Jan. 27, 1931. C. C. FARMER 1,790,205

AIR PURIFIER

Filed May 9, 1927

Fig. 1.

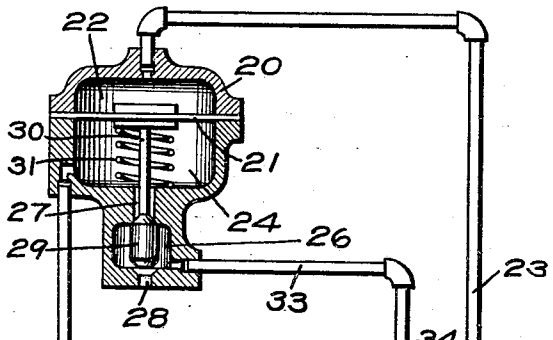
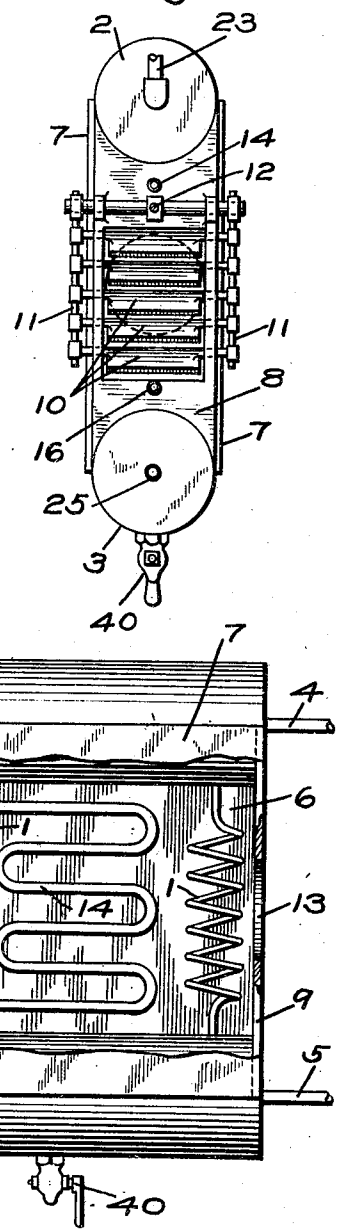


Fig. 2.



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UNITED STATES PATENT OFFICE

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AIR PURIFIER

Application filed May 9, 1927. Serial No. 189,763.

This invention relates to air purifiers and more particularly to a device for purifying air employed in a fluid pressure brake system.

With the usual fluid pressure brake system employed on railway trains, the locomotive is equipped with an air compressor and one or more main reservoirs into which the compressor compresses air. The air thus compressed, carries in suspension, more or less oil, which comes from the compressor, and water vapor, which is present in the air taken from the atmosphere by the compressor. It has been found that oil and water carried by the air, tend to collect in the several parts of the brake system, and in some cases, the deposits so formed, interfere with the desired operation of the brake, and in view of this it is very desirable that the oil and water be removed from the air before it is supplied to the brake apparatus.

The principal object of my invention is to provide means for purifying compressed air before it is supplied to a fluid pressure system, such as a fluid pressure brake system.

A more specific object of the invention is to provide an air purifying device having means whereby oil or water, contained in a fluid stream flowing through the device, may be removed from the stream by condensation and whereby congealed oil, or frost and ice formed in the device and clogging the flow of the fluid stream may be removed by the action of heat automatically applied to the device.

These and other objects and advantages will be apparent from the following description.

Referring to the drawing, in which like reference characters refer to like parts; Fig. 1 is a diagrammatic sectional view of an air purifying device constructed in accordance with my invention; and Fig. 2 is an end elevational view of a portion of the same.

According to my invention, one or more sections 1 of coiled pipe are provided, each section having its upper end opening into a header 2 and its lower end opening into a drain reservoir 3. Fluid under pressure is supplied to the header through a pipe 4 and is discharged to other parts of the fluid pressure system through an outlet pipe 5.

