

F. W. EAMES.
Cut-offs for Fire-Plug Systems.

No. 135,976.

Patented Feb. 18, 1873.

Fig. 1.

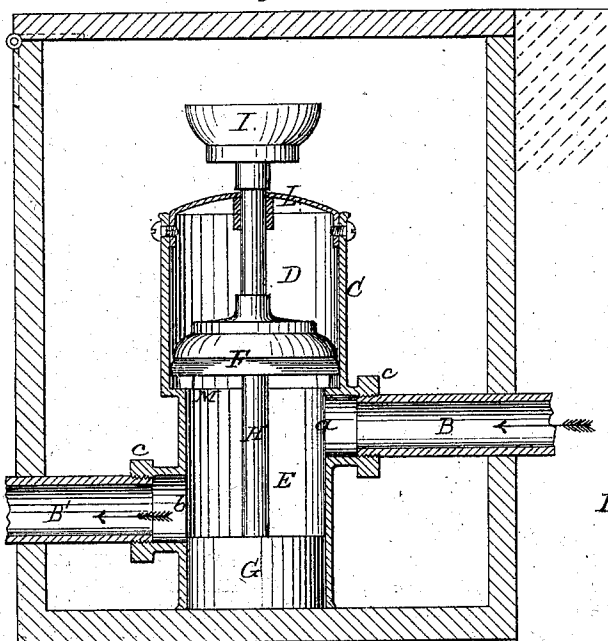
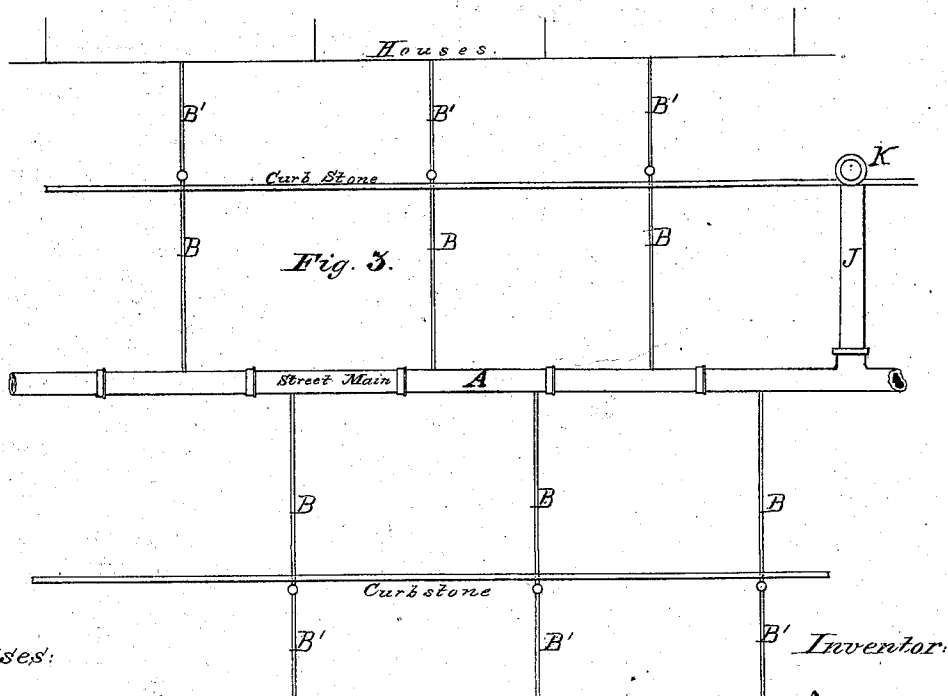
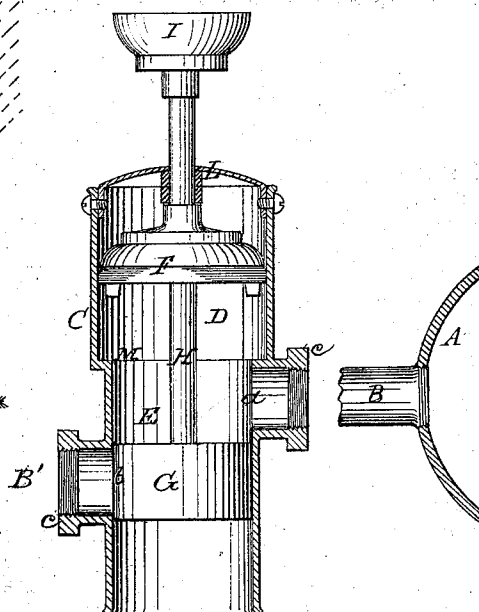


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN CUT-OFFS FOR FIRE-PLUG SYSTEMS.

Specification forming part of Letters Patent No. **135,976**, dated February 18, 1873.

