No. 791,790. PATENTED JUNE 6, 1905.

J. HUNT.

VALVE FOR AUTOMATIC FIRE EXTINGUISHERS.

APPLICATION FILED JAN. 30, 1904. RENEWED APR. 24, 1905.

2 SHEETS—SHEET 1.

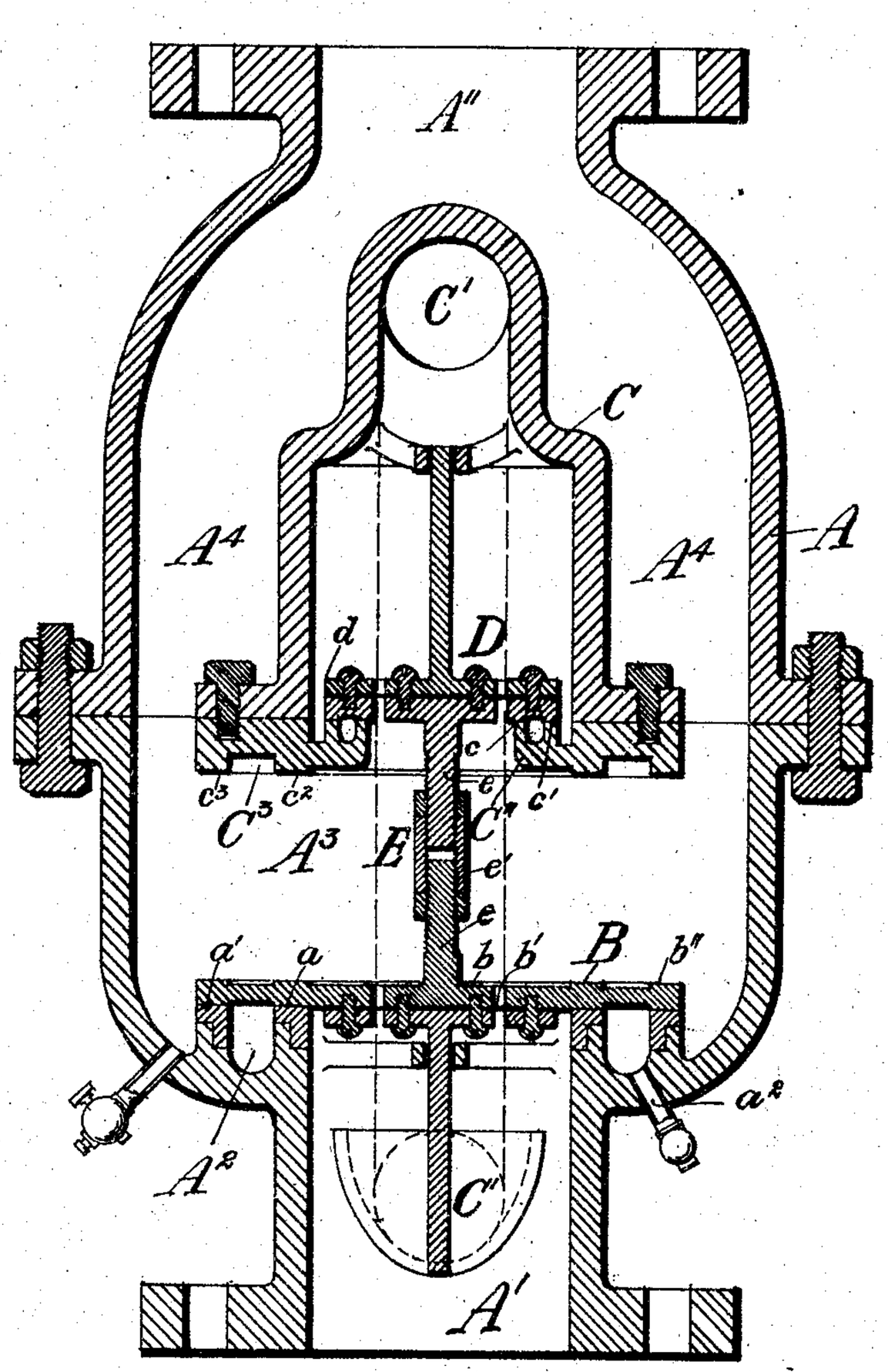

Fig. 1.

