(No Model.)

W. C. SHAFFER.

SPRINKLER SYSTEM.

No. 480,747. Patented Aug. 16, 1892.

Fig. 1.

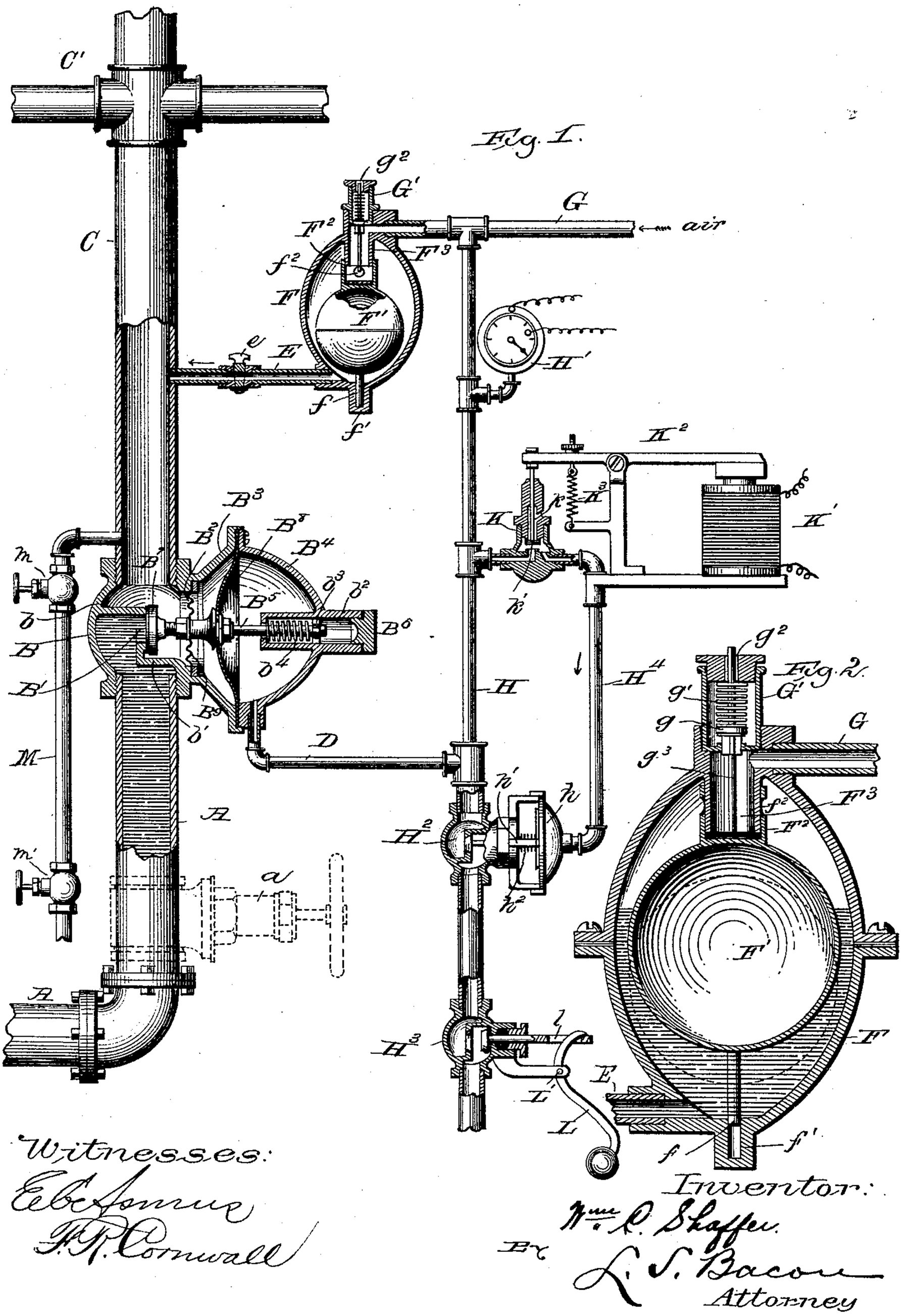

Fig. 2.

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SPRINKLER SYSTEM.

SPECIFICATION forming part of Letters Patent No. 480,747, dated August 16, 1892.