In the present embodiment of the invention, the sections 1 of coiled pipe are contained in a chamber 6, formed by the header 2, drain reservoir 3, side walls 7 and end walls 8 and 9, all of which are suitably connected together. The end wall 8 may be provided with a plurality of hinged doors 10, each of which is loosely connected with an operating bar 11, adapted to be operated by a lever 12, pivotally mounted on the end wall 8. The end wall 9 has formed therein an opening 13 through which currents of air are adapted to pass into or out of the chamber 6. It will be understood that, if desired, the end wall 9, instead of having the opening 13, may be provided with doors like those of the end wall 8. It will also be understood that the openings or doors may be in the side walls 7 or any other suitable part of the enclosing structure.

Extending into the chamber 6, there is a heating coil 14, the end 15 of which leads from a suitable source of steam supply, or any other suitable heating medium, and the end 16 being open to the atmosphere or to any suitable exhaust means. Interposed between the chamber 6 and the source of steam supply, there is a valve device 17 having a rotatable valve 18 which is adapted to be operated by a lever 19 secured thereto.

For controlling the opening and closing of the doors 10, and for controlling the valve 17, a valve device 20 is provided, which comprises a casing having a flexible diaphragm 21 mounted therein. At one side of this diaphragm there is a chamber 22 which is connected with the header 2 by a pipe 23 and at the opposite sides of the diaphragm there is a chamber 24 which is connected with the drain reservoir 3 by a pipe 25. The chamber 24 is adapted to communicate with a chamber 26 through a passage 27 and adapted to be opened to the atmosphere through a port 28. The opening and closing of the passage 27 and port 28 is controlled by a double seating valve 29 contained in the chamber 26 and which is provided with a stem 30, adapted to be acted upon by the diaphragm 21, to op-

erate the valve in one direction, and by a spring 31, to operate it in the opposite direction.

The chamber 26, of the control valve device 20, is connected with a piston device 32, by a pipe 33 leading to a piston chamber 34, formed in the casing of the piston device 32, such chamber 34 containing a piston 35. Below the piston 35 there is a chamber 36, having a port 37, open to the atmosphere, and containing a spring 38 adapted to engage the piston 35. The piston 35 is provided with a rod 39 which extends through the casing of the piston device and at its end is loosely connected with the outer end of the lever 12. Intermediate the casing of the piston device and the lever 12, this rod is loosely connected with the outer end of the valve lever 19.

Assuming the several parts of the invention to be in their normal positions, as shown in the drawing, fluid under pressure, from a compressor or any other suitable supply source, is supplied to the header 2, through the pipe 4 and from thence flows through the coils 1 to the drain reservoir 3 and then to other parts of the fluid pressure system, through the outlet pipe 5. With the header 2 and the drain reservoir thus charged, and the pressure in both being substantially the same, the pressures on the opposite sides of the diaphragm 21 will be balanced, this being due to the chamber 20 being connected with the header 2, and the chamber 24 being connected with the drain reservoir 3, so that the spring 31, acting upon the valve stem 30, will hold one end of the double seating valve 29 seated, to close the passage 27. When the valve 29 is in this position, the chamber 26 will be open to the atmosphere through the port 28, so that the piston chamber 34, of the piston device 32, which is connected with the chamber 26 of the control valve device, will be vented to the atmosphere through pipe 33, chamber 26 and port 28. With the several parts of the apparatus in the positions just described, the doors 10, mounted on the end wall 8, will be in their open positions, as shown in the drawing, and will thus permit currents of air at atmospheric temperature to freely pass into and out of the chamber 6 through the openings in the end wall 8 which are controlled by the doors 10, and the opening 13 in the end wall 9, and will act upon the coils 1 to cool them and thus cause any water or oil, which may be carried in suspension by the fluid under pressure from the fluid supply source, to condense and deposit on the interior surfaces of the coils, and such deposits will drain into the drain reservoir 3. When desired, the foreign matter, collected in the drain reservoir 3, may be discharged through a suitable drain cock 40.