Witnesses: Reuben Q. Brown
Paul Hufford.

Inventor:
James Hunt
By L. W. Hopkins
His Atty

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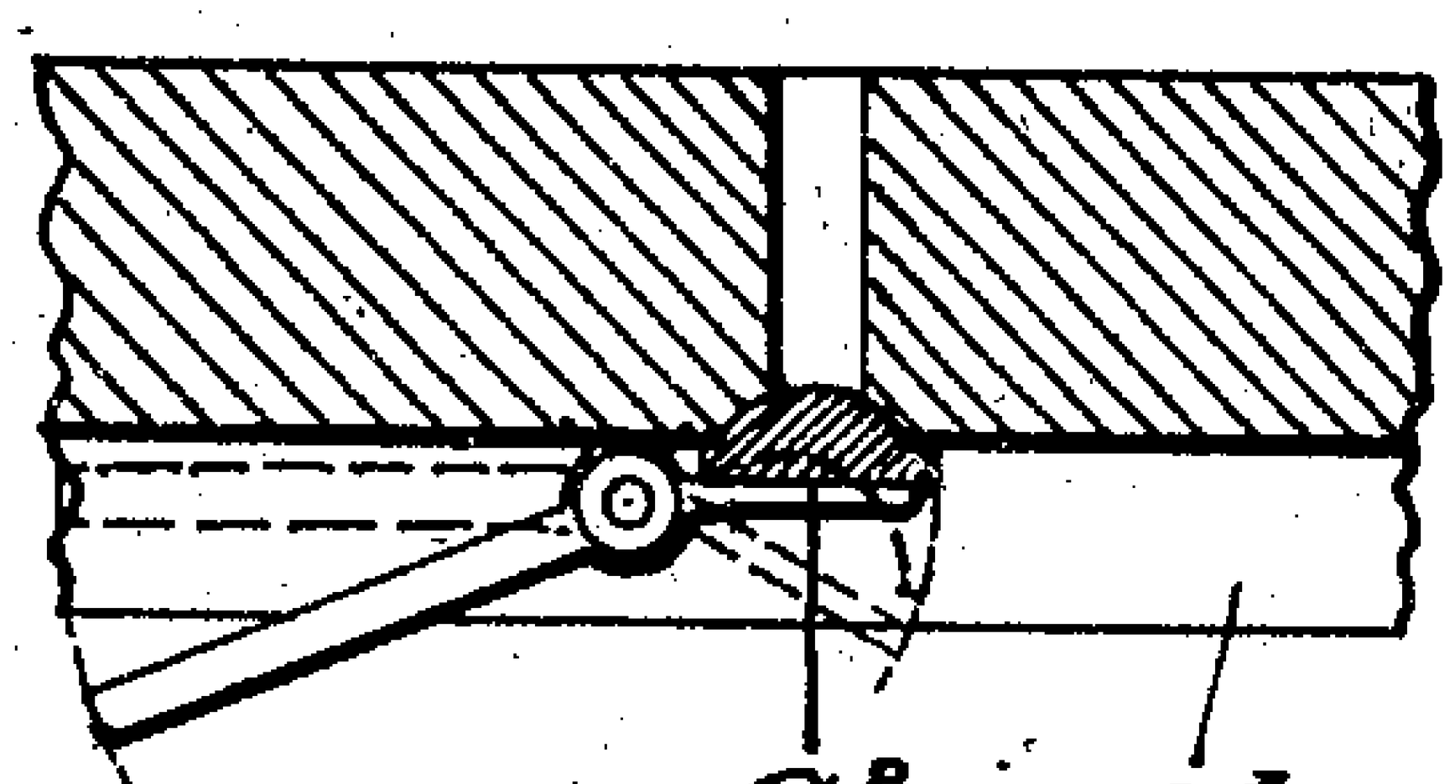

Fig. 3.