Application filed September 18, 1891. Serial No. 406,137. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM CASS SHAFFER, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Sprinkler Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in sprinkler systems for automatic fire-extinguishers; and it consists in the construction and arrangement of parts hereinafter described, and definitely pointed out in the claims.

The design of this invention is the provision of means for insuring a quick and positive automatic action of the governing-valve for the main water-supply of the system and to prevent the premature introduction of water into the system of distributing-pipes, and, further, to so construct, arrange, and combine the several parts that the apparatus will accomplish the result desired under varying circumstances and in a positive and effective manner. This object I attain by the construction illustrated in the accompanying drawings, wherein like letters of reference indicate like parts in the several views, and in which—

Figure 1 is an elevation, partly in section, of a part of a sprinkler system for fire-extinguishing apparatus embodying my invention; and Fig. 2 is a detail vertical section of the float-valve and casing.

In the drawings, A represents the main supply-pipe leading from the water main or tank and provided with a cut-off valve *a*. A globe joint or coupling B is threaded onto the top of the pipe A, constructed interiorly with horizontal partition *b* and an angular partition *b'* to form a lateral discharge-port B' within the coupling. From the outer end of the coupling B extends a riser-pipe C, from which the branch pipes C' extend to the desired point or points in the building. Suitable sprinkler-nozzles, (not shown, but preferably known as "automatic sprinkler-heads,") the valves of which are unseated by the application of heat in connection with a thermostat to other well-known devices, are placed at intervals on the branch pipes.

In the application and use of sprinkler systems it is at all times desirable and of the utmost importance to keep the riser-pipe and branch pipes when not in use free from water which would freeze during cold weather, be apt to leak at the valve opening or nozzles, and should a break in one of the branch pipes occur the apartment in which it is located would be flooded. To provide an apparatus for carrying out this requirement is the aim and intent of the construction and arrangement hereinafter described.

The coupling B has an opening B^2 in its side surrounded by an outwardly-flared flange B^3, the opening being directly opposite the port B' of the main supply-pipe A. To the outer edge of the flange B^3 is secured a casing B^4, having a hollow extension B^2 at its end, in which a valve-stem B^5 works. The end of this stem has a regulating-nut b^3 thereon and a spring b^4 between the end of the extension and nut.

B^6 is a cap on the extension for gaining access to the stem to adjust the nut.

The front end of the valve-stem B^5 has a valve B^7 thereon, which is held over or seated on the port B', thereby closing the same. A yielding diaphragm B^8 is secured to the stem midway its length, its outer edges being clamped between the meeting edge of the casing B^4 and flange B^3. This diaphragm is of greater diameter than the diameter of the opening B^2 in the coupling. Air under constant pressure is forced into the chamber in the rear of this diaphragm through pipe D, which tends to normally hold the valve B^7 to its seat and over port B'. To prevent undue back-pressure on the diaphragm and to keep the water from entering the chamber formed by the flange and the casing and also to avoid the use of a stuffing-box, a flexible partition B^9 is secured across the opening B^2 and tightly clasped around the valve-stem. This partition is preferably corrugated, and being formed of yielding material allows a reciprocating movement of the valve-stem.

E is an air-pipe entering the riser C a short distance above the diaphragm-chamber, its opposite end terminating in the lower end of an oval valve-casing F and has a turn-plug *e* between its ends. In the casing F is placed a float-valve F′, having a stem *f* at its lower end working in a guide-bearing *f′* in the casing. On the upper end of the valve F′ is a circular collar F^2, having lateral perforations f^2. This collar surrounds a cylindrical nipple F^3 on the top of the interior of the casing, which is of a length sufficient to open communication through the perforation f^2 and nipple when the valve is at its lowest point, as shown in Fig. 1.

The main air-supply pipe G enters the top of the valve-casing F horizontally through the nipple F^3. At the top of the nipple is a valve-opening formed in a suitable plug G′ on casing F. In this plug is a vertically-reciprocating valve *g*, normally held closed against the air-pressure by a spring *g′*, the upper end of the stem of the valve passing through an opening or port g^2 of much larger diameter than that of the stem, for purposes hereinafter stated. An actuating-rod g^3 is secured to the under side of the valve *g* and extends down into the path of the float F′ as the same is raised.

