

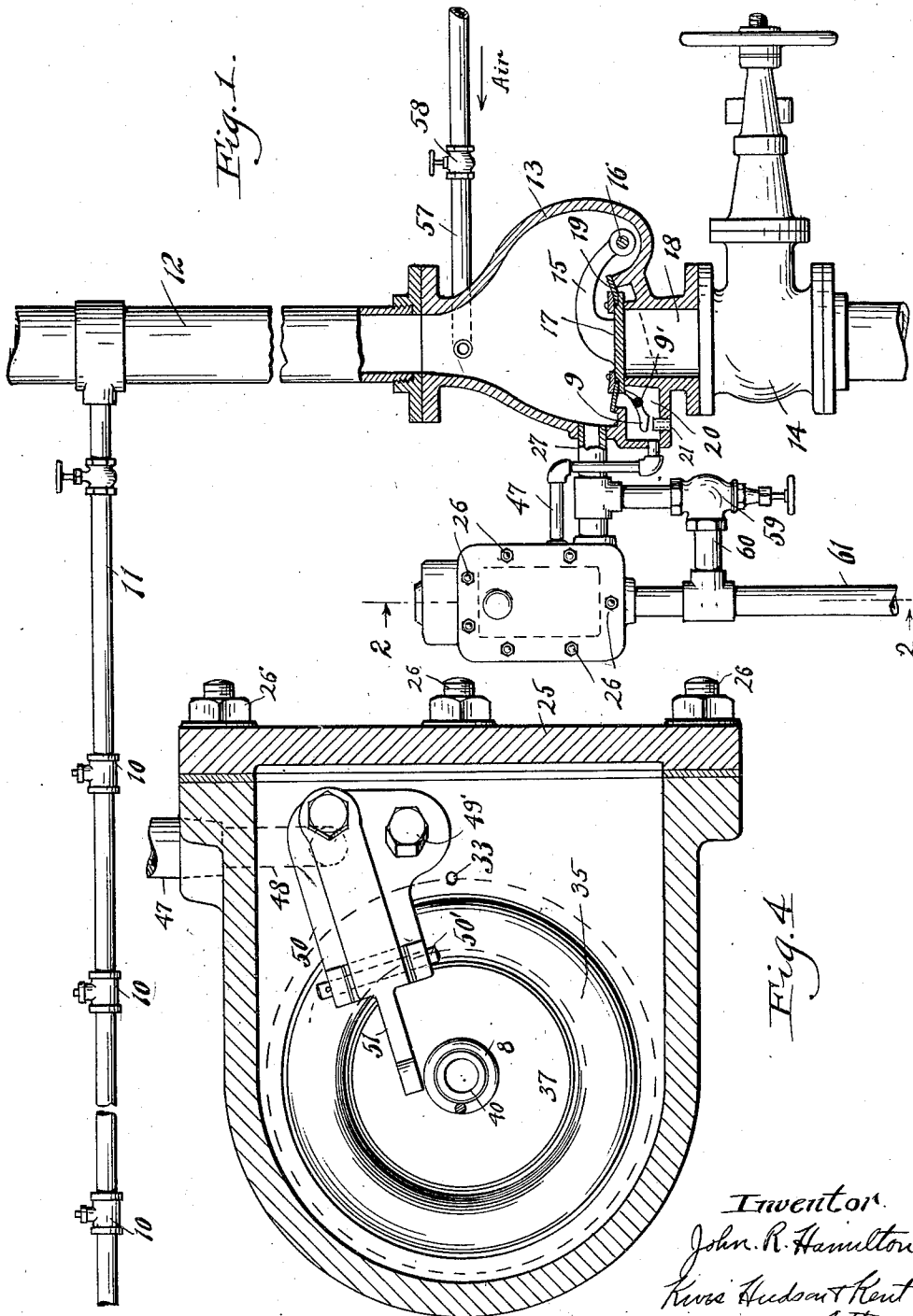
June 17, 1930.

J. R. HAMILTON
AUTOMATIC EXHAUSTER

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2 Sheets-Sheet 1



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Fig. 3.