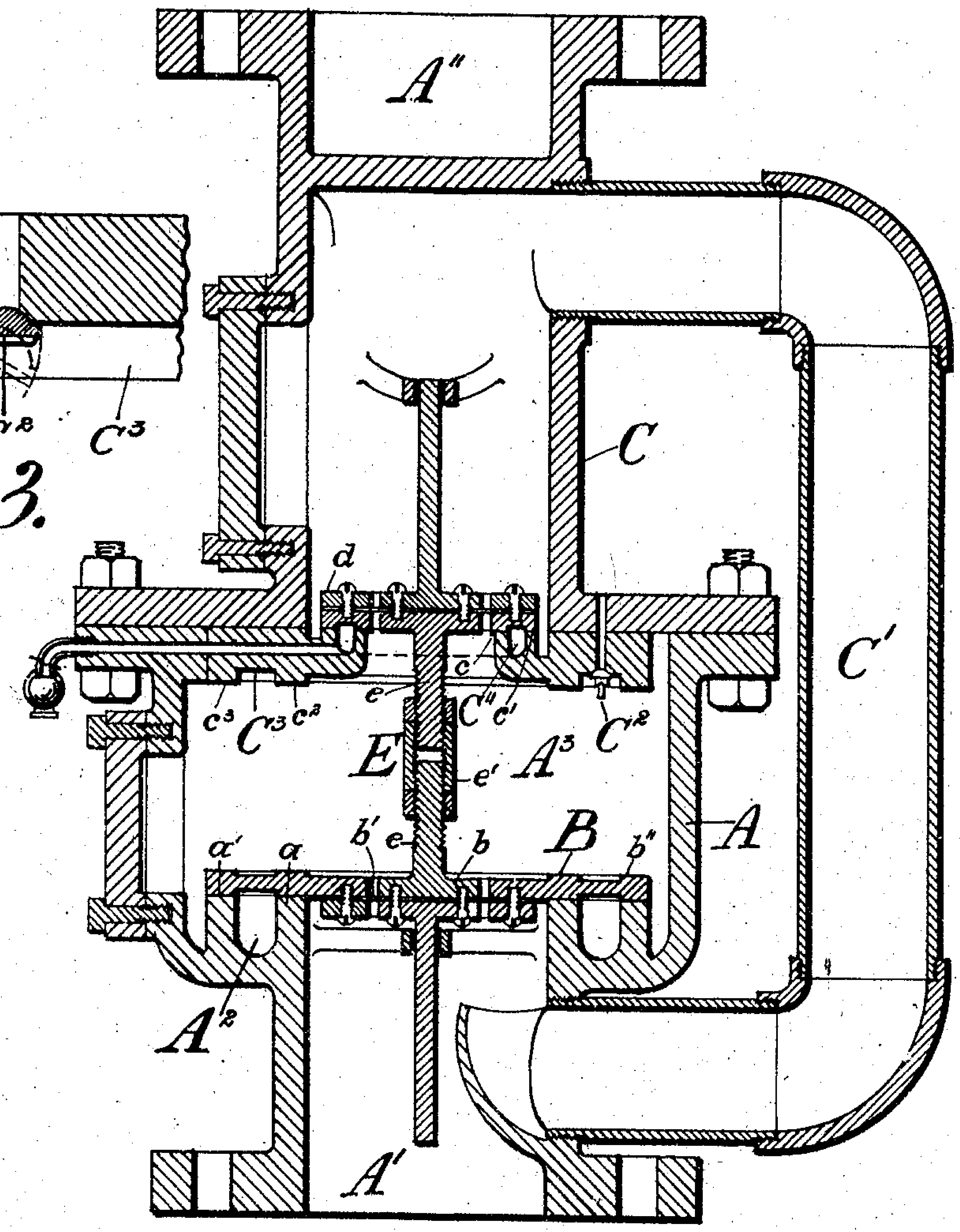

Fig. 2.

