May 19, 1931. C. C. FARMER 1,805,657

AIR PURIFIER

Filed May 9, 1927

Fig. 1.

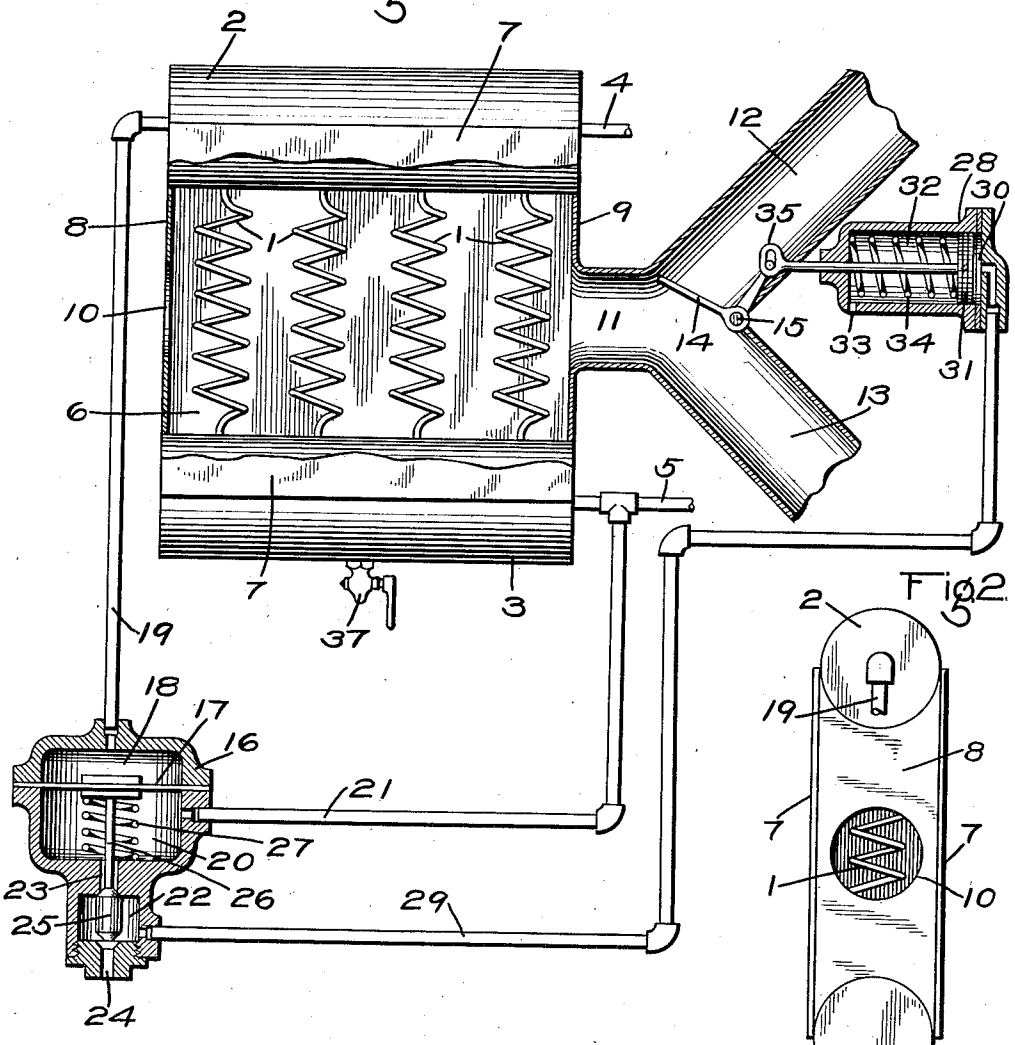

Fig. 2.

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AIR PURIFIER

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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, tends 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 brakes, 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 drawings, 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 within 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 is provided with an opening 10 through which currents of air are adapted to pass. It will be understood that the chamber 6 may be formed in many ways other than that described, and it will also be understood that the opening 10 may be formed in a side wall 7 or any other suitable part of the enclosing structure.

Leading into the chamber 6 there is an air duct 11 through which heated air may be conducted to the chamber from a heated air duct 12 and through which cool air may be conducted from a cool air duct 13, the flow of air through these ducts 12 and 13 being controlled by a gate or damper 14 which may be pivotally mounted upon a pivot pin 15 preferably located adjacent the juncture of the ducts 12 and 13. The operation of the gate or damper 14 is controlled by a control valve device 16. The cool air may be the same temperature as the atmosphere, while the temperature of the heated air is higher than that of the atmosphere and may be supplied from any suitable heating source.

