(No Model.)

A. F. NAGLE.

AUTOMATIC FIRE EXTINGUISHING APPARATUS.

No. 387,179. Patented July 31, 1888.

FIG. 3.

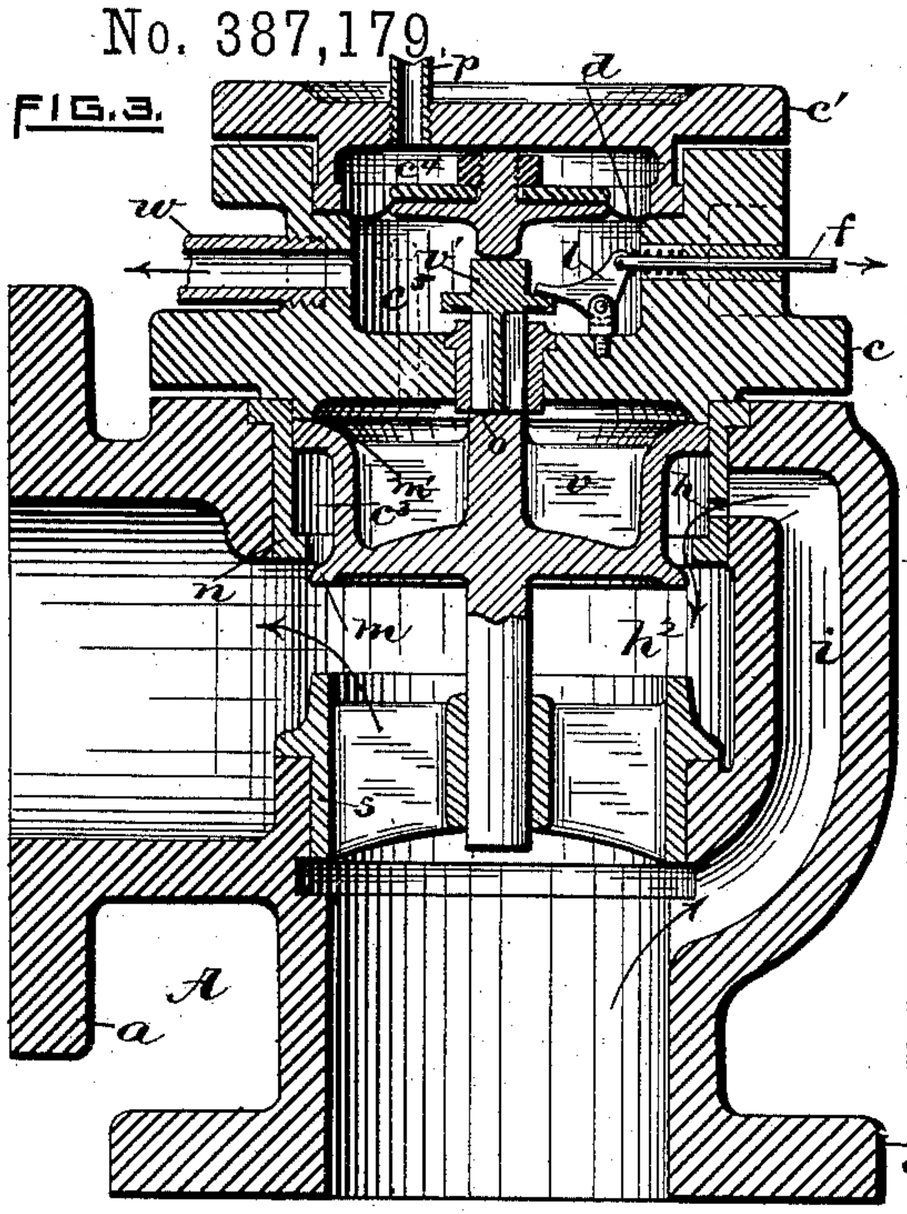


FIG. 5.

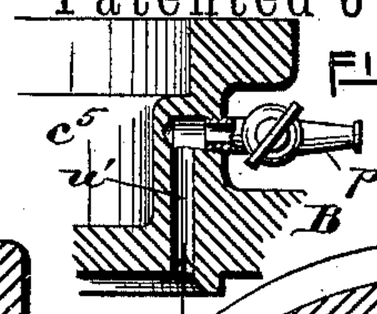


FIG. 4.

