modification.

Similar letters of reference indicate corresponding parts in all the figures.

A A represent a cylindrical valve-case, the upper and lower parts joined by a screw-thread, as is customary.

B is a flat disk or plate held in position by the same screw-thread as unites the upper and lower parts of the valve-case. Ports *b* are made in it near the periphery for the passage of water and air. On this disk is an upright cylinder, C, open at top. Near the bottom of the cup thus formed one or more small apertures, *c*, should be provided. In this cup is loosely confined a hollow float, D, of less depth than the cup, and made air and water tight at all points except an opening at the bottom. In the top are fixed two small tubes, *d d*, extending down into the float and closed at their lower ends. On the top is a broad strip of rubber or other tight fitting and pliable material, F, one end of which is firmly attached to the float. All the rest of the strip F is left free. It is supported on a coiled wire or analogous ridged surface to allow the air or water to get under it and to press it forcibly upward when required.

E is the main valve, of a form fitted to make an air and water tight bearing by the aid of a rubber packing carried thereon. The under side of this valve carries vertical pins or rods E′ E′, which, playing loosely in the tubes *d d*, serve as guides to keep the float D and valve

E in the same position laterally, while allowing independent vertical motion. Through the main valve E is made a series of small ports or secondary-valve passages, *e e*. On the lower face of the main valve are small cone-like projections, through which these ports or apertures extend, insuring a firm bearing on the rubber F, which serves as the secondary valve.

My invention being placed on the upper side of a water-pipe, preferably at the higher points of the system and properly connected, the following results ensue: On the admission of water into the pipe the air readily passes through the annular space between the cup C and the valve-case and past the main valve E out of the top. When the air is all discharged the water enters the valve-case and raises the float and lifts the main valve E to its seat, closing it tightly. The small amount of air remaining in the valve-case will be compressed by the force of the water, as also will be the air within the float D, and the apparatus will be approximately in condition as represented in Fig. 2, w' representing the water-level within the float, and w^2 representing the water-level in the valve-cases C A. These levels will be modified by variation of the hydraulic pressure in the pipe, which will be referred to farther on.

M is a check-valve of ample area and strongly mounted in a steadiment in a horizontal plate below the removable disk B. It opens downward, and is held open by its gravity and also by a projection from the disk B. So long as it remains open it is of no effect; but when it becomes necessary to remove the upper portion of the apparatus for examination or repairs or for the exchange of any part, all that is necessary is to apply a suitable wrench or other instrument, and by turning around the main body A to unscrew it from the base A′. This act raises the main body A and liberates the disk B. The moment the upper work is removed the check-valve M, being no longer held down by the disk B, is driven upward by the upward rush of water, and, closing, forms a check to hold the water back until the proper examination and repairs have been made. On returning the casing A, with its contents, the screwing down again acts on the stem of the check-valve M, and, forcing it open, allows the water to flow up through and the proper action of the apparatus to be instantly resumed. Any air that may be contained in the pipes or be drawn in from the source or forced in by the pumps, on reaching the opening at foot of the valve, ascends into the annular space between the cup C and the valve-case, displacing its own bulk of water. This continues until the water-level outside of the float D is down to or below that within the float. (See Fig. 3.) All the weight of the float, and also of the body of the water within the float not supported by the water outside, is now sustained solely by the strip of rubber or other pliable material F, which is attached, as described, by one of its ends only to the float D, and is held by the air-pressure against the orifices *e e*. When, by the gradual accumulation of air and lowering of the water-level outside, the sustained weight becomes greater than the air-pressure on the superficial area of one of the secondary-valve ports *e*, the rubber F is drawn away from such ports, and the air contained in the valve-case outside of the float escapes, its place being filled by water from the pipe below. As the air escapes the rising of the water in the valve-case A again lifts the float D and brings the rubber F again in tight contact with E, and all the parts resume their former condition, as shown in Fig. 2. Whenever from any cause the pipes are emptied or the pressure taken off the main valve immediately opens and admits the air into the interior of the pipe, rendering a vacuum impossible.