The control valve device 16 comprises a casing which contains a flexible diaphragm 17 having, at one side, a chamber 18 which is connected with the header 2 by a pipe 19. On the other side of the diaphragm there is a chamber 20 which is connected with the drain reservoir 3, through a pipe 21, which connects with the outlet pipe 5. The chamber 20 communicates with a chamber 22 through a passage 23 and the chamber 22 is adapted to communicate with the atmosphere through a passage 24. The opening and closing of the passages 23 and 24 is controlled by a double seating valve 25 contained in the chamber 22, and which is provided with a stem 26 adapted to be acted upon by the diaphragm 17 to operate the valve in one direc-

tion and by a spring 27 to operate the valve in the opposite direction.

The chamber 22 of the control valve device is connected with a piston device 28 by a pipe 29 which leads to a piston chamber 30, formed in the casing of the device, which chamber 30 contains a piston 31. At the left of the piston 31 there is a chamber 32, having a port 33 open to the atmosphere, and containing a spring 34. The piston 31 is provided with a rod 35 which extends through the casing of the device and at its end is loosely connected with a lever arm associated with the damper 14.

Assuming the several parts of the invention to be in their normal positions, as shown in the drawings, 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 system charged, the pressures on opposite sides of the diaphragm will be balanced, due to the chamber 18 being connected with the header 2, and the chamber 20 being connected with the outlet pipe 5, so that the spring 27, acting upon the valve stem 26, will hold one end of the double seating valve 25 seated to close the communicating passage 23. When the valve 25 is in this position, the chamber 22 will be open to the atmosphere through the passage 24, so that the piston chamber 30 which is connected with the chamber 22, by the pipe 29, will be vented to the atmosphere. In its normal position as shown, the damper 14 will close the heated air duct 12 and will permit cool air, from the cool air duct 13, to enter the chamber 6 to act upon the coils 1 to cool them and cause any water or oil, which may be carried in suspension by the air 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 reservoir, may be discharged through a suitable drain cock 37.

As long as fluid under pressure flows freely through the coils 1, the pressure in the header 2 and drain reservoir 3 and outlet pipe 5 are balanced, 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 1 from the header 2 to the drain reservoir 3 and outlet pipe 5, the pressure in the header would be greater than that of the drain reservoir and outlet pipe, and as the header is connected by a pipe 19 with the chamber 18 of the control valve device 16, the pressure in this chamber will be substantially the same as that in the header, and as the pressure in the chamber 20 is, due to its connection with the outlet pipe 5 by a pipe 21, substantially the same as that in the drain reservoir and outlet pipe, the pressures in the chambers 18 and 20 will be unbalanced, and fluid under pressure in the chamber 18 will act upon the diaphragm 17 and move it, together with the double seating valve 25, downwardly, compressing the spring 27 and unseating the upper part of the valve 25, thus permitting fluid under drain reservoir pressure to flow from the chamber 20 through the passage 23 to the chamber 22. As the upper portion of the valve 25 is unseated, the lower portion is seated, thus closing the passage 24 leading from the chamber 22 to the atmosphere, so that the fluid under pressure in the chamber 22 will flow through the pipe 29 to the chamber 30 of the piston device 28 and cause the piston 31 and rod 35 to move outwardly, thus compressing the spring 34 and causing the damper 14 to be rotated, about its pivot pin, a sufficient distance that it will open the heated air duct 12 and close the cool air duct 13. Heated air is now conducted into the chamber 6 through the duct 11, and if the coils are clogged by ice or frost, the heat in the chamber will melt such clogging matter and permit it to drain into the drain reservoir 3, and likewise if the clogging of the coils is caused by congealed oil the heat will cause the oil to become thin enough that it will drain into the reservoir 3. When the coils are thus cleared of foreign matter, the pressure in the drain reservoir will again be raised to that of the pressure in the header 2, at which time the pressures in the chambers 18 and 20 are balanced. The spring 27 which has been compressed, now acts upon the valve stem 26 to move the double seating valve 25 upwardly until the upper portion of the valve seats and closes the passage 23, so that fluid under pressure from the chamber 20 is not permitted to flow into the chamber 22. As the upper portion of the valve 25 seats, the lower portion is unseated, thus permitting fluid under pressure in the chamber 30 of the piston device, to be vented to the atmosphere through pipe 29, chamber 22, and passage 24, which permits the spring 34 which has been compressed, to move the piston 31 and rod 35 back to their normal positions, as shown in the drawings. As the rod 35 is thus moved, it causes the damper 14 to move to again open the cool air duct 13 and close the heated air duct 12.