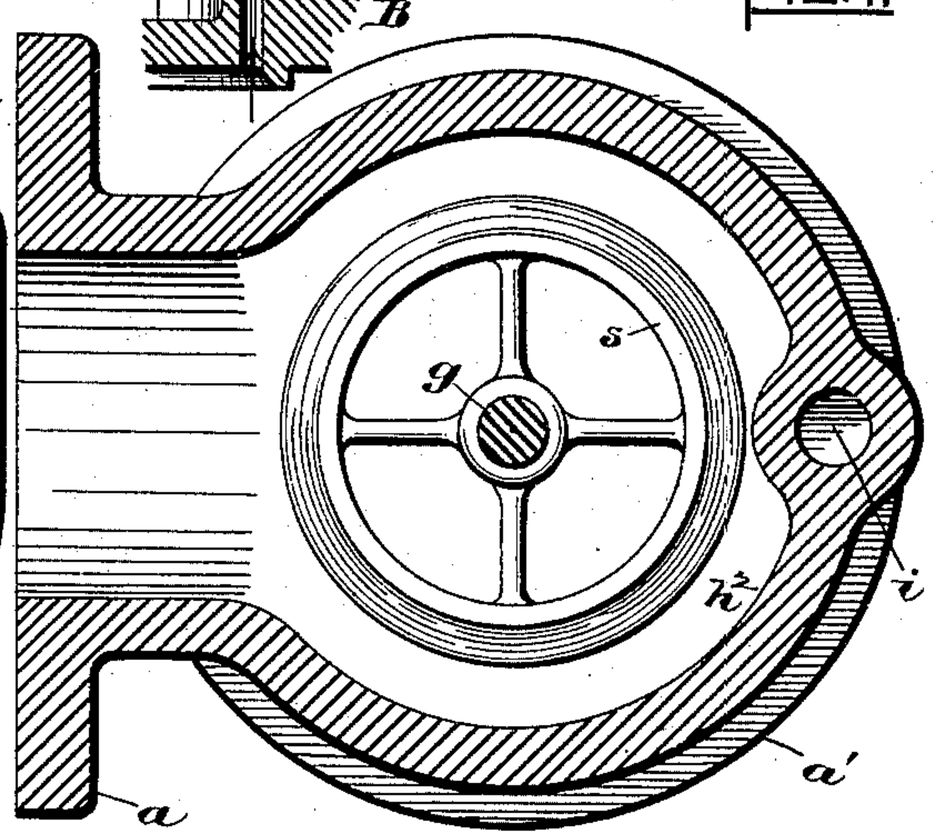


FIG. 1.