Witnesses: Reuben Q. Brown
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Inventor.
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No. 791,790. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

JARVIS HUNT, OF CHICAGO, ILLINOIS, ASSIGNOR TO PHOENIX FIRE EXTINGUISHER CO., OF CHICAGO, ILLINOIS, A CORPORATION OF NEW JERSEY.

VALVE FOR AUTOMATIC FIRE-EXTINGUISHERS.

SPECIFICATION forming part of Letters Patent No. 791,790, dated June 6, 1905.

Application filed January 30, 1904. Renewed April 24, 1905. Serial No. 257,098.

To all whom it may concern:

Be it known that I, JARVIS HUNT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Valves for Automatic Fire-Extinguishers, of which the following is a specification.

The present invention relates to what is known as the "main valve" of a dry-pipe automatic fire-extinguishing system. The general construction and mode of operation of such a system are well understood and need not be set forth at length in this specification.

Broadly stated, the object of the invention is to provide a valve of simple construction and one which shall at the same time have a high efficiency and be free from all liability to failure when once it is called into action.

More particularly stated, the objects of the invention are to provide a valve, first, that is sure to operate and admit water to the system upon a reduction of the air-pressure therein to a predetermined point; second, that when once unseated will be held unseated as surely and as positively as it was held seated; third, that cannot possibly become "columned," and, fourth, that reduces the injurious effect of "water-hammer" to a minimum.

The accomplishing of the first-stated object is due to the general construction of the valve device, as hereinafter fully described.

I accomplish the second-stated object by constructing the main water-valve or cut-off with two faces presented in opposite directions—one upward and the other downward—and providing for each of these faces a seat of such construction that whether the valve contacts with the one or the other the pressure upon it will hold it seated. In other words, the main water-valve has exposed differential areas so proportioned and related that while closed and under normal conditions it will be held closed by the combined pressure of the air and water within the system and when once fully opened it will with equal certainty be held open, so as to prevent its reseating.

The accomplishing of the third-stated object is due in a large measure to the conditions last above suggested, since it is apparent that the main water-valve cannot possibly become columned if when once fully unseated it is prevented from reseating. The system then becomes a "wet-pipe" system.

I accomplish the fourth-stated object by exposing oppositely-presented surfaces of differential valves or cut-offs to the pressure of the water in the main or supply pipe, so that the hammer in one direction opposes and balances or approximately balances the hammer in the opposite direction, leaving to the pressure of the air in the system only the duty of overcoming the preponderance or differential of the pressure of the water on the valves.

It may here be stated that the use of concentric valve-seats with intermediate chambers maintained at low or atmospheric pressure conduces to the efficiency of the improved valve, although I am aware that such chambers, broadly considered, are not new. I believe, however, that one of my proposed uses of such a chamber is absolutely new—that is to say, I believe that I am the first to suggest the use of a low-pressure chamber so arranged as to give the water-pressure against the main water-valve an advantage and enable it to hold said valve open when once unseated, and thus absolutely and positively prevent the columning when once the valve fully is unseated.

The invention consists in the features of novelty that are hereinafter described with reference to the accompanying drawings, which are made a part of this specification, and in which—

Figures 1 and 2 are vertical central sections of a valve embodying the invention, the cutting planes being at right angles to each other. Fig. 3 is an enlarged detail of a relief-valve.

The construction of the casing is immaterial further than that it shall have the features necessary for the carrying out of the invention as herein defined.

The outer shell A may be formed in two parts flanged and bolted together at about mid-length. It has an inlet A′, adapted for communication with a street main or other

source of water-supply, and an outlet A″, adapted for communication with the riser of a sprinkler system equipped in customary manner with sprinkler-heads. The inlet A′ is surrounded by two concentric annular valve-seats *a* and *a′*, and intermediate of these valve-seats is a chamber A^2, which is maintained at low or atmospheric pressure. As shown, this chamber communicates, through a drain-pipe a^2, with the atmosphere, and this drain-pipe is provided with a delicate valve of customary construction (shown in elevation) which will seat when subjected to any considerable pressure, but which will remain unseated under atmospheric pressure and thereby maintain the chamber A^2 at atmospheric pressure.

