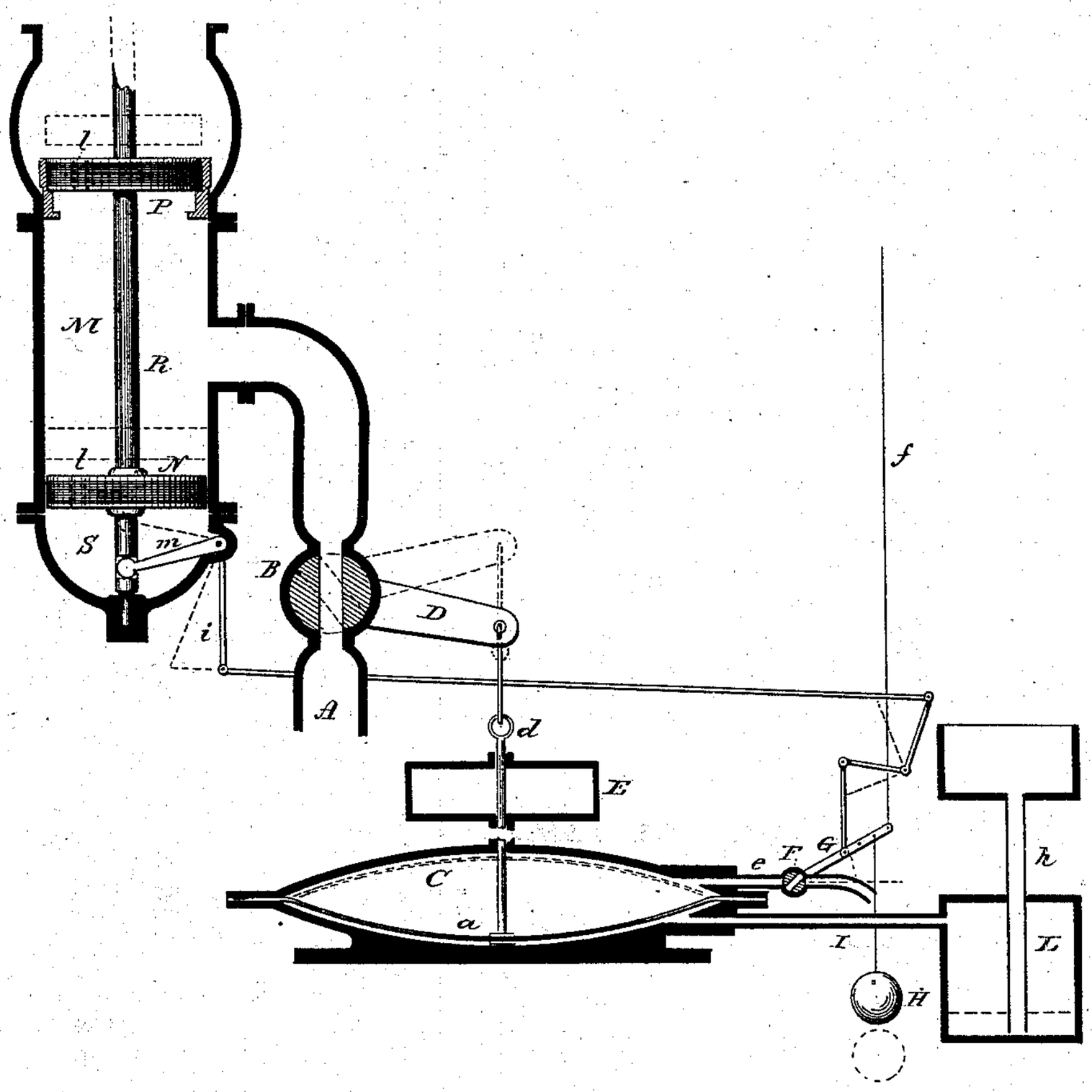
(No Model.)

J. W. BISHOP.

FIRE EXTINGUISHER.

No. 283,196. Patented Aug. 14, 1883.



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FIRE-EXTINGUISHER.

SPECIFICATION forming part of Letters Patent No. 283,196, dated August 14, 1883.

Application filed December 7, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. BISHOP, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Fire-Extinguishers; and I do hereby declare the following, when taken in connection with accompanying drawing and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawing constitutes part of this specification, and represents a vertical central section.