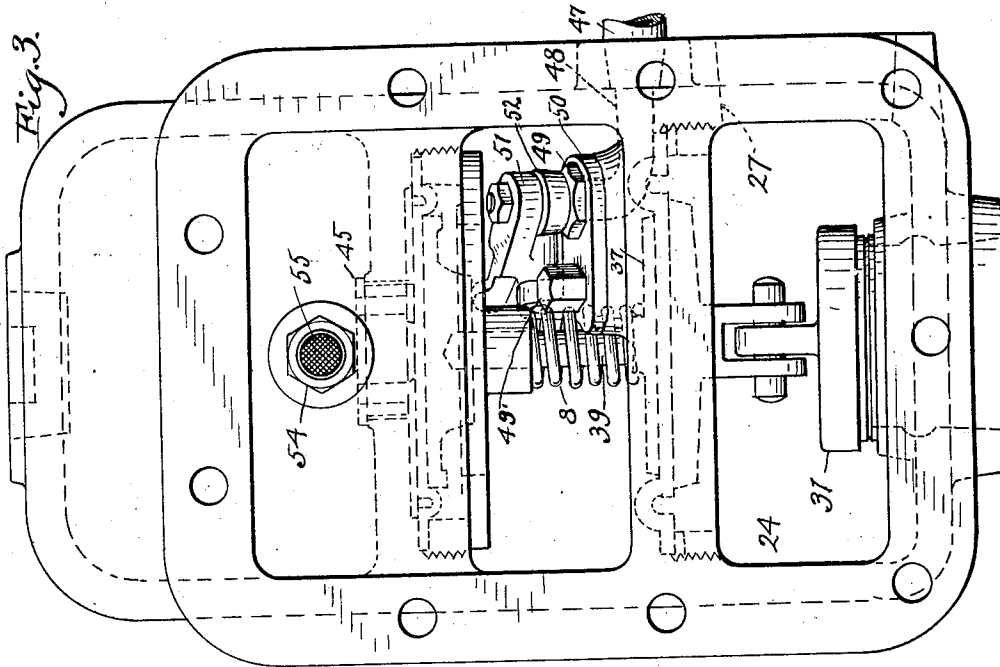
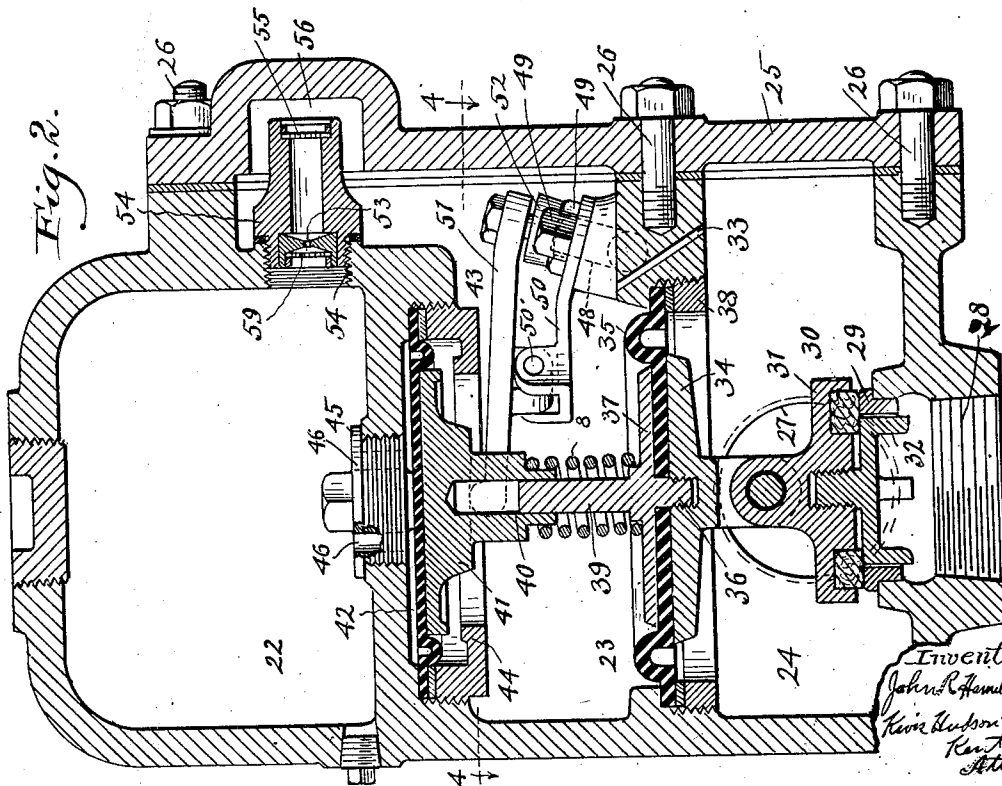


Fig. 2.