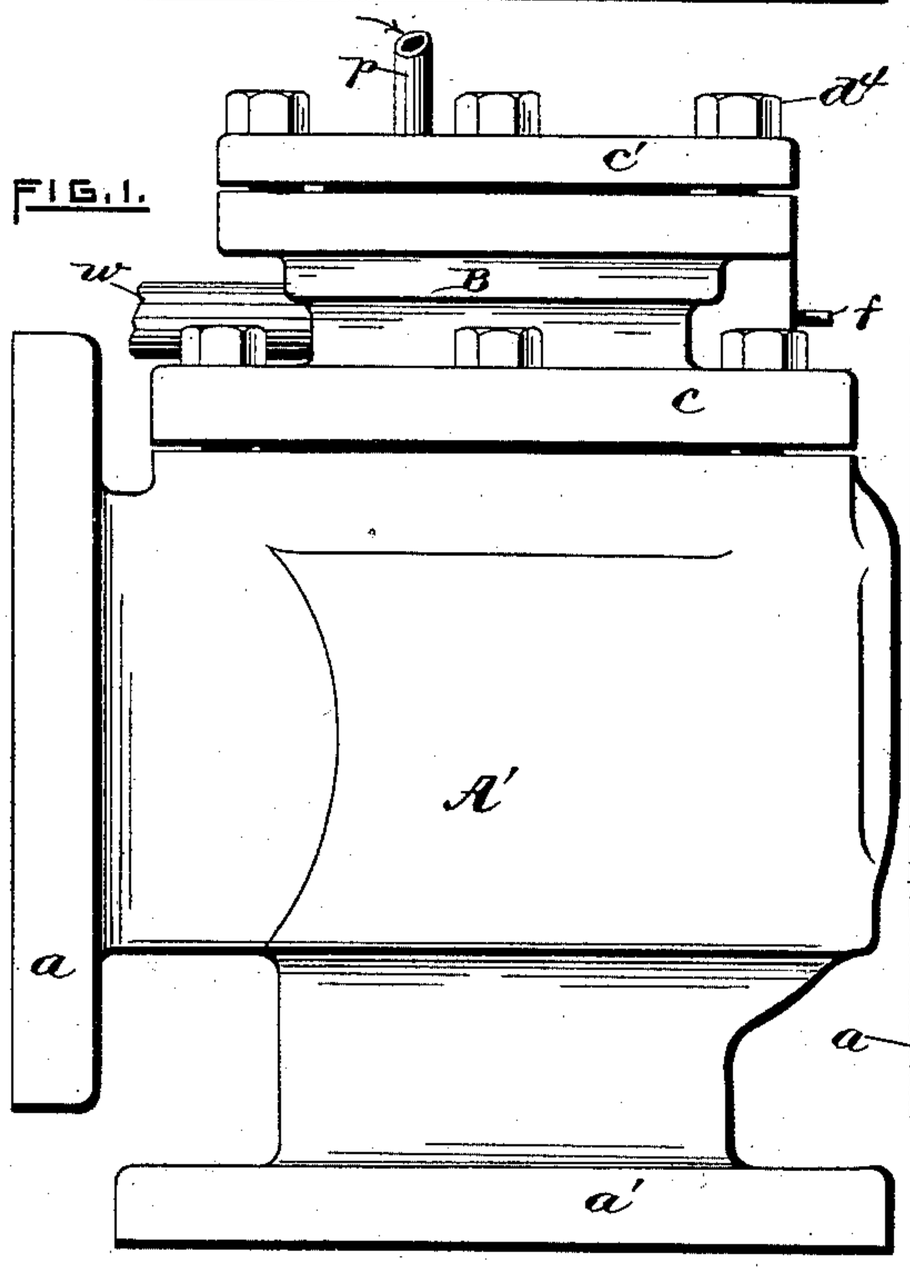
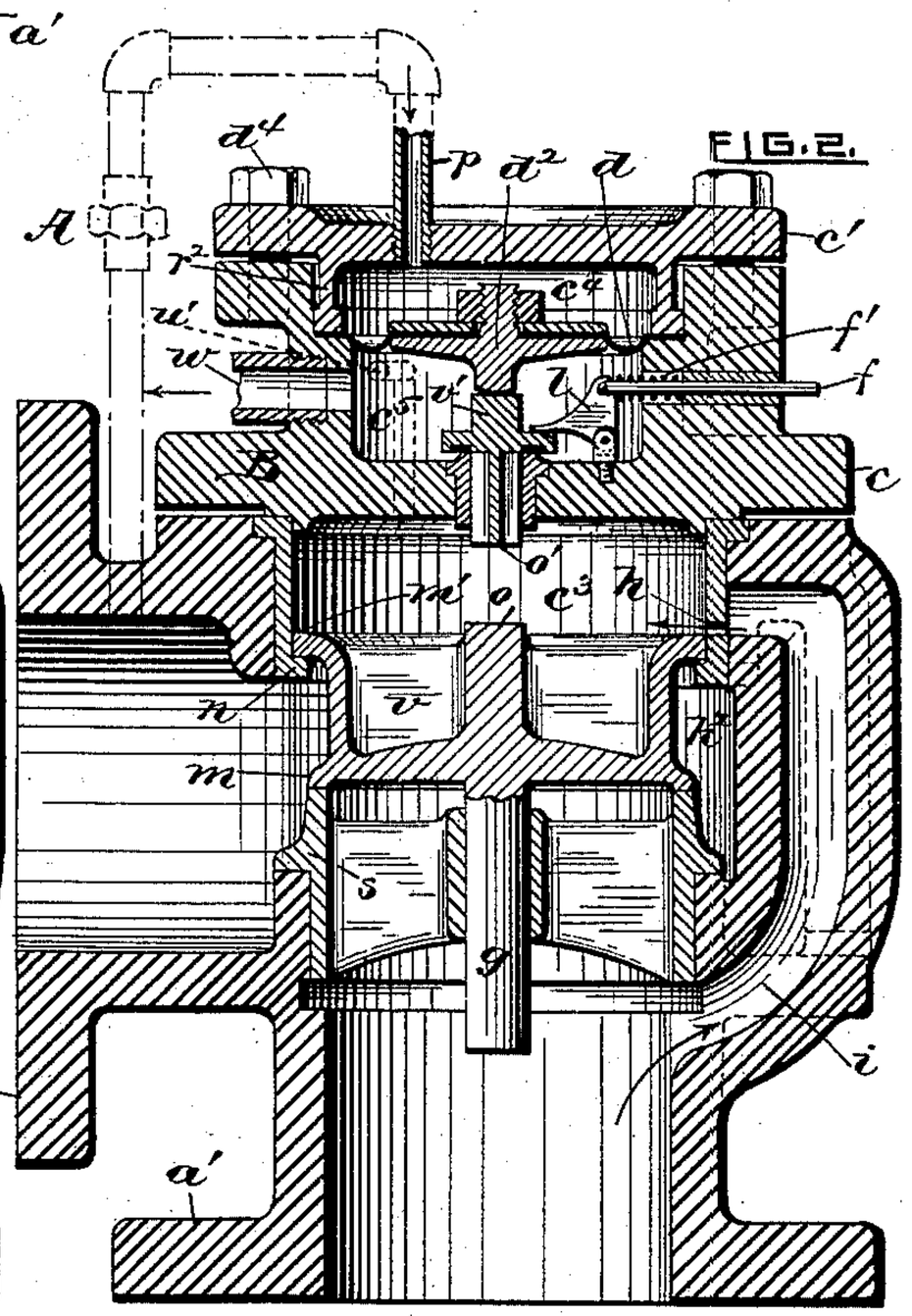


