

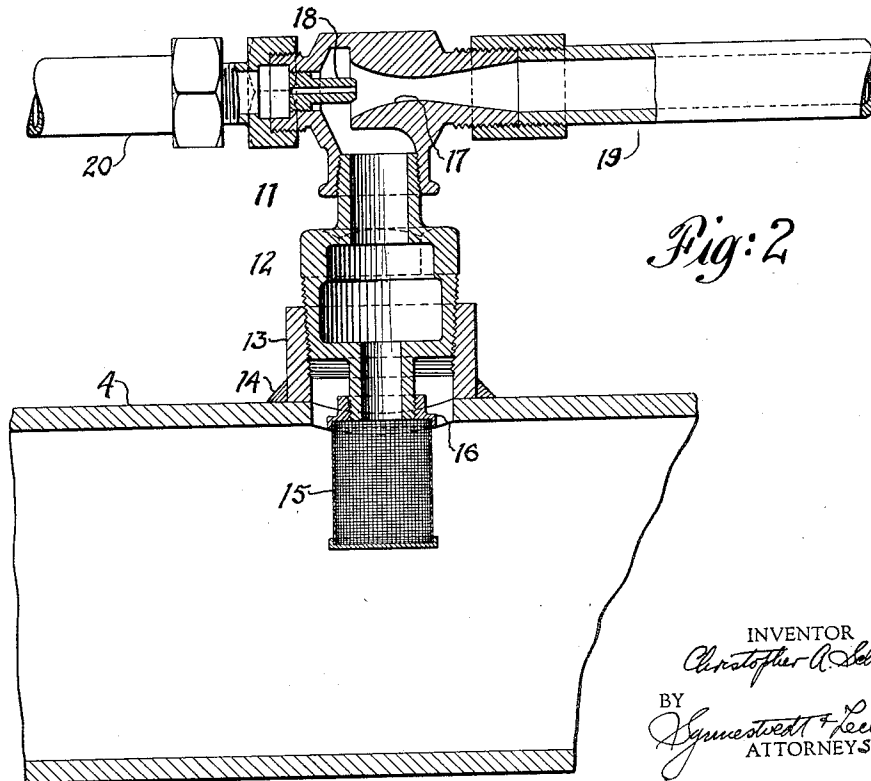
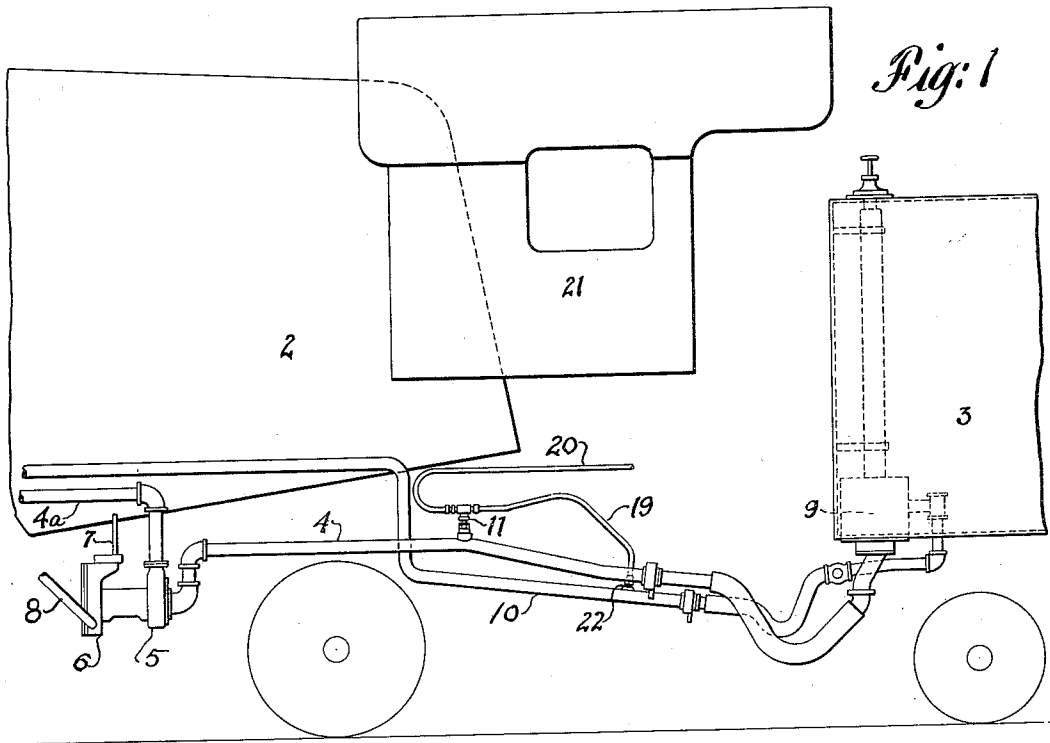
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1,959,929

LOCOMOTIVE FEED WATER SYSTEM

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## LOCOMOTIVE FEED WATER SYSTEM

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9 Claims. (Cl. 122-434)

This invention relates to locomotive feed water systems, and is particularly useful in connection with a system employing a pump for the delivery of water from the tender tank to the boiler.