This invention relates to an improvement in that class of fire-extinguishing apparatus which consists in the arrangement of lines or systems of tubing around the various apartments to be protected, the tubes in connection with the water-supply, and with distributers opening from the tube into the apartment, the water held in suspense by a fusible or other device, which will be released should a fire occur in the apartment and raise the temperature to a sufficient extent to release the device which holds back the supply of water, and the water thus liberated will flow through the distributers and extinguish the fire. While this class of apparatus is extremely useful, and almost indispensable in manufactories and exposed apartments, a serious difficulty arises in its use because of the continued flow of water after the fire is extinguished. Except under extraordinary circumstances, the fire in an apartment will be extinguished in less than sixty seconds, and many times the fire occurs and is extinguished without creating an alarm; but the water will continue to flow, or, if an alarm be given, the water will continue to flow until some one has the presence of mind to shut it off.

The object of my invention is to combine with such a system of supply-pipes and distributers a device which will permit the flow of water for a certain predetermined length of time, and, when that time shall have expired, cut off the supply and prevent further flow.

In this system of extinguishing apparatus it is desirable that an alarm should be sounded whenever a fire occurs, and as such alarm can best be given by the starting of the flow of water, the alarm-giving device must be in a position to be acted upon by the water. As usually arranged, the lines of tubing for the protection of the apartment are in connection with the water-supply pipes for ordinary purposes. A serious difficulty occurs in the arrangement of the alarm-giving device in such pipes, for the sudden cutting off of the flow of water at one point will produce what is known as "water-hammer" throughout the pipes, and which many times gives such an impulse to the water in the pipes as to cause the alarm to be sounded.

The second object of my invention is to overcome this difficulty.

My invention consists, first, in combining with the valve or cock by which the water-way is opened to supply the water a mechanism held in suspense by a certain or predetermined quantity of fluid, the fluid confined by a device acted upon directly or indirectly by the fire or heat therefrom, which, when a fire occurs, will liberate the said fluid, and by such liberation permit it to escape, and by such escape permit the apparatus to cut off the supply of water; second, in the arrangement of two pistons of different area or diameters upon the same rod in a cylinder, between which pistons the inflowing water to the extinguishing-pipe enters, with a limited escape for the water through both pistons, whereby the concussion or water-hammer upon the water will be received between the two pistons, and with the greatest force upon the larger piston, and in an opposite direction to the natural flow of water, but so that when the flow of water beyond the pistons is opened the water will pass the piston of largest area into a chamber upon its opposite side, producing a pressure to force the piston in the direction of the flow of water, and so as to fully open the passage for the flow, and in such opening will sound the alarm, as more fully hereinafter described.

A represents the pipe through which the water flows to the system of tubes for fire-extinguishing purposes; B, a cock therein, normally standing open, so as to permit the flow of water to the said system of tubes.

C is a closed chamber, arranged in some convenient position, preferably near the cock B, or valve which controls the flow of water. This chamber is divided by a diaphragm, *a*,

said diaphragm free to move from top to bottom of the chamber, thus producing a chamber above or below the diaphragm, accordingly as the diaphragm is at the bottom or top of the chamber—a device common and well known. From this diaphragm a rod, *d*, extends upward, and is connected to the lever D of the cock B by any suitable connection, whereby the movement of the diaphragm up or down will correspondingly turn the lever and the plug of the cock to which it is attached.

Above the chamber C is a reservoir, E, for water or other suitable fluid, opening into the chamber C above the diaphragm. From the chamber C, above the diaphragm, is an escape-tube, *e*, in which is a cock, F, the plug of which is provided with a lever, G, the cock normally standing in closed position, as shown. From the lever G a cord, chain, or other suitable connection, *f*, leads to some point where it will be broken when a fire occurs. This may be to the various apartments, and, if a cord, so as to be burned by the fire occurring, or a chain connected by solder which will melt because of the fire, or to some part of the distributer which is moved when the fire occurs—that is to say, so that when the fire occurs the lever G will be free, and when so free the weight H, or any suitable device, will cause the plug of the cock to turn and open the chamber C above the diaphragm.

I is a tube opening to the chamber C below the diaphragm and from a reservoir, L, which should be of about the same capacity as that of the chamber C. From near the bottom of the reservoir L a tube, *h*, leads upward, but opens into the chamber L at its lower end. The chamber L is filled with water or other suitable fluid, and the tube *h* with mercury or any equivalent therefor.