FIG. 2.



WITNESSES.

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AUGUSTUS F. NAGLE, OF CHICAGO, ILLINOIS.

AUTOMATIC FIRE-EXTINGUISHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 387,179, dated July 31, 1888.

Application filed May 1, 1888. Serial No. 272,489. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS F. NAGLE, of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Automatic Fire-Extinguishing Apparatus, of which the following is a specification.

My invention relates to the main valve of what is known as the "dry-pipe" system of automatic fire-extinguishers, where the water is prevented from entering the distributing-pipes by a main valve, which is in turn so controlled by a light air-pressure in said distributing-pipes as to be only liberated when said light air-pressure is reduced by the opening of one or more of the sprinkler-heads.

My improved valve consists of a double-seated main valve or gate having unequal areas, an open water passage or by-pass communicating with the under and upper sides of the valve, a small waste-valve controlling a waste-passage from one side of said main valve, and a diaphragm exposed to atmospheric pressure on one side and to the light air-pressure of the distributing-pipes on the other side controlling the waste-valve. The main valve is kept seated by the water-pressure, and the small valve at the same time is kept on its seat by the pressure of air upon the diaphragm, the effective area of the latter by having the small pressure of the air upon it somewhat exceeding the pressure exerted by the water upon the under side of the waste-valve. Now, in case of a fire and the opening of a sprinkler, the air-pressure is quickly reduced below the fixed limit, and the water-pressure immediately acts to automatically lift the waste-valve, and consequently reduces the pressure upon that side of the main valve, after which the larger volume of water forces the valve from its seat, thereby allowing the water to flow into the distributing-pipes to quench the fire.

In the accompanying sheet of drawings, illustrating my improved valve, Figure 1 represents a side elevation. Fig. 2 is a central sectional view showing the valves closed, as in their ordinary or normal position. Fig. 3 is a similar view showing the valves open, as in the event of a fire. Fig. 4 is a horizontal sectional view taken on line $x\,x$ of Fig. 2; and Fig. 5 is a partial sectional view through the valve-casing, showing a small outlet leading from the upper portion of the main-valve chamber.

The following is a more detailed description, including the manner of the operation of the valve.