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AUTOMATIC EXHAUSTER

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My present invention relates to that type of device intended to hasten the operation of the dry pipe valve on that kind of sprinkler system known as "dry pipe," that is, the type of sprinkler system in which air under pressure normally fills piping system and holds in a closed position the valve which upon the opening of a sprinkler head from fire or other cause allows water to flow into the piping system and out of the particular sprinkler head that is opened.

The usual air pressure carried in such systems may be, say 40 pounds, while the air pressure at which the dry pipe valve operates and allows water to enter the piping system may be, say 15 pounds, and it is highly desirable to shorten the interval of time between the opening of the sprinkler head and the operating action of the dry pipe valve.

The purpose of my exhaustor is to detect the slight fall in pressure incident to the opening of a sprinkler head and make an additional opening from the piping system from which the air can exhaust quickly to the point at which the dry pipe valve itself operates. The location at which the air is discharged should preferably be remote from the sprinkler head to avoid as far as possible the fanning action of the air on the fire, and I have arranged my exhaustor so that the air will be delivered into the piping by which the sprinkler system is normally drained of water when the piping system has been filled with water.

Other objects will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

Fig. 1 is a somewhat diagrammatic, elevational view of a fire prevention sprinkler system, the automatic water valve being shown in section;

Fig. 2 is a vertical sectional view of an air exhaustor embodying my invention;

Fig. 3 is a front elevational view of the air exhaustor with its cover plate removed; and

Fig. 4 is a horizontal sectional view taken substantially on the line 4-4 of Fig. 2.

Similar reference characters refer to like parts throughout the views.

In the drawings, the sprinkler heads are indicated at 10. Any desired number of such heads may be employed and may be connected by branch pipes, such as 11, with a header pipe 12 that is connected to the upper end of the casing 13 of an automatic water valve. This latter casing may be in turn connected with a hand operated water valve 14 as illustrated.

The automatic valve may be any one of various well known types, but I prefer to employ that shown in Fig. 1, where 15 is an arm pivoted at 16 upon a pin mounted in the casing 13 and carrying at its free extremity a flap valve 17. The valve 17 normally closes the upstanding cylindrical end of a water passage 18. Clamped to its periphery by any suitable means is a leather or fabric ring 19 which fits an annular valve seat surrounding the passage 18 and spaced therefrom. Outside of the walls of the passage 18 and below the ring 19 is a chamber 20 hereinafter called the neutral chamber, which is normally open to atmosphere through a small tube 21 extending upwardly into the chamber through the bottom wall thereof. The pressure of the air in the pipe system 11, 12 acting upon the comparatively large upper face of the flap valve with its ring 19 is sufficient to overcome the pressure of the water acting only upon the smaller surface of the valve exposed to the space within the water passage 18, and holds the valve normally closed. A gravity actuated valve 9 for closing the upper end of the tube 21 is pivotally mounted as indicated at 9' and normally held open by the flap valve 17 in a manner that will be apparent from an inspection of Fig. 1.

My air exhaustor, designed to provide a quick egress for the air in the system when any one or more of the sprinkler heads is opened, is located preferably near the automatic water valve as shown in Fig. 1. It consists of a casing divided into three compartments 22, 23 and 24, 22 being hereinafter termed an air storage compartment, 23 an intermediate compartment and 24 an air exhausting compartment. The casing of the

exhauster is formed preferably of a single casting open upon one side, with a cover 25 adapted to close the casing and complete the enclosure of the compartments 23 and 24 in which the moving parts are all located. The cover is held in place by suitable means, such as stud bolts 26.

The lower or air exhausting compartment 24 is in constant communication with the pipe system through a large passage 27. This compartment is furnished also with an exhaust opening 28 in its lower wall, this opening being supplied with a valve seat 29 with which engages a packing ring 30 clamped between a valve piece 31 and a follower or guide 32, the latter having a central stud threaded into the said valve piece 31. The intermediate and lower compartments 23 and 24 are in constant communication through a passage 33 of small cross section.

The stem of the valve piece 31 is pivotally connected with a reinforcing plate 34 for a flexible diaphragm 35, the plate 34 being drilled and threaded at the center to receive a threaded stud 36 depending from a further reinforcing plate 37. When the stud 36 is screwed home the two plates 34 and 37 grip the diaphragm 35 between them. The latter is made preferably of rubberized fabric so as to form a gas-tight partition, and its periphery is mounted in an annular recess in the metal dividing wall between the compartments, being held securely and tightly therein by a threaded ring 38.