The chamber C and the reservoir E are both filled with water, so as to force the diaphragm to the bottom of the chamber C, as shown, the column of mercury in the tube *h*, which bears upward upon the water in the reservoir L, tending to force it into the chamber C below. The diaphragm is graduated so as to support a column of water in the chamber C, say, to the level of the bottom of the reservoir E. Now suppose a fire to occur which liberates the lever G. The cock F is instantly opened, permitting the water to slowly escape from the chamber C, the water in the reservoir passing down into the chamber, holding the diaphragm down until it has reached the counterbalancing or level point of the mercury-column. Then the mercury begins to act upon the water in the reservoir L and force it through the tube I into the chamber C, below the diaphragm, the water above the diaphragm escaping through the tube *e* as the water enters below, and thus the diaphragm will be raised by the pressure of the mercury on the water until the diaphragm is arrested in its ascent, and in such rise of the diaphragm the rod *d* acts upon the cock B and turns it to its closed position. It will be observed that the diaphragm cannot move until the water in the reservoir E has escaped to bring the pressure of the water down to the pressure of the mercury; hence the flow through the cock B will continue until such time as the diaphragm begins its ascent; then, as the diaphragm continues its movement, the cock gradually turns until completely closed or flow of water stopped.

The escape of the contents of the reservoir E and chamber C is regulated by the cock F, and may be quicker or slower, accordingly as the cock F fully or partially opens, or according to the size of the opening produced by the cock. Therefore, by the adjustment of the cock F, the time at which the cock B shall be closed may be adjusted, it only being essential that the time shall be sufficient for extraordinary circumstances; or the capacity of the chamber E may be varied to regulate the time of the flow. By this device the flow of water through the distributing apparatus will be automatically cut off at the expiration of a certain predetermined time after the liberation of the water.

The lever G of the cock F may be connected to the alarm-lever *i*, as indicated, so that when the flow of water commences, and which flow operates the alarm, the closing apparatus will be operated, as before described. This is desirable in order to prevent a long flow of water. Should there be a burst in the pipes permitting an accidental flow of water, it will operate the alarm-lever, and thereby cause the apparatus to stop the flow, as in the case of fire, and generally this will be the better arrangement; but in case there is no alarm attachment, then the connection may be made, as by the chain or cord *f*, as before described. If one is used, however, it will be understood that the other is unnecessary.

In my improved method of operating the alarm-lever the inlet-pipe A opens into a cylinder, M, between two pistons, N and P, arranged therein upon a single rod, R, the piston P being toward the flow and the piston N in the opposite direction, the piston N of somewhat larger area than the piston P. The two pistons may fit loosely in the cylinder, or each provided with a small aperture, *l*, through them, and so that the water will flow through or beyond the piston P to fill the system of pipes, and also beyond the piston N to fill a chamber, S, on its opposite side. The pressure therefore stands alike on all sides of the two pistons. Should water-hammer occur, it will be received between the two pistons, and because it is greater on the piston N than on the piston P, owing to their differential areas, the tendency will be to throw the two pistons downward or away from the direction of the flow of water; but should the flow be opened beyond the piston, as in case of fire, then the pressure on the outflow side of the piston P is reduced, and the water under pressure entering between the two pis-

tons will force its way through the piston N into the chamber on its opposite side, and there create a pressure greater than on the opposite side of the piston P, and will cause the pistons to move in the direction of the flow until the piston P passes into an enlargement of the chamber, which will permit a free flow of water, as indicated in broken lines.

m is an arm of the alarm-lever *i*, and which lever is hung in the piston-cylinder, the free end of the arm *m* in connection with the piston-rod, as shown; hence when the pistons move, because of opening the flow, they turn the arm *m*, and with it the lever *i*. The alarm device, whether it be bell or whistle, is connected to the lever *i*, and so as to be sounded when the lever is so turned, and the cut-off apparatus, if attached to the said lever, will be also operated as before described. As the pistons cannot move when the water-hammer comes beyond what is permitted by the elasticity of the water in the chamber S, it follows that that movement cannot be sufficient to have any effect upon the alarm-lever. As the pistons cannot move in the direction of the flow until the flow has been practically opened, the alarm cannot be operated by the water-hammer, or until the flow has fairly commenced, and this alarm will occur whenever that flow be accidental, as by bursting, or whether it be produced by fire.

The prevention of the action of water-hammer on the distributers is very desirable, as in many cases they are sensitive to any sudden increased pressure; hence I do not wish to be understood as necessarily combining an alarm with the water-hammer-preventing device.

I have represented the cocks B and F as common plug-cocks. This I have done for convenience of illustration; but it will be understood that any suitable cock or valve may be used as a substitute therefor.