As long as fluid under pressure flows freely through the coils 1, the pressure in the header 2 and drain reservoir 3, will be substantially the same and the device will operate as just described.

Should the oil deposited in the coils 1 become congealed, or should the condensed moisture freeze in the coils to such an extent that fluid under pressure would not be permitted to flow freely through the coils, the pressure in the header 2 would be greater than that of the drain reservoir 3, and as the header is connected with the chamber 22 of the control valve device by the pipe 23, the pressure in this chamber will be substantially the same as that in the header, and as the drain reservoir 3 is connected with the chamber 24 by a pipe 25, the pressures in these chambers will be unbalanced and the fluid under pressure in the chamber 22 will act upon the diaphragm 21 and move it, together with the double seating valve 29, downwardly, compressing the spring 31 and unseating the upper end of the valve 29, thus permitting fluid under drain reservoir pressure, to flow from the chamber 24 through the passage 27 to the chamber 26. At substantially the same time as the upper end of the valve 29 is unseated, the lower end of the valve is seated, thus closing the port 28 leading to the atmosphere, so that the fluid under pressure flowing into the chamber 26 will not be permitted to escape to the atmosphere through the port 28, but will flow through the pipe 33 to the piston chamber 34, of the piston device 32, and cause the piston 35 and rod 39 to move outwardly, thus compressing the spring 38 in the spring chamber 36, and causing the lever 19 to be operated to rotate the valve 18 to its open position, in which position the valve will permit steam to flow through the steam coil 14. At the same time, the rod 39 will move the outer end of the lever 12 downwardly and the opposite end thereof, and the bar 11 upwardly, causing the doors to swing downwardly to their closed positions. When the doors are in their closed position, the heat from the steam coil 14 will raise the temperature in the chamber 6 so that ice, clogging the coils, will be reduced to liquid form and will drain into the drain reservoir. In the event of the coils being clogged by congealed oil, the heat in the chamber will be great enough to thin the oil, and in this form it will also drain from the coils into the reservoir 3.

When the coil or coils 1 are again cleared of clogging matter, the pressure in the drain reservoir 3 is increased to that of the header 2, at which time the pressures in the chambers 22 and 24 will be balanced and the spring 31, which has been compressed, will act upon the valve stem 30 to move the double seating valve 29 upwardly until the upper portion thereof seats and closes the passage 27, so that fluid under pressure is not permitted to flow from the chamber 24 into the

chamber 26. As the upper end of the valve 29 seats, the lower end thereof is unseated, thus permitting fluid under pressure, in the piston chamber 34, of the piston device 32, to be vented to the atmosphere through pipe 33, chamber 26 and port 28. As the fluid under pressure is thus vented, the spring 38, of the piston device 32, will cause the piston 35 and rod 39 to move back again to their normal positions, as shown in the drawing. As the rod 39 is thus moved, it operates the lever 19 to move the valve 18 to its closed position to shut off the steam from the coil 14, and further operates the lever 12 to move the bar 11 to swing the doors 10 to their open positions so that currents of cool air are again permitted to circulate about the coils 1.

I am aware that many changes may be made in the details and arrangement of the several parts of the device without departing from the invention.

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

1. A device for separating foreign matter from a fluid stream, comprising a member through which fluid flows, the inner wall of said member collecting said foreign matter from the fluid stream, and means for automatically varying the temperature of said member according to the condition of the collected matter in said member.

2. A device for separating foreign matter from a fluid stream, comprising a member through which fluid flows, the inner wall of said member collecting said foreign matter from the fluid stream, and means for automatically varying the temperature of said member according to the condition of the collected matter in said member.

3. A device for separating foreign matter from a fluid stream, comprising a member through which fluid flows, the inner wall of said member collecting said foreign matter from the fluid stream, and fluid pressure operated means for varying the temperature of said member according to the condition of the collected matter in said member.

