George I. Rockwood, of Worcester, Massachusetts.

Air Exhauster for Dry-Pipe Sprinkler Systems.

Application filed January 6, 1921. Serial No. 435,512.

To all whom it may concern:

Be it known that I, George I. Rockwood, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Air Exhauster for Dry-Pipe Sprinkler Systems, of which the following is a specification.

The object of this invention is to provide an air exhauster for dry pipe sprinkler systems by which the air in the system will be quickly exhausted therefrom at a point remote from the sprinklers when a sprinkler head comes into operation.

The invention is illustrated in the accompanying drawings in which—

Fig. 1 is a sectional elevation illustrating the arrangements of the parts;

Fig. 2 is a sectional elevation illustrating the operating connection to the exhaust valve;

Fig. 3 is a still larger detail view of the bleed opening in the valve connection; and

Fig. 4 is a detail of the air release valve.

Referring to the drawing and in detail, I have shown my invention applied to a sprinkler system having a dry pipe valve arranged between the water supply pipe and the distributor pipes. This dry pipe valve has a swinging weighted valve plate A pivoted in a casing said valve plate carrying a water valve B and a sizable air valve C which co-operates with suitable seats in the casing. The space D between the valves forms a drain chamber. The air valve C is larger in diameter than the water valve B, the relative areas of the same in practice being about six to one so that a relatively light air pressure in the sprinkler system of, say forty to fifty pounds will keep the water valve B closed to hold back a water pressure of perhaps one hundred fifty pounds. The details of this dry pipe valve are illustrated in Letters Patent granted to me July 23, 1912, No. 1,033,471.

The air exhausting device used with such dry pipe valve will now be described. A pipe 13 is connected to some point of the distributing system preferably the highest point of the riser extending from the dry pipe valve and this pipe has a drip or drain valve 14. A casing or shell 15 is arranged so as to provide an upper air exhaust chamber 16 and lower air storage chamber 17. An unobstructed inlet pipe 18 connects the pipe 13 to the exhaust chamber 16, the exhaust chamber also being provided with an exhaust or drain pipe 19 normally closed by an exhaust valve 20 mounted on a valve frame 21 pivoted at 22 to the casing 15. The weight of the frame will keep the valve 20 on its seat in the absence of any operating force. The chambers 16 and 17 are separated by a diaphragm 23 on which is mounted a valve lifter 24. The upper end of the valve lifter 24 is positioned to engage a cap 25 adjustably threaded into an extension of the valve frame 21. These parts form means for opening the exhaust valve by a fall of air pressure in the system. A screw 26, provided with a lock nut, is threaded into the end of the valve frame so that the closed position thereon can be accurately determined. The valve lifter 24 is provided with a small passage 27 therethrough connecting at its lower end with the chamber 16 and at its upper end with the chamber 17. A drain valve 28 is provided for the air storage chamber 17. The parts thus far described operate as follows:

Under normal conditions the valve 20 is firmly seated to close the drain pipe 19 and the cap 25 is slightly removed from the end of the lifter 24. The exhaust chamber 16 is normally filled with water up to the level of the inlet connection 18. The air in the exhaust chamber 16 thus will be under the same pressure as the air in the dry pipe system commonly from forty to fifty pounds per square inch and the air in the chamber 17 also will be under the same pressure due to the free connection through the opening 27 between the two chambers. Assuming that a sprinkler head is opened, air will escape through the sprinkler head more rapidly than air can flow from the storage chamber 17 through the passage 27 into the exhaust chamber 16. The pressure in the chamber 16 will therefore fall below that in the chamber 17 with the resulting upward movement of the diaphragm 23. Such movement will force the valve lifter 24 against the cap 25 with two important results. In the first place, the cap 25 immediately closes the opening 27 and prevents any further reduction in the pressure in the storage chamber 17. In the second place, the cap 25 is moved upward carrying with it the valve frame 21 and thus swinging the exhaust valve 20 to open the exhaust pipe 19 through which air will escape from the dry pipe system with great celerity as the
pipes 13 and 18 are unrestricted. Thus a great part of the volume of air in the system is released at a point remote from the opened sprinkler head or heads.

As the air pressure is thus quickly released the air pressure on the valve plate A will be relieved and the dry pipe valve will open and allow the water to flow into the system. As this takes place and as the riser is filled, water will flow into the return pipe 13 and through the inlet pipe 18 into the exhaust chamber 16. Water rushing into the chamber 16 will close the valve 20 by the momentum thereof and by the pressure in the storage chamber 17.

In operating said device it has been found that the closing of the exhaust valve takes place so rapidly that the momentum of the water acting on top of the diaphragm 23 in opposition to the air pressure in the air storage chamber 17 is apt to cause the exhaust valve 20 to bound a number of times on its seat before it finally closes, thus causing deleterious water hammer in the system. The principal object of the present improvement is to retain this quick closing of the exhaust valve and to eliminate this hammering action and to insure the closing of the exhaust valve.