While I prefer the diaphragm and reservoir arranged as described, it will be evident to those skilled in this art that a cylinder and piston may be employed as an equivalent for the diaphragm, the rod of the piston corresponding to the rod *d*, attached to the diaphragm, and the piston traveling in its cylinder to operate the cock B, as does the diaphragm; and in that case the cylinder may be of sufficient length to form the reservoir—that is, the upper part of the cylinder will be the reservoir—and until the water has fallen in the cylinder to the same relative point that it falls in the reservoir the piston will remain stationary, but after that time will move by the pressure of the fluid upon the opposite side.

I have represented and described the water-way as having the valve standing normally open; but in some systems the valve or cock in the water-way is arranged to stand normally closed, and held so closed by connection with the apartments to be protected, so that fire in those apartments will cause the valve in the water-way to open. In such cases it will be understood that the mechanism which operates the valve will be brought into connection with that valve, or this automatically-operating valve may be in advance or in rear of the valve operated by this mechanism. I therefore do not wish to be understood as confining my invention to a water-way in which the flow or pressure of water is constantly open or closed throughout the system, it only being essential to my invention that there shall be a valve in the water-way which is opened or stands open for the flow of water, and with which my mechanism is connected, so that after the flow has continued for a predetermined length of time the flow of water will be cut off.

While I prefer the column of mercury and the fluid to operate upon the opposite side of the diaphragm or piston, it will be apparent that the pressure upon the opposite side of the piston may be otherwise produced—as, for instance, by a spring or weight—it only being essential that there shall be a device bearing upon said opposite side of the piston or diaphragm against the pressure of the fluid in the chamber and reservoir, and with such relation thereto that the chamber before the said mechanism on the said opposite side of the diaphragm or piston will begin to act.

I claim—

1. The combination of a cock or valve in the water-supply way, a chamber fitted with a diaphragm movable within the said chamber, the said diaphragm connected with the said cock or valve in the water-supply way when open, whereby the movement of the diaphragm will close the said cock, a reservoir connected with said chamber, said reservoir and chamber supplied with fluid and serving to hold the said diaphragm in its normal position, a passage from the said chamber containing said fluid, with a cock in said passage normally closed and held so closed by a device liberated when the flow of water begins, and which, when so liberated, will permit the escape of the fluid from said chamber and reservoir, with a mechanism, substantially such as described, operating upon the opposite side of said diaphragm to move said piston or diaphragm after a predetermined quantity of fluid shall have passed from the chamber, and which movement will impart to the said valve or cock in the water-way a movement to cut off the flow of water, substantially as described.

2. The combination of a cock or valve in the water-supply way, arranged to normally stand open, a chamber fitted with a diaphragm movable in said chamber, the said diaphragm connected with the said cock in the water-supply way, and whereby the movement of the diaphragm will close the said cock, a reservoir connected with said chamber, said reservoir and chamber supplied with fluid serving to hold the said cock in its open position, a passage from the chamber containing said fluid, with a cock in said passage normally

closed and held so closed by a device liberated when the main flow of water begins, and when so liberated will permit the escape of the fluid from the said chamber and reservoir, with a second reservoir opening to the opposite side of the said diaphragm, containing a fluid under a regulated pressure with relation to the fluid in the reservoir and chamber, whereby, after a certain predetermined quantity of fluid has escaped from said chamber and reservoir, the said fluid under pressure will cause the said diaphragm to move and close the said cock in the water-supply way, substantially as described.

3. The combination of a cock in the water-supply way A, a chamber, C, diaphragm *a*, arranged therein, a rod, *d*, above the diaphragm, connecting said diaphragm with said cock, reservoir E, outlet-tube *e*, a cock therein, inlet-tube I, reservoir L, and mercury-column *h*, substantially as and for the purpose described.

4. The combination of the cylinder M, differential pistons N P, connected together and movable in said cylinder, the inflow water-passage A, opening to said cylinder between the said pistons, and chamber S in said cylinder, the said pistons both constructed to permit a limited flow from the receiving-chamber to their opposite sides, substantially as and for the purpose described.

5. The combination of the cylinder M, differential pistons N P, connected together and movable in said cylinder, the inflow water-passage A, opening to said cylinder between the said pistons, and chamber S in said cylinder, the said pistons both constructed to permit a limited flow from the receiving-chamber to their opposite sides, an alarm-lever, *i m*, connected with said pistons, substantially as described.

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