To all whom it may concern:

Be it known that I, FREDERICK W. EAMES, of Grand Rapids, in the county of Kent and State of Michigan, have invented a new and useful Improvement, being an Automatic Water Cut-Off for the Service-Pipes of Street-Mains in Extinguishing Fires, of which the following is a specification:

My invention has for its object the utilization of the full pressure of the water in the street-mains under what is known as the Holly system of fire-protection and water-supply for towns and cities. In such system it is found impracticable to concentrate the pressure from the pumping-works within the street-mains so as to obtain the full benefit of such pressure through the public hydrants, by reason of the loss of pressure through the service-pipes, which are more or less open throughout the place. In addition to this, it is found necessary that the service or house pipes should be made sufficiently strong to withstand the increased fire-pressure, and thus increase the expense, to avoid the liability of the service-pipes to burst. My invention is designed to remedy these objections and disadvantages, and to render the high-pressure system for water-mains not only more efficient for the extinguishment of fires, but of less expense in maintaining the system. To this end my invention consists in the combination and arrangement of an automatic-valve cut-off device with the service-pipe of a street water-main, the said automatic cut-off device being located between the street-main and the point of use of the water, constituting a part of the service-pipe and operating to maintain an open communication between the main and service pipe under the usual pressure for daily supply, but to cut off such communication whenever the pressure is increased upon an alarm of fire, and thereby concentrate the full force of the pressure for utilization through the public hydrants; and in the construction and arrangement of the several parts which constitute my new automatic cut-off device for the service-pipes of street water-mains.

In the accompanying drawing, Figure 1 represents a vertical section of my new automatic cut-off device for street-mains, the communication between the main and service pipe being shown as open. Fig. 2 represents a similar

section, showing the eduction-opening of the service-pipe closed to cut off the communication with the street-main; and Fig. 3 represents a plan, showing the street-main and the service-pipes to which my invention is applied, and also a hydrant-connection with the main.

The water-main A is laid in the street, and leads to the supply or water works, which are provided with suitable pumping-engines and machinery to increase the pressure in the main, so as to give to the latter, through the public hydrants, the capacity of a fire-engine. The service-pipes B enter the premises to be supplied with water, and are also laid beneath the surface of the street. Hitherto these service-pipes have been provided with stop-cocks, operated by hand to cut off their communication with the main when desired for repairs, or for non-payment of water-rent; but practically the communication of the main with the service-pipes has been perpetual, so that the pressure within the street-main must be distributed throughout the service-pipes of every place supplied with water. In proportion, therefore, to the number of these service-pipes open throughout the city, so would be the diminution of the pressure within the street-main, and a corresponding loss of force at the fire-plugs, and any increase of the pressure from the water-works in case of fire would be very materially diminished and lost through the open service-pipes, and to a very serious extent destroy the efficiency of the system of hydrants for the extinguishment of fires. This my invention effectually obviates, and the cut-off valve, which I have constructed for the purpose, is attached to the service-pipe B, between the street-main A and the premises supplied. I prefer, however, to locate it at the curb-stone beneath the pavement, at which point the service-pipe B is cut and forms two branches, B and B', each of which is connected to a piston-chamber, C, and forms an induction-opening, *a*, and an eduction-opening, *b*, therein, the junction of which service-branches B B' with the chamber-shell C, being on opposite sides thereof and at different heights, the chamber-shell being provided with coupling-necks *c*, into which the service-pipes B B' are secured in any suitable manner. In the example shown, this chamber is formed by a cast shell or section, C, about six inches long,

and is placed in a vertical position with respect to the service-pipe, but may be arranged in any other suitable way, so long as it constitutes a part of the service-pipe of a street-main. It is open at both ends, and has an upper larger and a lower smaller chamber, D and E, within which work pistons F and G, rigidly secured to the stem H. The two branches B B' of the service-pipe connect with the lower smaller chamber E. The smaller piston G works below the eduction-opening *b*, and is made sufficiently long to present a solid side surface to close the eduction-opening *b*, and thus serve as a valve as well as a piston to close said opening *b* whenever the piston G is raised up high enough to pass over it. The upper piston F is always above the induction-opening *a*, and the water from the street-main, therefore, always acts by pressure against its under side, so as to constantly tend to raise it and at the same time upon the upper side of the lower piston G, so as to constantly tend to depress it; but the upper piston F having a greater area than the lower one, would keep both pistons constantly raised, and the eduction-opening *b* constantly closed. To overcome this the valve-stem H is provided with a weight, I, or its equivalent, on its upper end, sufficient to more than compensate for the difference in the area of the pistons, and the usual pressure of the water from the main, upon such difference of area, and thereby always keep the pistons down against the pressure required for daily supply. When, however, this pressure is increased in the main A from the water-works, it acts upon the increased area of the upper piston F, with a force to overcome the weight I upon the valve-stem H, and cause the pistons to rise under such pressure until the lower piston G closes the eduction side opening *b* in the shell C, and automatically effects the cut-off of the flow of water into the service-pipe. This cut-off will remain so long as the increased pressure remains; and as each service-pipe is provided with one of these automatic cut-off devices, the full force of the pressure within the street-main A will be confined only to such connections J as still remain open, and as these are designed to be only with the fire-plugs K, Fig. 3, the entire force of the pressure will be expended through them; and thus by my invention not only a greater supply of water is rendered available, but a greater pressure is obtained, and consequently the water thrown with a greater force and to a greater distance, which are matters of great importance in extinguishing fires. During the cut-off the chamber in the shell between the pistons is closed against the flow of the water there-through, but the highest or induction-opening *a* always remaining open by the pressure from the street-main, the cut-off will remain until the pressure decreases sufficiently to allow the weight I, upon the stem, to cause the pistons to descend and open the pipe B'. This is automatically effected, as soon as the fire is out,

