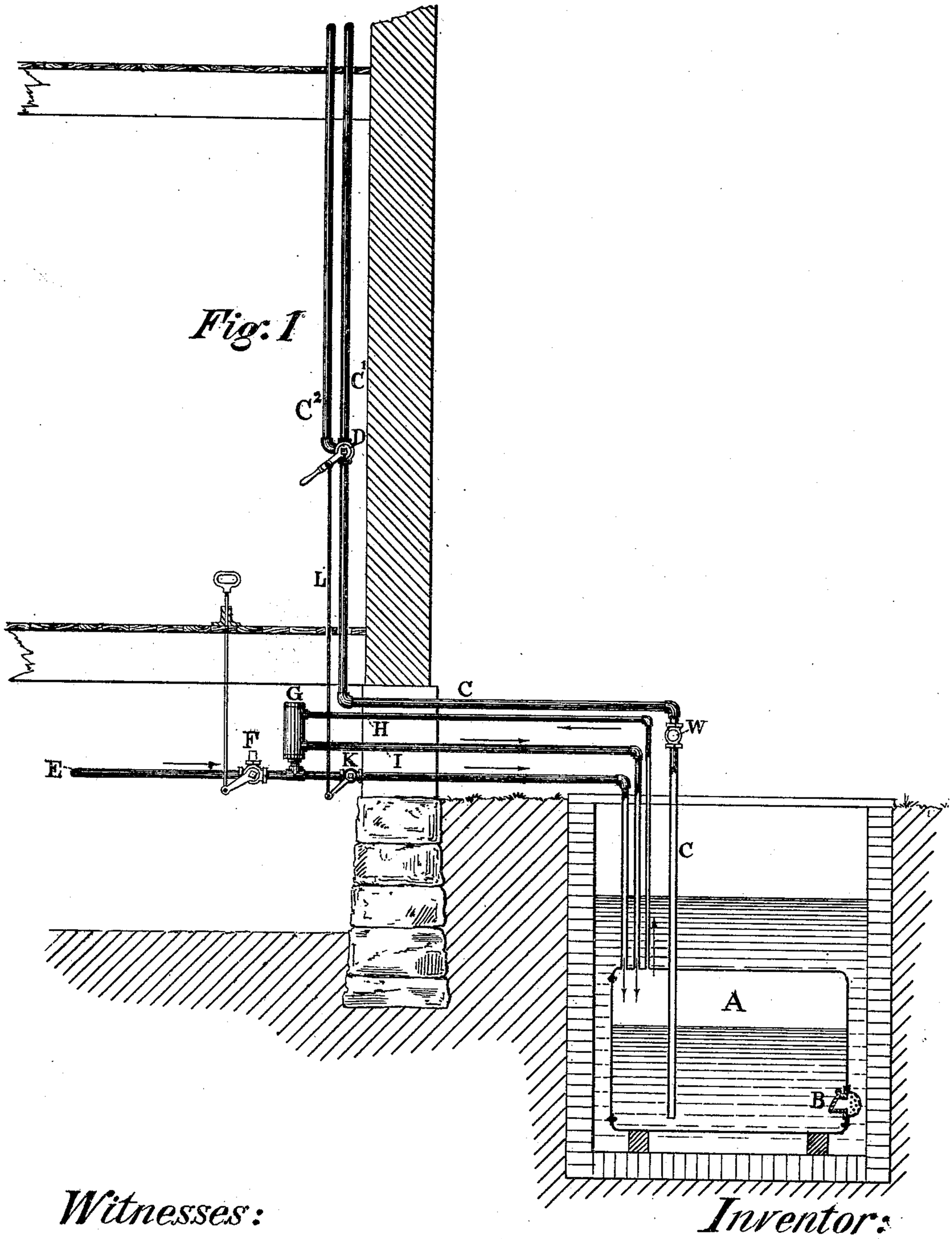
2 Sheets—Sheet 1.

W. E. PRALL.

PNEUMATIC WATER SUPPLY SYSTEM FOR BUILDINGS.

No. 172,488. Patented Jan. 18, 1876.

Fig: 1



Witnesses:

David A. Burr
S. B. Jones

Inventor:

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2 Sheets—Sheet 2.