A smooth stem 39 extends upwardly from the plate 37 and has a sliding fit in a bore 40 formed in a plate 41, on the upper flat surface of which there is a second diaphragm 42 of material similar to that of diaphragm 35 and mounted in a similar way in an annular recess formed in the casting, being held therein by a threaded ring 43 which is provided with an inner ledge 44 to support the plate 41 when the diaphragm 42 is in its lowest position. Upward movement of the diaphragm 42 and the plate 41 is limited by a plug 45, and communication between the space above the diaphragm and the interior of the compartment 22 is insured by a series of holes 46 in the plug. A coil spring 8 tends to separate plates 37 and 41 and to hold the latter at its upper limit of motion as well as to hold the valve 31 upon its seat 29.

I provide a normally closed passage between the atmospheric chamber 20 of the automatic valve and the intermediate compartment 23 of the exhauster, consisting primarily of the pipe 47 which opens at its upper end into a cored passage 48 (Fig. 3), which is provided with a valve seat formed in a plug 49. A bracket 50 is secured in position by the plug 49 and the stud 49' and carries the pivotal mounting 50' for a lever 51 in which the valve 52 is located, the opposite end of the lever being arranged to underlie a

shoulder on the plate 41 so as to be engaged and moved thereby when the plate descends.

The intake and outgo from the upper compartment 22 passes through an orifice 53 of very small size in a plug 54, which plug is threaded into a hole 54', as shown in Fig. 2, and carries on opposite sides of the orifice 53 screens 55 and 59 of fine mesh for guarding against any possible clogging of the orifice 53 with foreign matter. The cover 25 is formed with a cavity 56 in an outwardly projecting portion so as to clear the plug 54.

Air may be pumped into the system through a pipe 57 provided with a shut-off valve 58. A valve 59 in a by-pass pipe 60 may be employed for draining water from the system into a drain pipe 61, which also connects with the exhaust opening 28.

In describing the operation of the invention let us assume first that the system is filled with air under a pressure, for example, of 40 pounds to the square inch, the air valve 58 being then closed. The water valve 14 being open, the under surface of flap valve 17 is exposed to the water pressure in the water supply main, the amount of this pressure varying with different installations. Air pressure in the three compartments 22, 23 and 24 of the air exhauster will be equalized and the same as in the pipe 12 of the system, the air having entered the exhauster through pipe 27, then flowing through passage 33 connecting the compartments 23 and 24 and then through screen 55, orifice 53 and screen 59 into compartment 22.

In the event of a fire near one of the sprinkler heads 10, the fusible metal in the head will be melted, opening the head as is well understood in the art. Air will then flow out of the head, thereby reducing the pressure in the sprinkler system. However, the automatic valve 17 is so proportioned as not to open until the air pressure has been lowered to 15 pounds, or thereabouts, and if all of the air that must escape from the system, in order to reduce the pressure to this extent, had to pass through the one sprinkler head a considerable time would be required before the water could enter the system and this air would be supplied to the space where the fire is located and increase the fire. When my air exhauster is employed, however, a very slight reduction in pressure in the system is immediately communicated to the compartment 24, and, by means of the passage 33 to the compartment 23. Because of the smallness of the orifice 53, however, this reduced pressure is not felt at once in compartment 22 and consequently the excess of pressure in that compartment over the pressure in intermediate compartment 23 causes the diaphragm 42 and plate 41 to descend, thereby depressing the adjacent end of lever 51 and raising the valve piece 52 out of contact with its seat in the plug 49, thus

opening the compartment 23, through the comparatively large passage 48 and pipe 47, to chamber 20, which is open to atmosphere. The consequent sudden reduction of pressure in compartment 23 to near atmospheric pressure is not communicated at once to compartment 24 because of the fact that passage 33 is very much smaller than passage 48 and pipe 47. Hence the higher pressure in compartment 24, acting on the large area diaphragm 35, overcomes the pressure of the spring 8 and load on the valve 31 and raises the plate 36 and valve 31, thereby opening immediately a large capacity exhaust for the pipe system through pipe 27 into the compartment 24 and out through valve 31 and opening 28. The air exhaust may be discharged into the room in which the apparatus is situated, but I prefer to have it enter a drain pipe 61 where it cannot act to fan the flames of the fire which brought about the operation of the device.