Many modifications may be made without departing from the principle of my invention. For instance, the valve-float D may be made solid, of any suitable material. Such a float combined as here shown will serve with some success; but I attach much importance to the construction of my float D as a hollow shell of metal open only at the bottom, because the water will enter and compress the air to an extent proportioned to the pressure in the pipe, and the weight of the float in pulling open the secondary valve requires to be greater with the higher pressure.

My peculiar construction of the float is preferable to a float of uniform flotation, because it will float with force and lift the main valve firmly to its seat under light pressures when the air within the float is not compressed, and when the pressure is not sufficient to hold the main valve up to its seat; and it will, by the compression of the air within the float into a small compass under high pressures, allow so much water to enter the float that it will lose a great portion of its buoyancy under conditions when it can be spared, and will, by the greater gravity of the float, give increased power for pulling downward on the flexible strip F when it is held up against the respective holes *e* with the greatest force.

The form and construction of this valve-case may be varied to suit circumstances and conditions. The main valve and its seat may be greatly varied as to material, form, and method of packing. The secondary-valve ports may be placed in varied positions in the main valve, or they may be made in the valve-case at the top or side and suitable appliances to open and close them at proper times be connected with the valve-float; but for simplicity of construction I prefer them as described.

I can use other means of holding the valve E upon the float D, so as to maintain their correct lateral position and prevent their turning around one relatively to the other, while allowing the proper amount of vertical motion of the float without disturbing the main valve,

and the same of the main valve without necessitating a corresponding vertical movement of the float.

Parts of the invention may be used without the whole. I can use an ordinary stop-cock below instead of the check-valve M. I can use the apparatus with some success without any special provision for removing the parts for repairs. In the ordinary form of the device the motion is confined to a slight vertical movement of the float D, and consequently of one extremity of the strip F, alternately covering and uncovering one of the apertures *e*. It is only in case of the reception of extraordinary quantities of air that the float D will sink low enough to uncover more than two or three of the apertures. I esteem it important to have a series of the apertures *e*, in order that while but slight resistance is offered to the opening of the first a sufficient sinking of the float will open a large area to discharge much air under extraordinary conditions. It is also important in case any small solid substance should be received in one of the holes *e* and obstruct it. In such case the float will sink lower, and the alternate opening and closing will be performed on the second instead of the first aperture *e*.

The proportionate dimensions of valve-case, float, main orifice, and secondary ports may be varied within wide limits.

The modification shown in Figs. 6 and 7 are outlines, showing the upper portion of the float with the main valve and secondary valve or valves. Fig. 6 has only one secondary valve. This is exactly in the center, and the guides are omitted. There is no objection to permitting the float to turn around into any position it may chance to assume. The secondary valve is conical and fits in a corresponding seat in the main valve. Fig. 7 has two secondary valves, mounted independently, but so caged on the float that the gradual sinking of the float will open one before the other.

I claim as my invention—

1. The casing A, inclosed float D, main valve E, and sub-valve F, and means for attachment to a pipe, arranged to serve as herein specified.

2. The valve or valves F, arranged to control the series of small apertures *e e*, and open one of the apertures at a time, in combination with the operating-float D and with a casing, A, with provisions for connecting with a water-pipe, as herein specified.

3. The hollow float D, open only at or near the bottom, in combination with the main valve E, sub-valve F, and casing A, as herein specified.

4. The shield-plate B and internal case or cup, C, having limited openings *c*, arranged to serve relatively to the float D, main valve E, and external casing, A, as herein specified.

5. The combination, with the main valve E, float D, shield-plate B, and casing A, of the check-valve M, arranged to serve as herein specified.

In testimony whereof I have hereunto set my hand, at New York city, N. Y., this 24th day of January, 1882, in the presence of two subscribing witnesses.

JNO. L. DIBBLE.

Witnesses:
THOMAS D. STETSON,
CHARLES C. STETSON.