H is a branch pipe leading down from the main air-supply and from which the pipe D leads to the diaphragm-chamber. This pipe has a pressure-indicator H′ thereon and two globe-valves H^2 H^3 at its lower end below the pipe D. The valve H^2 is normally closed by having a diaphragm secured to the end of the stem *h′*, against the rear side of which air is forced, entering the diaphragm-chamber *h* through a branch pipe H^4, leading from the pipe H. The valve H^2 is opened when the air-pressure is taken from the diaphragm by the spring h^2, sleeved on the stem *h′*.

K is a cut-off valve located in the pipe H^4, formed with an exit-passage *k*, leading out from the same.

k′ is the plunger for closing the valve K, which operates to close the exit port or passage when the same is elevated and to close the supply-pipe when lowered, and at the same time opens the exit-port and allows the air from pipe H^4 to escape. The plunger is normally held to close the exit-port by an electro-magnet K′, which draws down the long arm of the lever K^2, on which the plunger is secured, the magnet being constantly energized, the breaking of the energizing-circuit causing a release of the armature on lever K^2. The plunger is then lowered by a spring K^3, connected with the short arm of the lever.

The air-discharge valve H^3 in the lower end of the pipe H is arranged to be normally held open by a weighted lever L, fulcrumed on an arm L′, its short arm being curved and passes through a slot *l* in the end of the valve-stem, which serves to close the valve when the weighted end of the lever is raised and to automatically open the same as soon as the lever is released.

M is a discharge-pipe leading from the base of the riser-pipe C for withdrawing the accumulated water from the same. It is provided with two separated valves *m* *m′*, so that the water may be introduced into the intervening section, and by closing the upper and opening the lower valve the same may be discharged without allowing the compressed air to escape.

The operation of the system is as follows: The valve *a* in the supply being closed to prevent water from entering the riser and branch pipes, compressed air is forced into the pipe G through the nipple F^3 on casing F and through the perforations f^2 in the collar F^2, casing F, and pipe E into the riser and branch pipes, the valve *g* being held closed by the spring *g′*. The compressed air is also forced down into pipe H, the valve H^3 being held closed by raising the weighted lever by manual power. From pipe H the air passes to the rear of the diaphragm B^8 through pipe D and forces the same out, closing port B′. The compressed air is also conducted in the rear of the diaphragm on valve-stem h^2 through pipe H^4 and valve K, closing valve H^2, thus preventing air from escaping when the valve H^3 is opened. The water is turned on and rises against valve B^7, where its farther passage is interrupted. Should a fire occur in the building, the circuit through which magnet K′ is energized is broken, suitable circuit-breaks of any desired form being employed. The spring K^3 thereupon draws the plunger *k′* down, cutting off the air-supply from the pipe H and opening the exit *k*, through which the compressed air in pipe H^4 and chamber *h* escapes, allowing the spring *h′* and compressed air to force the valve H^2 back, which opens the escape for the air in the system and releases the pressure on diaphragm B^8. The valve B^7 is drawn back by the spring b^4 and the water immediately fills the riser and branch pipes, so that the same will be immediately discharged as soon as the valves on the sprinkler-heads have been unseated by the heat. As the water rises in the riser-pipe it flows into float-valve chamber through pipe E, forcing the valve up until the perforations are closed by the nipple F^3, which prevents the water from rising into the air-pipes. As the valve F′ rises it strikes the rod g^3, forcing up valve *g*, and thus opening an escape for the air through the opening g^2. This feature of the apparatus is only necessary when the electrical apparatus fails to operate. The sprinkler-heads have been opened, allowing the air to escape therethrough from the system, the exit-opening g^2 being necessary for the air to escape through when the water has closed perforations f^2.

It will be understood that the area of the diaphragm is such that the air-pressure there-

on closes the valves against what back-pressure there may be on the valves, owing to the comparatively small area of the faces thereof.

I am aware that many minor changes in the construction and arrangement of the parts of my device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

The construction involving a sprinkler-head, the connecting-pipe between the same, and the source of supply of the extinguishing medium, a valve controlling the admission of water to said head, and an electrically-controlled air-valve for operating the controlling-valve for the fire-extinguishing medium I have made the subject-matter of a concurrently-pending application Serial No. 307,335, filed April 12, 1889.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a sprinkler system, the combination, with the main water-supply pipe, of a valve for closing the same, a diaphragm on the valve, a compressed-air-supply pipe leading into the rear of the diaphragm, and two or more automatically-operated independent means in operative connection with the system for releasing the diaphragm from the air-pressure upon the presence of abnormal heat, substantially as described.