4. A device for separating foreign matter from a fluid stream and for removing the separated foreign matter from the path of flow of said stream, comprising a member through which fluid flows, the inner wall of said member collecting said foreign matter from the fluid stream and being adapted to conduct said foreign matter out of the path of flow of the fluid stream, and means operable automatically for heating and cooling said member.

5. A device for separating foreign matter from a fluid stream, comprising a member through which fluid flows, the inner wall of said member collecting said foreign matter from the fluid stream, a structure enclosing said member, and means for automatically varying the temperature of the interior of said structure according to the condition of the collected foreign matter in said member.

6. A device for separating foreign matter from a fluid stream and for removing the separated foreign matter from the path of said stream, comprising a member through which fluid flows, the inner wall of said member collecting said foreign matter from the fluid stream and being adapted to conduct said foreign matter from the path of flow of the fluid stream, a structure enclosing said member, and normally open to the atmosphere to permit currents of air at atmospheric temperature to pass therethrough for cooling said member, means operable to prevent said currents from passing through said structure, and means for heating said member when the first mentioned means is operated.

7. The combination with means interposed in a flow of fluid for separating oil and water from the flowing fluid, of means automatically operated upon the clogging of the separating means for applying heat to the separating means to cause the clogging matter to flow from said separating means out of the path of flow of the fluid stream.

8. The combination with means interposed in a flow of fluid for separating oil and water from the flowing fluid, of means operated upon the clogging of the separating means for applying heat to the separating means to cause the clogging matter to flow from said separating means and out of the path of the flow of the fluid, and means automatically operated upon the clearing of said separating means for shutting off said heat and for applying a cooling medium to said separating means.

9. The combination with a coil of pipe through which a stream of fluid flows and in which foreign matter in the fluid stream collects, of a structure enclosing said pipe, a heating unit in said structure, means for controlling the flow of air currents through said structure, and means operated by the differential of fluid pressures between the inlet and outlet of the fluid stream for admitting a heating medium to said heating unit and for preventing the passage of air currents through said structure.

10. The combination with a plurality of vertically disposed sections of coiled pipe interposed between the inlet and outlet of a fluid stream collecting oil contained in said fluid stream and from which the collected oil tends to drain by gravity, heating means adjacent said coils of pipe for heating said pipe when said pipe is clogged, and means operable when said coils of pipe are clogged with oil, for admitting a heating medium to said heating means.

11. The combination with a coiled pipe connecting inlet and outlet means for a fluid

stream and adapted to collect foreign matter contained in said fluid stream, of a structure enclosing said coiled pipe, a heating unit in said structure, doors for controlling openings formed in said structure, a piston device for operating said doors and for controlling the supply of a heating medium to said heating unit, and a valve device connected with said inlet and outlet means and with said piston divice and operative for controlling the flow of fluid under pressure to and from said piston device and thereby controlling the operation of said piston device.

12. The combination with a coiled pipe connecting inlet and outlet means for a fluid stream and adapted to collect foreign matter contained in said fluid stream, of a structure enclosing said coiled pipe, a heating unit in said structure, doors for a controlling openings formed in said structure, a piston device for operating said doors and for controlling the supply of a heating medium to said heating unit, and a valve device operable by the pressures in said inlet and outlet means for controlling the operation of said piston device.

13. A device for separating foreign matter from a fluid stream, comprising a member through which fluid flows and on the inner surface of which said matter is adapted to collect, said member being so disposed that collected foreign matter therein will tend to drain therefrom by gravity, and means operative automatically for applying heat to said member to liquefy foreign matter collected in said member, and operative to apply a cooling medium to said member when said member is free from collected foreign matter.

14. The combination with a coil of pipe through which a stream of fluid flows and in which foreign matter in the fluid stream collects, of means operated by the differential of fluid pressures between the inlet and the outlet of the fluid stream for applying heat to said coil for clearing same of collected foreign matter, said coil being so disposed that the foreign matter collected therein will tend to flow therefrom by gravity.

In testimony whereof I have hereunto set my hand.

CLYDE C. FARMER.