The main water-valve is shown at B. It blanks the inlet A′ and overlaps the valve-seat *a*, the low-pressure chamber A^2, and the outer annular valve-seat *a′*. It consists of a central disk *b*, a flexible annular diaphragm *b′*, and a surrounding ring or annulus *b″*, which is ground to adapt it the valve-seats *a* and *a′* and which is connected to the disk *b* by means of the flexible annular diaphragm *b′*. The manner of constructing and connecting these parts is immaterial further than that the valve as a whole should be flexible to allow for inequalities in expansion and contraction and perform certain functions hereinafter described. The valve B (constructed as above or otherwise) is the main water-valve or cut-off. It is disposed in a chamber A^3 of the casing, and this chamber is in constant open communication with the distributing-pipes of the system through passages A^4, which lead directly from the chamber A^3.

Within the casing is a part C, that may properly be called a "dome" or a "chamber" or any other of a number of appropriate names; but for the sake of distinction it will hereinafter be called a "dome." It is connected by a by-pass C′ with the inlet A′, so that its interior is maintained full of water at the same pressure as that in the inlet A′ or the main. The bottom of this dome communicates by a port or opening with the chamber A^3, and this port is surrounded by two concentric valve-seats *c* and *c′*, between which is a low-pressure chamber C″, open to atmosphere. This chamber is preferably valved similarly to the chamber A^2. The port between the dome C and chamber A^3 is controlled by a valve D, which in all respects is constructed similarly to the valve B, excepting that in its over-all dimensions it is smaller. The valves B and D are connected by a rigid stem E, which preferably consists of three members—to wit, two stems *e*, projecting from the central disks, respectively, and provided with right and left threads and a turnbuckle or connecting-sleeve *e′*, correspondingly threaded. No novelty is claimed for this valve-stem construction, and a fuller description is therefore not necessary.

The areas of the valves B and D as a whole are differential—that is to say, the area of the valve B exposed to the pressure of the water in the inlet A′ (under normal conditions) exceeds the area of the valve D exposed to the same pressure in the dome C. Hence, water-pressure only being considered, there is a constant tendency to unseat the valves B and D and admit water to the system; but as a resistance to this tendency, due to the preponderance of water-pressure upward upon the valve B, the preponderance of air-pressure downward upon the valve B must be taken into consideration. A differential is apparent from an inspection of the drawings. The precise ratio of this differential need not be stated and, furthermore, will vary with different conditions in different situations and must be left to the discretion of the builder. Suffice it to say that a differential is fairly indicated in the drawings and suggested in the foregoing description, and the rest must be left to the skill and ordinary knowledge of the craft. It will be observed, however, that when the main valve B fully unseats it will be forced upward until it comes to concentric annular seats c^2 c^3, with an annular low-pressure chamber C^3 between them. This chamber is normally closed by a valve C^2, which prevents leakage from the system, but which upon the upward impact of the valve B unseats and admits atmospheric pressure to the chamber C^3. In this event the pressure of the water against the under side of the valve B will hold it up. Thus it is columned unseated rather than seated. Another factor tending to unseat the valves B and D is the suction produced by the water rushing past the lower end of the by-pass C′. This is designed to create a suction which will tend to exhaust the water from the dome C, with a consequent tendency to lift the valve D from its seat and when once unseated thereafter hold it unseated. To this end the lower end of the by-pass and the inlet A′ are so proportioned and arranged as to act upon the principle of an ordinary injector, (or ejector.) The flexibility of the valves B and D, due to the diaphragms incorporated in them, will fully compensate for inaccuracies in the distance apart of their respective seats and inequalities in expansion and contraction of the several parts of the valve device as a whole.

Preferably the top side of the valve B is provided with flexible seating-surfaces for contact with the concentric annular seats c^2 and c^3.