2. In a sprinkler system, the combination, with the main water-supply pipe, the riser, and branch pipes, of a compressed-air-supply pipe, a branch pipe forming communication between the air-supply and riser, a valve actuated by the compressed air to cut off the water-supply, and a valve actuated by the water to close communication between the air-supply and riser, and an automatically-operated escape-valve in the air-pipe, substantially as described.

3. In an automatic sprinkler system, the combination, with the main supply-pipe, the riser, and branch pipes, of a valve located between the riser and main supply pipe, a stem on the valve, a diaphragm on the stem, a compressed-air-supply pipe leading into the rear of the diaphragm, a valve in the air-pipe, a magnet for unseating the valve, a branch pipe forming communication between the riser and air pipes, and a valve in the branch pipe for closing the communication upon the pressure of water in the branch pipe, substantially as described.

4. In a sprinkler system for automatic fire-extinguishers, the combination, with the water-supply pipe, riser, and branch pipes, of an air-supply pipe, a valve actuated by the air-supply to close the water-supply, a communicating passage between the air-supply and riser, a valve in the passage for closing the same, and an escape-valve actuated by the said valve, substantially as described.

5. In a sprinkler system, the combination, with the water-supply pipe, riser, and branch pipes, of a compressed air-supply pipe communicating with the riser, a valve between the riser and water-supply, a diaphragm against which the compressed air impinges for closing the valve, a float-valve between the riser and air-supply, and an escape-valve actuated by the float, substantially as described.

6. In a sprinkler system for fire-extinguishers, the combination, with a supply, riser, and branch pipes, of a compressed-air supply, a communicating passage between the same and riser, a float-valve in the passage, a perforated sleeve on the float, a nipple with which said sleeve engages, and an air-discharge valve actuated by the float, substantially as described.

7. In a sprinkler system for automatic fire-extinguishers, the combination, with the supply and riser pipes, of a valve between the same, a diaphragm-chamber in which the valve-stem works, a diaphragm on the valve, means for introducing compressed air in the rear of the diaphragm, and a yielding partition between the diaphragm and valve, substantially as described.

8. In a sprinkler system, the combination, with a water-supply pipe and riser-pipe, of a valve-coupling between, a casing on the coupling, a valve in the coupling, a diaphragm on the valve, and a yielding partition secured to the valve between the casing and coupling, substantially as described.

9. In a sprinkler system, a diaphragm-valve for closing the water-supplying pipe, pipes for supplying compressed air for actuating the diaphragm, valves for releasing the diaphragm from said air-pressure, a valve in the air-pipes, and a weighted lever for normally opening the same, substantially as described.

10. In a sprinkler system, the combination, with the riser, air, and water-supply pipes, and a diaphragm-valve for closing the water-supply, of a communicating pipe between the air-supply and riser pipes, a float-valve in said communicating pipe, an air-discharge valve, and a stem on the air-discharge valve extending down into the path of the float, substantially as described.

11. In a sprinkler system, a float-valve having a perforated collar, a hollow nipple fitting within the collar, and a guide-pin on the float, substantially as described.

12. In a sprinkler system, the combination, with the main supply-pipe, riser, and branch pipes, of a valve between the supply and riser pipes, a stem on the valve, a diaphragm on the stem, a casing surrounding the diaphragm, an air-supply pipe leading into the casing and riser, and a valve in the air-pipe, actuated by the water to close communication between the riser and air pipes, substantially as described.

13. In a sprinkler system, the combination, with the water, riser, branch, and air pipes,

of a diaphragm-valve for closing the water-pipe, a diaphragm-valve for closing the air-pipe, an air-exit valve, a plunger for opening and closing the same, an electro-magnet for normally holding the plunger to close the exit-valve, a float-valve, and an exit-valve actuated by the float to prevent the escape of the air from the air-pipe upon the pressure of water in the riser-pipe, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM C. SHAFFER.

Witnesses.

D. G. STUART,

L. S. BACON.