by the diminution of the pressure at the pumping-works; the cut-off and supply are therefore rendered automatic by the pressure of the water in the street-mains. The lower end of the piston-shell C is open, for the purpose of allowing the free escape of any water which may pass the piston-valve G by leakage or otherwise; the upper end of said shell being also open to allow of the escape of any water which may pass upward between the sides of the piston and shell, and to allow the pistons to be easily removed and replaced within the shell by simply removing and replacing a bow, L, secured and crossing the upper end of the shell, and serving as a bearing and guide for the upper end of the piston-stem. The piston-stem H projects above the bow L, and is provided with a cup, I, or any suitable means for weighting it to overcome the pressure of the water for daily consumption.

The device is of simple construction, and can be applied to the service-pipes already laid by severing them and attaching their severed ends directly to the projecting-through connections *c* of the shell C, in any suitable way. In laying new pipe the automatic cut-off device is put in at the same time. The induction-branch B of the service-pipe enters the shell at a point above that of the eduction-branch B', and when these branches are open the water passes through the shell between the pistons. Under the increased pressure of the water the pistons would be liable to be forced up out of the tube, but the top-bow L forms a stop to the stem H to prevent such occurrence. The increased area of the upper chamber D forms an annular projection, M, by its junction with the lower chamber E, and a stop or rest thereby for the upper piston F, and thus prevent the lower piston from descending too much below the eduction-opening *b*. The device, when attached at the pavement curb, is inclosed within a box, so that it may be easily got at for repairs or examination. It may be, however, located any where within the premises.

It will be observed that the lower piston G is made sufficiently long to completely cover the eduction-opening *b* of the service-pipe when the pistons are raised, thereby not only cutting off the connection from the street-main A but sealing the water which is already in the service-pipe B', and preventing its escape below the piston G, and leaving the pipe B' empty, because, should this occur, the service-pipe B' would be subjected to a powerful strain by reason of suddenly filling the empty pipe under pressure when the pistons should descend and open the through way.

Having described my invention, I claim—

1. In combination with a street water-main, A, and the service-pipes B B' thereof, an automatic cut-off device, arranged to constitute a part of, and forming a through junction with, the service-pipe between the street main and the point of use for the water, essentially as and for the purpose described.

2. In an automatic water cut-off for street-mains, the combination thereof with a shell, C, having an upper and a lower chamber, D E, of unequal diameters, and an upper and a lower piston, F G, operating in connection with the induction and eduction-pipes B B', arranged at different heights to cut off and open the connection of the service-pipe with the street-main.

3. In an automatic water cut-off for street-mains, the piston-shell C, open at both ends, and provided with a bow, L, to form a guide and stop to the ascent of the pistons, and also with an interior annular shoulder, M, to form a stop to limit the descent of the pistons, as described.

4. In an automatic water cut-off for street-mains, which operates by the pressure within the main, the combination of an upper and lower pressure-piston, F G, when the latter is made to serve also as a valve to open and close the service-pipe B', as described.

5. The solid piston-valve G, in combination

with the induction and eduction pipes B B', arranged one above the other on opposite sides of the piston-shell C, the upper piston being of greater area and working above the upper pipe B, as and for the purpose described.

6. The lower-valve piston G of an automatic water cut-off, of a length to entirely cover the eduction-opening, for the purpose of preventing the escape of the water already in the service-pipe when the latter is cut off from the street-main, as described.

7. The combination and arrangement of the open shell C, the pistons F G of different area, the weighted piston-stem H, the piston limit-stops L M, and the upper and lower branches B B' of the service-pipe of the street-main, the several parts being constructed, arranged, and operating substantially as described.

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Witnesses:

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