W. E. PRALL.

PNEUMATIC WATER SUPPLY SYSTEM FOR BUILDINGS.

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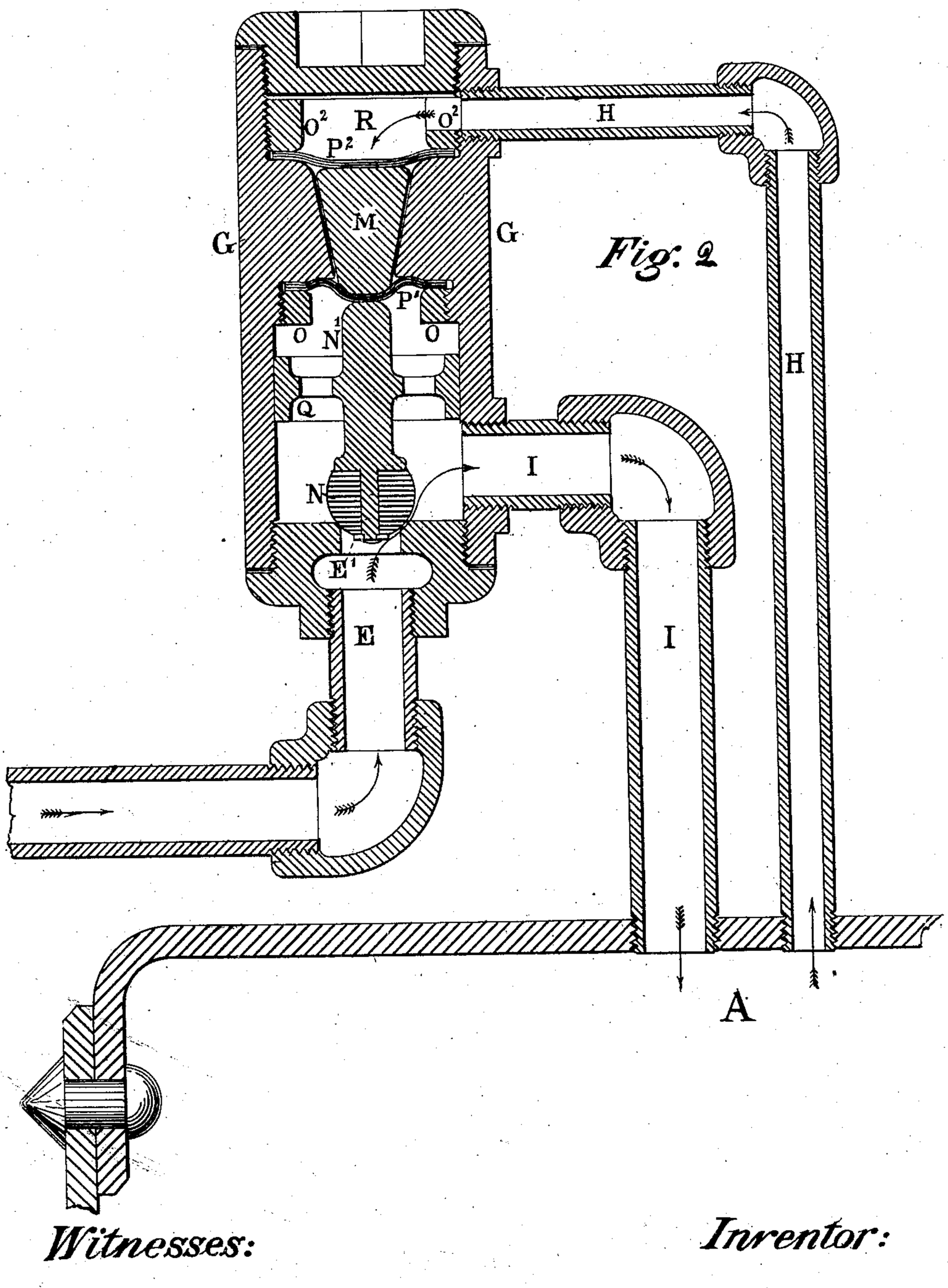

Fig: 2

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UNITED STATES PATENT OFFICE.