Another feature of this valve is that in addition to the pressure of the water against the under side of the main water-valve tending first to unseat it and then to hold it unseated and in contact with the annular seats c^2 and c^3 the flow of the water past the lower end of the by-pass C′ produces a suction that augments both of these actions—*i. e.*, the unseating of the valve and holding it unseated. It is manifest that with the parts arranged as

shown a current of water moving swiftly past the lower end of the by-pass will act upon the principle of an ejector and exhaust the water from the dome C. This will in turn act with a suction upon the top of the valve D and tend to unseat the two valves. Furthermore, when fully open and the valve B is upon the seats c^2 and c^3 this same suction will tend to hold it there. These things will of course depend upon the velocity with which the water passes the lower end of the by-pass.

The passage between the annular low-pressure chamber C^3 and the atmosphere is controlled by a valve C^2, which is preferably so constructed and arranged that it is tripped automatically by the valve B as the latter comes to its seats c^2 c^3.

Certain novel features that are herein shown and described are not herein claimed, but are claimed in my application of even date herewith, bearing Serial No. 191,317. Generically stated, the novel features here referred to relate to the combination of a casing having a chamber and provided with two ports opening thereinto for the admission of water and a port opening therefrom for the escape of water to the system, two valves for controlling the water-inlet ports, one of said valves seating with and the other against the water-pressure, intervening mechanism whereby the valves oppose each other with a counterbalancing effect, the preponderance of water-pressure being in favor of the valve seating against the water-pressure, and means controlled by the pressure in the system for overcoming said preponderance of water-pressure and holding the valves firmly seated, whereby when the pressure in the system is reduced the pressure of the water will automatically unseat the valves.

What I claim as new is—

1. In a device of the class described, the combination with a casing having an inlet for water, a chamber in communication with the system into which said inlet opens, a valve for controlling said inlet and concentric annular valve-seats for receiving the valve when open, the space bounded by the valve-seats being in communication with the atmosphere through a valved opening, substantially as described.

2. In a device of the class described, the combination with a casing having an inlet for water, a valve for controlling said inlet, a chamber containing said valve, and in communication with the system, concentric annular valve-seats adapted to receive the valve when open, and means for maintaining low pressure between the annular valve-seats when the valve is seated upon them, substantially as described.

3. In a device of the class described, the combination with a casing having a chamber communicating with the system and an inlet opening thereinto, of a valve for controlling said inlet, said valve having differential areas exposed to the water in the inlet and the air in the system, a seat for receiving said valve when open, said seat being of greater area than the inlet, and means for maintaining low pressure within the boundary of said seat, when the valve is seated thereon, whereby the pressure in the system holds the valve open and upon said seat, substantially as described.

4. In a device of the class described, the combination with the casing having an air-chamber in communication with the system, a water-inlet opening into said air-chamber, annular valve-seats surrounding said inlet, a low-pressure chamber intermediate of said valve-seats, a chamber in communication with the water-supply and having a port opening into the air-chamber, annular valve-seats surrounding said port, and a low-pressure chamber intermediate of said valve-seats, of connected differential valves adapted to said seats, and exposed to both the water-pressure and the air-pressure, substantially as described.

5. In a device of the class described, the combination with a casing having an air-chamber communicating with the system, a water-inlet opening thereinto, a water-chamber having a port opening into the air-chamber, and a by-pass connecting the water-chamber with the water-supply, of a main water-valve for controlling the inlet, and having differential areas exposed to the water and air pressure, a smaller valve for controlling said port and having differential areas exposed to the water and air pressure and a stem connecting the two valves, the casing being provided also with annular valve-seats surrounding the port and adapted to receive the main water-valve when opened, and with a valved low-pressure chamber between said seats, substantially as described.

6. In a device of the class described, the combination with a casing having an air-chamber, a water-inlet opening thereinto, and a water-chamber having a port communicating with said air-chamber, of a by-pass connecting said water-chamber with the waterway and arranged to act as an ejector for exhausting water from said water-chamber, and connected valves for normally closing said water-inlet and port, the valve for controlling said inlet being also adapted, when open, to close said port, substantially as described.

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