The reduction of air pressure in the system will thus take place very rapidly indeed, and when the pressure is lowered to the predetermined amount it will permit the water pressure under valve 17 to swing that valve back upon its pivot 16, permitting water to fill the pipe system and to flow from whatever sprinkler heads may have been opened by the fire. When the valve 17 opens water is, of course, permitted to enter the chamber 20 therebelow, but at the same time the gravity valve 9 descends and closes the tube 21 thus preventing water leakage at that point.

As soon as water enters the system, some of it, of course, will flow through pipe 27 into compartment 24 and out through the drain 61. At the same time, however, water will flow also through pipe 47 and passage 48 into intermediate compartment 23 until the water pressure on both sides of diaphragm 35 becomes balanced. Thereupon the pressure upon the top of valve piece 31 added to the force of spring 8 acts to seat valve 31 and cut off the escape of water to the drain, this action taking place quite rapidly.

When the fire is extinguished, valve 14 should be closed and valve 59 opened to drain out the water left in the system. Some water will remain unavoidably in the exhauster, but I have provided means for permitting the operator to easily remove such water and clean and dry the interior of the exhauster as well as its moving parts by removing the cover plate 25. Any water that may have entered the chamber 22 may be removed by taking out the plug 54 which carries the screens 55 and 59.

While I have described with considerable particularity the details of the apparatus herein disclosed, it should be understood that such description and disclosure are merely for the purposes of illustration, and that I do not desire to limit myself to the precise con-

struction and arrangement shown except as they may be included in the appended claims.

Having thus described my invention, what I claim is:

1. In a dry pipe sprinkler system, an automatic water valve having a neutral chamber, an air exhauster having an air storage compartment, an air exhausting compartment and a third compartment all in communication through relatively restricted passages, the passage connecting the third compartment and the air storage compartment being more restricted than the passage connecting the third compartment and the air exhausting compartment, a connection communicating with the neutral chamber and leading from said third compartment to atmosphere through said neutral chamber, means for normally closing the atmosphere connection, means controlled by a pressure difference between said third and said air storage compartments for suddenly opening said atmosphere connection, the air exhausting compartment having an open communication with the pipe system, an exhaust valve in said air exhausting compartment, spring means for urging said valve toward closed position and adapted to be overcome by the pressure difference set up between said third and said air exhausting compartments, means controlled by said pressure difference for opening said exhaust valve, and means for automatically closing said neutral chamber from atmosphere upon the opening of the water valve, whereby water pressures in said third and air exhausting compartments are equalized, permitting said exhaust valve to close.

2. In a dry pipe sprinkler system, an air exhauster having an air storage compartment, an air exhausting compartment and third compartment all in communication through relatively restricted passages, the passage connecting the third compartment and the air storage compartment being more restricted than the passage connecting the third and the air exhausting compartments, a connection leading from said third compartment to atmosphere, means for normally closing the atmosphere connection, means controlled by a pressure difference between said third and said air storage compartments for suddenly opening said atmosphere connection, the air exhausting compartment having an open communication with the pipe system, a normally closed exhaust valve in said air exhausting compartment, means controlled by the pressure difference set up between said third and said air exhausting compartments for opening said exhaust valve, and spring means for closing said exhaust valve when the pressures in said third and said air exhausting compartments are substantially equalized and adapted to be overcome by said pressure difference to permit the opening of said valve.

3. In a dry pipe sprinkler system, an automatic water valve having a neutral chamber, an air exhauster having two compartments separated by a diaphragm, the first compartment being continuously connected with the pipe system through a restricted opening, the second compartment being continuously open to the pipe system through an unrestricted opening, a passage connecting said first compartment with said neutral chamber and with the atmosphere, means normally closing said passage and adapted to be actuated by lowered pressure in the system for opening said first compartment to atmosphere through said neutral chamber, an exhaust port in said second compartment, a valve for said port, an operative connection between said diaphragm and said valve whereby said diaphragm moving in response to the lowered pressure in said first compartment opens said valve, spring means tending to move said diaphragm in the direction to close said valve and adapted to be overcome by said pressure difference to permit the opening of said valve, and means for automatically closing said neutral chamber from atmosphere upon the opening of the water valve, whereby the water pressures in said compartments will quickly equalize after the discharge of air from the system, permitting said spring means to close said valve.

In testimony whereof, I hereunto affix my signature.

JOHN R. HAMILTON.