A designates the air or gate valve as a whole. A′ indicates the body portion or shell, the same having a flanged inlet-nozzle, a', adapted to be secured to a water-supply pipe, and also having the outlet-nozzle a adapted to be secured to the distributing-pipes, in which are located a series of sprinkler-heads. Centrally of the shell is formed a chamber, h^2, in which is secured the lower seat, s. A seat, n, is also fitted into the upper portion of the shell and forming a chamber, c^3. This upper seat is somewhat greater in diameter than the lower one. A small opening or by-pass, i, is formed in the valve-casing, as clearly shown, the same extending from the inlet-nozzle past the valve to the said chamber c^3, a narrow orifice, h, cut through the upper seat, n, and communicating with the by-pass, permitting the water to enter the chamber.

v designates the main valve, the same being adapted to rest upon the two seats s n and form two water-tight joints. The area of the upper joint exceeds that of the lower joint; hence the water filling the chamber c^3 (and being of the same pressure per square inch as that below the valve) acts to maintain the valve v upon its seats. A central stem, g, fitting the hub of the lower seat, serves to guide the valve, as common. The outer edge of the upper portion of the valve is turned off, so as to permit the valve to move freely up and down in the chamber c^3 without friction.

B indicates a head or cap having a lower flange, c, adapted to be secured to the upper portion of the shell. This head is provided with a small check or waste valve, v', seated in the center of the flange c. The valve has a fluted stem, o', which extends down through the seat, and is adapted to engage the central stem, o, formed on the upper side of the main valve. The said valve v' opens into a chamber, c^5. A pipe, w, tapped into the head B and communicating with the last-named chamber, serves to conduct the overflow or waste water therefrom. To the top of said head is secured a cover, c', having a deep rim, r^2,

adapted to extend into the head and engage the interior shoulder, u^2. A diaphragm, d, of metal or other suitable material, is secured to a central disk or head, d^2, by means of a washer and nut, or in any well-known manner. The under side of the disk is in contact with the waste-valve v', the two parts consequently moving in unison. The outer portion of the diaphragm rests upon the said shoulder u^2, and is firmly retained in place by the rim r^2, in connection with the holding-down bolts d^4. By means of this construction and arrangement of diaphragm, &c., is formed an upper chamber, c^4, separated from the waste-chamber c^5 by the diaphragm d, all as clearly shown. A pipe, p, communicates with the upper or diaphragm chamber, and also with the distributing-pipes, thereby maintaining the same pressure within the former as in the latter; or, in other words, the pressure within the nozzle portion a (when connected as in use) and the chamber c^4 is the same.

If desired, the pipe p may be connected as shown by dotted lines in Fig. 2.

In order to ascertain the nature of the contents of the chamber c^3, the head B is provided at one side with a small hole, u', in direct communication with said chamber, and having a petcock or pipe, p', at the outlet of the aperture u', as clearly shown in Fig. 5.

The apparatus is readily adapted to automatically send out an alarm electrically in the event of the opening of the main valve v, as in the case of fire. To this end a bell-crank lever, l, is pivoted within the waste-chamber c^5, one arm of the lever being in direct contact with the waste-valve, and the other being pivoted to a rod, f, which passes through the head B. A spiral spring, f', serves to maintain the lever in engagement with the valve. The rod f in moving outwardly is adapted to close an electrically-connected circuit, as common.

The operation of my improved valve is as follows: We will assume that the valve A is secured by its outlet-nozzle a to a main pipe, which in turn is in direct communication with the distributing or service pipes, provided with automatic sprinkler-heads, and suitably arranged and located in a building. At the same time the other or inlet nozzle, a', of the valve is secured to a main which supplies the water under considerable pressure. Now it is evident that the said water-pressure is upon both the upper and under sides of the main valve v at the same time, the water freely passing into the chamber c^3 by way of the by-pass i; but, owing to the excess of area of the upper over the lower side of the valve, the latter is maintained upon its seat. At the same time, also, the water is pressing against the under side of the waste-valve v'. The distributing-pipes, and of course the connected nozzle and chamber portion $a\,h^2$, being free of water, are next filled with air under pressure, and which also fills the upper chamber, c^4. The ratio of the effective area of the diaphragm d to the valve v' being, say, 20 : 1, it is obvious now that air at five pounds pressure per square inch upon the diaphragm will equal a water-pressure of one hundred pounds per square inch pressing against the waste-valve. Practically, however, the air-pressure is increased a pound or two, so as to insure the seating of said valve and consequently maintaining the larger valve upon its seat. Now, in case the air-pressure should be reduced suddenly, as in the event of a fire by which the sprinkler-heads become unsoldered, thereby allowing the air to escape, then the pressure of water in the chamber c^3 immediately lifts the valve v', fills the chamber c^5, and overflows through the pipe w. From the fact that the area of the orifice h is considerably less than the net area through the waste-valve opening, the pressure is removed thereby from the top side of the main valve v, the pressure against the under side at the same time instantly forcing the valve v from its seat and past the opening h. After passing said opening the valve readily rises to its limit and maintaining the waste-valve and the diaphragm in the extreme position shown in Fig. 3. The under side of the flange c extends into the chamber c^3 and is ground to form a tight joint with the upper face, m', of the valve, as clearly shown in said figure, thereby preventing waste of water. It is obvious that as the main valve opens the water instantly rushes into the nozzle a, leading to the distributing-pipes, and displaces the air, the water flowing from the heads quickly subduing the fire.