WILLIAM E. PRALL, OF WASHINGTON, D. C., ASSIGNOR TO PRALL RAILWAY SIGNAL AND TELEGRAPH COMPANY, OF NEW YORK, N. Y.

IMPROVEMENT IN PNEUMATIC WATER-SUPPLY SYSTEMS FOR BUILDINGS.

Specification forming part of Letters Patent No. **172,488**, dated January 18, 1876; application filed November 21, 1874.

CASE E.

To all whom it may concern:

Be it known that I, WILLIAM E. PRALL, of Washington city, in the District of Columbia, have invented an Improved Pneumatic Water-Supply System for Buildings, of which the following is a specification:

My invention relates to an improved method of supplying public and private buildings, fountains, &c., with water out of wells, cisterns, or local reservoirs by pneumatic pressure derived from mains or reservoirs charged with compressed air by suitable machinery. It consists of a novel combination and arrangement of one or more water-reservoirs with an air-supply pipe, an automatic pressure-regulator, and a system of distributing-pipes extending from the reservoirs into and about the building to be supplied therefrom.

In the accompanying drawings, Figure 1 is a sectional view illustrating my invention as applied to the water-supply of a building; and Fig. 2 a similar view of an improved form of pressure-regulator to be used therewith.

A, Fig. 1, is an air-tight tank of suitable size to be immersed in the well, cistern, or stream from which a supply of water is to be drawn. B is a valve arranged at or near the bottom of the tank to open inwardly, so that the water may readily and naturally flow into the tank by gravitation, and thus automatically refill the same when emptied. C is a discharge-pipe opening into the tank at or near the bottom thereof, and extending thence to the house and grounds, if required. This pipe is fitted with a check-valve, W, and may be divided above the valve into two branches, C^1 and C^2, the communication between the main pipe C and said branches being controlled by means of a three-way cock, D, whereby the communication with one branch is cut off when opened with the other, and vice versa. One of these branch pipes, C^1, is carried directly to all points where a high pressure of water may be required for use in case of fire, &c. The second branch, C^2, is used as the ordinary service-pipe, and connects with the cocks and hydrants commonly used about the house, and in which a high pressure or head of water is not required. E is a pipe connecting the water-tank A directly with a reservoir or main pipe kept constantly charged with compressed air at a high pressure; and F is an exhaust vent or opening in said pipe E, which is closed by a three-way cock so arranged as that when the admission of air to the tank from the pipe E is cut off, communication will be established between the tank and the open exhaust-vent to allow the air in the tank to escape as it is displaced by the water entering it. G is the outer casing of an improved automatic pressure-regulator, which is constructed as hereinafter described; and H I are air-pipes connecting the same with the tank A. K is a second cock placed in the pipe E to cut off at pleasure the direct admission of air to the tank through said pipe, and to divert it through the pressure-regulator G; and L is a rod or chain connecting the lever of the cock K with the lever operating the three-way valve or cock D above, so that the communication of the main delivery-pipe C with the ordinary low-pressure service-pipe C^1 through the cock D shall be closed, and that with the high-pressure pipe C^2 be opened when the cock K is opened, and vice versa.

The pressure-regulator G (see Fig. 2,) consists of a conical piece, M, playing loosely within a conical chamber inclosed by the casing G, and confined by diaphragms P^1 P^2, of rubber or other flexible yielding air-proof material. This loose piece M is so interposed between the diaphragms P^1 and P^2 in contact with both as to transmit the movement of the one to the other. These diaphragms are secured in place each by means of a ring or centrally-perforated piece, O or O^2, which is screwed down or otherwise fastened upon the edges of the diaphragm against or upon an offset or shoulder formed about the opening covered by the diaphragm, so as to fasten the latter with an air-tight joint. E′ is a port in the casing G, to which the main air-pipe E is connected. This port is formed opposite the minor diaphragm P^1, which covers the smaller opening into the central differential chamber of the device. A valve, N, is arranged to open and close the port E′, as shown in Fig. 2, its stem N′ being extended far enough to bear

against the minor diaphragm P^1, so that an outward movement thereof shall operate to close the valve. The valve is guided in its movements by means of an annular perforated bearing-piece encircling its stem and projecting therefrom, as shown in the drawing. I is a pipe connecting the space or chamber between the port E′ and minor diaphragm P^1 with the water-tank A, through which the air admitted from the pipe E by the valve controlling the port E′ is conducted to said tank A.