To this end, the following attachment is provided. The bottom of the casing 15 is provided with a guard ring 30 and screwed into the bottom of the casing is a mushroom plate 31 having a plate 32 screwed into the same, the latter being connected by a pipe 33 to the drain chamber D or space between the valves B and C of the dry pipe valve. A diaphragm 34 is arranged between the plates 31 and 32 and the same carries a stem 35, the end of which is shaped to form a relief valve 36 which co-operates with the hub of the plate 31 which forms a valve seat. The stem 35 is grooved where the same passes through the hub of the plate 31 and a spring 37 is arranged in said hub so as normally to keep the valve 36 seated. The hub of the plate 31 is provided with suitable outlets 38. The operation of this apparatus is as follows:

When the dry pipe valve opens to admit water under pressure into the system, the drain chamber D is filled with water and the same immediately rushes through the pipe 33 and acts under the diaphragm 34. This will open the relief valve 36 and will release the air pressure in the chamber 17 and this action will allow the exhaust valve 20 to return to its seat, perhaps even before the water surges back down through the return pipe 13. Thus, the exhaust valve will be caused to seat and close the exhaust pipe 19 by two actions, first, by the release of the air pressure below the diaphragm, and second, by the water acting on top of the diaphragm.

It is extremely important that the exhaust valve should close when the system fills with water because if the same should remain open there would not be force enough perhaps to drive the water out through the open sprinkler head.

After the exhaust valve 20 closes a small quantity of water may flow through the passage 27 into the chamber 17 but this water can not act on the diaphragm 34 to lift the same as the valve 36 remains open and as the flow through the passage 27 is very small.

Thus, by this attachment which I have added to the Carlson device, a double result is obtained in that the hammering action of the exhaust valve on its seat is eliminated and in that a second action is added to help close the exhaust valve when the system is filling with water, namely, the exhausting of the air storage chamber 17.

The detail of the connection between the valve lifter 24 and the cap 25 has also been improved. The end of the valve lifter is made ball or spherical shaped as at 40 and the passage 27 therethrough is restricted by a small plate 41 set into the end thereof, this plate having a bleed passage 42 formed through the same whereby the air connection between the two chambers is accurately determined. The valve cap 20 is provided with a soft metal seat 43 the bottom of which is bored into conical shape, the valve lifter head 40 fitting somewhat loosely therein so that air can pass around said ball. The normal relation of the parts is shown in Fig. 2. When the device comes into operation the head 40 will engage the seat 42 and prevent air passing between the chambers, and by reason of the spherical shape of the end of the valve lifter and the conical seat in the valve cap there will be an accurate closure of this connection even as the valve frame swings on its pivot. This detail improvement insures accuracy of operation in closing the air passage between the two.

The details and arrangements herein shown and described may be greatly varied by a skilled mechanic without departing from the scope of my invention as expressed in the claims.

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

1. An air exhauster for dry pipe sprinkler systems having a dry pipe valve, comprising a restrictively connected air exhaust chamber and air pressure chamber, said air exhaust chamber being connected to the system and having an exhaust valve, means for operating the exhaust valve from the air pressure chamber, and means for releasing the air pressure in the air pressure chamber when the dry pipe valve opens.
2. An air exhauster for dry pipe sprinkler systems having a dry pipe valve, comprising a restrictedly connected air exhaust chamber and air pressure chamber, said air exhaust chamber being connected to the system and having an exhaust valve, means for operating the exhaust valve from the air pressure chamber, and means for releasing the air pressure in the air pressure chamber operated by the water flowing into the system.

3. An air exhauster for dry pipe sprinkler systems having a dry pipe valve, comprising a restrictedly connected air exhaust chamber and air pressure chamber, said air exhaust chamber being connected to the system and having an exhaust valve, means for operating the exhaust valve from a fall of air pressure in the system, a relief valve for the air pressure chamber, and means for opening the same connected to the drain chamber of the dry pipe valve.

4. An air exhauster for dry pipe sprinkler systems having a dry pipe valve, comprising a restrictedly connected air exhaust chamber and air pressure chamber, said air exhaust chamber being connected to the system and having an exhaust valve, means for operating the exhaust valve from a fall of air pressure in the system, a relief valve for the air pressure chamber, a diaphragm connected to the same, and a connection from the diaphragm to the drain chamber of the dry pipe valve.

5. An air exhauster for dry pipe sprinkler systems having a dry pipe valve, comprising a restrictedly connected air exhaust chamber and air pressure chamber, said air exhaust chamber being connected to the system and having an exhaust valve, means for operating the exhaust valve from a fall of air pressure in the system, a relief valve for the air pressure chamber, a spring normally closing the same, a diaphragm connected to the relief valve, and a connection from under the diaphragm to the drain chamber of the dry pipe valve.

6. An air exhauster for dry pipe sprinkler systems having a dry pipe valve, comprising a casing, a diaphragm in the casing separating the same into an air exhaust chamber and an air pressure chamber, said air exhaust chamber being connected to the system, an air exhaust valve arranged in the air exhaust chamber, connections between the diaphragm and the exhaust valve, a restricted opening through said connections which is closed when the device operates, a relief valve for the air pressure chamber, and means for opening the same connected to the drain chamber of the air pipe valve.

7. An air exhauster for dry pipe sprinkler systems having a dry pipe valve, comprising an air exhaust chamber and an air pressure chamber, an exhaust valve, a lifter therefor having an opening through the same, a spherical head on the lifter, and a conically recessed cap connected to the valve and engaged by said head.

8. An air exhauster for dry pipe sprinkler systems having a dry pipe valve, comprising an air exhaust chamber and an air pressure chamber, the combination of a pivoted arm or frame carrying an exhaust valve, a cap threaded thereinto and having a soft metal conical seat, a valve lifter having a passage through the same and a spherical head for engaging said seat, and a plate embedded in said head and having a restricted opening.

In testimony whereof I have hereunto affixed my signature.

GEORGE I. ROCKWOOD.