It will be seen from an inspection of the drawings that the main valve is practically a gate, and when opened permits an unobstructed flow of water, the joints being sealed with water and are self-tightening when the valve is closed.

As hereinbefore stated, the waste-valve in opening is in contact with a lever, l, to which is jointed a rod, f, adapted in its movement to automatically announce an alarm in case it be connected in an electric circuit provided with stations adapted to send out an alarm or signal.

From the foregoing description it is obvious that my improved valve is entirely automatic in its action. So long as the pressure of air is maintained within the sprinkler-pipes it is impossible for the valve v to lift from its seat to allow water to enter, although readily permitting the passage of water immediately the air-pressure is reduced below a normal or fixed limit.

The pipes may be filled with air by the use of a small air-pump.

I claim—

1. The combination of the supply-pipe charged with water under pressure and the distributing-pipe charged with air under a less pressure, with a double-headed valve separating them normally, one head of the valve closing the supply-pipe and the other head closing a chamber communicating through a restricted by-pass with the supply-pipe, a waste-

valve closing a waste-outlet from said chamber, and a diaphragm holding said waste-valve closed against the water-pressure, the said diaphragm being itself held by the light air-pressure, substantially as and for the purpose set forth.

2. The combination of the supply-pipe charged with water under pressure and the distributing-pipe charged with air under a less pressure, with a differential valve separating them normally, the smaller head of the valve closing the supply-pipe and the other head closing a chamber communicating through a restricted by-pass with the supply-pipe, a waste-valve closing a waste-outlet from said chamber, and a diaphragm holding said waste-valve closed against the water-pressure, the said diaphragm being held by the light air-pressure, substantially as and for the purpose set forth.

3. The combination of the supply-pipe charged with water under pressure and the distributing-pipe charged with air under a less pressure, with a double-headed valve separating them normally, one head of the valve closing the supply-pipe and the other head closing a chamber communicating through a restricted by-pass with the supply-pipe, a waste-valve closing a waste-outlet from said chamber, and a diaphragm holding said waste-valve closed against the water-pressure, the said diaphragm being held by the light air-pressure, and an alarm mechanism connected with the waste-valve, substantially as and for the purpose set forth.

4. The combination of the supply and distributing pipes with the double main valve, the restricted by-pass around the said valve, whereby the water is allowed to act upon both faces of the valve, the diaphragm exposed on one face to the light air-pressure of the distributing-pipe and on the other side to the atmospheric pressure, the waste-valve closing the waste-passage from one side of the main valve, the said waste-valve being normally held closed against the water-pressure by the diaphragm, and the said by-pass leading into the waste side of the valve-chamber just above the main valve, so as to be shut off by the said main valve during the first part of its movement.

5. The combination of the supply and distributing pipes with the double main valve, the restricted by-pass around the said valve, whereby the water is allowed to act upon both faces of the valve, the diaphragm exposed on one face to the light air-pressure of the distributing-pipe and on the other side to the atmospheric pressure, the waste-valve closing the waste-passage from one side of the main valve, the said waste-valve being normally held closed against the water-pressure by the diaphragm, and the said waste-valve being adapted to be held in its open position by the main valve when the latter is fully open.

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Witnesses:
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B. W. DAWLEY.