It will be understood that changes may be made in the details and arrangement of the several parts of the device, without departing from the spirit and scope of the appended claims.

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 the fluid stream flows, the inner wall of said member being adapted to collect said foreign matter from the fluid stream, a structure enclosing said member, an air duct leading into said structure through which cool or heated currents of air are adapted to be introduced into said structure for cooling or heating said member, and means for automatically selecting one or the other of said currents of air.

2. A device for separating foreign matter from a fluid stream, comprising a member through which the fluid stream flows, the inner wall of said member being adapted to collect said foreign matter from the fluid stream, a structure enclosing said member, an air duct leading into said structure through which cool or heated currents of air are adapted to be introduced into said structure for cooling or heating said member, damper means operative for selecting either the heated or the cool air current, and valve means subject to opposing fluid pressures to operate said damper.

3. 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 supplying a heated current of air around the separating means to cause the clogging matter to flow from said separating means, said means being operable upon the clearing of said separating means for closing off the heated current of air and for supplying a cool air current to the separating means.

4. The combination with means interposed in a flow of fluid for separating oil and water from the flowing fluid, of a structure enclosing the separating means, ducts for supplying heated and cool air currents to the interior of said structure for controlling the temperature of said separating means, a damper associated with said ducts for shutting off one or the other of said currents of air, and means for automatically operating said damper.

5. The combination with a coiled pipe through which a stream of fluid flows and in which foreign matter in the fluid stream collects, a structure enclosing said coiled pipe, ducts for supplying a heated and a cool air current to the interior of said structure for heating or cooling said pipe, a damper associated with said ducts and adapted to shut off one or the other of said air currents, and fluid pressure means for selectively operating said damper.

6. 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 pipe, ducts for supplying heated and cool air currents to the interior of said structure, a damper for selectively controlling the flow of said air currents, a piston device for operating said damper to shut off one or the other of said air currents, and a valve device connected with said inlet and outlet means and with said piston device, said valve device controlling the operation of said piston device.

7. 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 pipe, ducts for supplying heated and cool air currents to the interior of said structure, a damper for selectively controlling the flow of said air currents, a piston device for operating said damper to shut off one or the other of said air currents, and a valve device controlled by the pressures in said inlet and outlet means for causing said damper to be operated to select either the heated air current or the cool air current for admission to said structure.

8. 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 the fluid stream flows, the inner wall of said member collecting said foreign matter from the fluid stream and conducting said collected foreign matter out of the path of flow of the fluid stream, and pressure sensitive means for controlling heated and cool air currents about said member.

9. 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 the fluid stream flows, the inner wall of said member collecting said foreign matter from the fluid stream and permitting said collected foreign matter to be discharged from the path of flow of the fluid stream, and pressure sensitive means for controlling heated and cool air currents about said member.

10. 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 the fluid stream flows, the inner wall of said member collecting said foreign matter from the fluid stream and conducting said collected foreign matter out of the path of flow of the fluid stream, and means operative automatically according to the flow of the fluid stream through said member for admitting air at different temperatures around said member.

11. 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 the fluid stream flows, the inner wall of said member collecting said for-

eign matter from the fluid stream and conducting said collected foreign matter out of the path of flow of the fluid stream, and means automatically operative by fluid under pressure according to the condition of the collected foreign matter in said member for supplying air around said member at one temperature at one time and at a different temperature at another time.

12. The combination with means interposed in the flow of fluid for separating oil and water from the flowing fluid and for conducting said separated oil and water from the path of the flowing fluid, of means operated upon the clogging of the separating means for supplying a heated current of air around the separating means to cause the clogging matter to flow from said separating means.

13. The combination with a coiled pipe through which a fluid stream flows and in which foreign matter in the fluid stream collects, of means for conducting a heated air current and a cool air current about said coiled pipe, a damper operative to selectively control the flow of said air currents about said coiled pipe, pressure sensitive means for operating said damper and a pressure sensitive valve device operative to control the operation of said pressure sensitive means.

In testimony whereof I have hereunto set my hand.

CLYDE C. FARMER.