An inclosed air-tight chamber, R, is formed over the enlarged or major diaphragm P^2, and communication is established between said chamber R and the water-tank A by means of a pipe, H.

As the office of the loose piece N′ is merely to transmit the movement of the one diaphragm to the other, its form is immaterial, provided its ends afford good bearing and support for the diaphragms. It may, in fact, be made in separate sections.

An outward vent may be pierced to communicate with the central differential chamber inclosed by the diaphragms, in order to guard against an accumulation of pressure in said chamber by means of a leak of air therewith under pressure.

The automatic operation of the valve controlling the port E′ in governing and regulating the admission of air, or of any gas or fluid, from the pipe E to the tank A, and in determining and maintaining a given pressure thereof in said tank, is determined by the relative proportion of the areas of the two ends of the central differential chamber, covered, respectively, by the major and minor diaphragms P^1 and P^2. If, for instance, the areas of the two ends or openings into the differential chamber be in the proportion of two to one, the pressure of the air admitted against the minor diaphragm P^1, covering the opening of smaller area, will be overcome, and the diaphragm forced outward to close the valve so soon as the pressure in the chamber R upon the major diaphragm P^2, covering the opening of larger area, becomes more than one-half as great. In other words, if the area of the opening covered by the major diaphragm be twice as large as that of the opening covered by the minor diaphragm, and the pressure of air in the pipe E be twenty pounds to the square inch, the valve will be closed so soon as the pressure in the pipe I and tank A (and, consequently, in the chamber R, because of the connecting-pipe H) shall become equal to ten pounds to the inch, but the valve will instantly open so soon as the pressure in the chamber R become less than ten pounds, or one-half less than that in the pipe, and, consequently, upon the surface of the valve covering its port E′.

In the operation of my improved apparatus, as above described, if, when the tank A is filled with water, the main cock F be opened and the pressure-cock K closed, compressed air will be admitted to the tank A, and such constant pressure be maintained upon the water therein as shall cause a gentle flow of water at all the cocks and hydrants having connection with the distributing-pipe C^2, the degree of pressure being so determined by an adjustment of the pressure-regulator G, as described, as that it will produce a proper flow of water without any unnecessary waste of air from excessive pressure. When, however, in case of fire, or for use in watering a garden, or other extraordinary occasions, a very great quantity of water or high pressure is desired, the full pressure of air in the main E may be instantly turned on, and, at the same time, the ordinary low-pressure pipes be protected from this great strain, by simply turning the cock D, whereby the high-pressure cock K will be opened, and the connection of the main water-pipe C be changed from the ordinary service-pipe C^2 to the high-pressure pipe C^1.

When the tank A has been emptied of its contents, the three-way cock F must be turned so as to cut off the admission of air from the pipe E, and permit an escape of the air in the tank A through the exhaust-opening in said cock F, whereupon the tank will automatically fill by an inflow of the water surrounding it, through the valve B.

I contemplate producing an automatic movement of the cock F when the tank A is emptied, and again when it has filled, by combining with said cock a float, or its equivalent, arranged in the tank, to be operated by the rise and fall of the water therein.

I contemplate, as a part of my system, connecting the high-pressure pipe C^2 directly with a second self-filling water-tank, entirely independent of the low-pressure tank A and pipes C^1, and carrying the high-pressure pipe E directly from the cock K to said second tank, so that when said cock K is opened the high pressure will be exerted in the second tank and its connected pipes only, without cutting off or affecting the supply and flow of water from the tank A through the low-pressure service-pipes.

I contemplate, also, duplicating the tanks and regulators in connection with the cock F, so that when the supply of air is cut off from one tank to allow it to fill, it shall be turned into the second, so that a flow of water shall be produced therefrom into the common distributing-pipes, and vice-versa.

I claim as my invention—

One or more self-filling water-tanks, A, and a system of delivery-pipes, C^1 C^2, connected therewith, when combined with a high-pressure air-supply pipe, E, pressure-regulating device G, low-pressure air-supply pipe I, and high-pressure cut-off cock, K, substantially as and for the purpose herein set forth.

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