In such systems, especially where a centrifugal pump is employed, certain difficulties are at times encountered in practice, among which may be mentioned the tendency for air to accumulate in the water intake pipe of the pump when the pump is idle, or in the pump itself, so that the pump, when operated, does not deliver water immediately. Overspeeding of, and injury to, the pump are thereby likely to occur. Another difficulty, common to practically all feed water systems, is the tendency of the line to freeze up in cold weather.

I aim by my invention to overcome these and other disadvantages, and in general to provide means for maintaining water in the pump and suction line at all times, and means for preventing freezing of the pump and connected piping.

More specifically, the invention contemplates the positive exhausting of air from the water line and the setting up of a warm circulation therein, even though the pump be idle for considerable periods.

It is a further object of the invention to provide a single device for accomplishing all of the foregoing objects, and to make such device as simple, inexpensive, and easily installed and repaired, as possible.

How I attain these advantages, and others which are incident to the invention or which will occur to those skilled in the art, will be clear from the following description, taken together with the accompanying drawing, in which:

Fig. 1 is a fragmentary diagrammatic side elevation of a locomotive and tender, with my improvements applied thereto; and

Fig. 2 is an enlarged longitudinal vertical section through a portion of the apparatus of Fig. 1.

In the drawing I have illustrated the rear end of a locomotive 2 and the front end of its tender 3, between which is a feed water line 4. In said line is a water-propelling means, in this case a centrifugal pump 5, adapted to force water through the portion 4a of the line, to the boiler (not shown). The pump here shown may be driven by a turbine 6 having a steam inlet pipe 7 and exhaust pipe 8.

The tender 3 is preferably provided with a water heater 9 (of any suitable type), to which heater a heating medium, such as steam, (or

condensate from a locomotive feed heater or an economizer), may be delivered through the conduit 10.

At a high point in the suction or intake line 4 to the pump, I locate the ejector or air-exhausting device 11 for positively removing air from the system, such device, as seen in Fig. 2, comprising: a connection 12, adapted to be screwed into the pipe 4, or, as here shown, into a nipple 13 secured as by a weld 14 to said pipe; a screen or strainer 15 removably secured to the connection 12, as by a nut 16; a nozzle member 17, which may be removably secured to said connection; and a jet-device 18 removably secured in the nozzle member and positioned to direct a stream through said nozzle; together with an outlet pipe 19 from said nozzle, and an inlet 20 to said jet, through which steam or other suitable fluid under pressure is delivered.

Steam may be admitted to pipe 20 from any suitable source, preferably under the control of the engineman in the cab 21. The outlet pipe 19 is preferably connected to some point in the feed water system removed from the location of the connection 12, to prevent loss of steam (and also of any water which may be ejected with the air) and to warm the feed water system, particularly when the pump is not in operation. I have illustrated said pipe as being connected at a point 22 in the pipe 10 leading to the tender, which, in this particular installation is equipped with a heater 9, hereinbefore referred to.

In operation, it will now be seen, steam (at a low rate of feed) is admitted through pipe 20 to the jet-device 18 and directed through nozzle 17. By the suction thereby created, any air which may collect in the pipe 4 or the pump 5, is drawn through strainer 15, connection 12, and nozzle 17, from which it is discharged with the steam, through pipe 19 into the pipe 10 leading to the source of water. The pump and suction line are thereby always maintained free of air, and the system has, at the same time, a warm circulation set up therein, irrespective of the operation of the tender heater 9, and even though the pump 5 be idle for a considerable period of time.

It will be obvious that the device is simple and inexpensive in construction, easily installed in whatever position may be most advantageous, adapted to prevent wasting of water or steam, and of low cost as to maintenance and repair, the strainer, jet and nozzle devices being readily removable.

What I claim is:—

1. For a locomotive having a boiler with its water supply tank, a feed water system comprising a water delivery line from the tank to the boiler, a feed water pump in said line, the part of the line between the tank and the pump having a portion extending below the pump inlet and another portion located higher than said first mentioned portion, and a fluid operated ejector device connected to the second mentioned portion adjacent the high point thereof whereby to draw off from said portion of the line any air, steam, and the like which accumulates and is pocketed therein by influx or leakage from the tank or the boiler.
2. For a locomotive having a boiler with its water supply tank, a feed water system comprising a water delivery line from the tank to the boiler, a feed water pump in said line, the part of the line between the tank and the pump having a portion extending above the pump inlet and having another portion positioned below the first mentioned portion, and a fluid operated ejector device connected to the first mentioned portion adjacent the high point thereof whereby to draw off from said portion of the line any air, steam, and the like which accumulates and is pocketed therein by influx or leakage from the tank or the boiler.
3. For a locomotive having a boiler with its water supply tank, a feed water system comprising a water delivery line from the tank to the boiler, a rotary feed water pumping unit in said line between the tank and the boiler and positioned with its inlet below the normal low water level of the tank for gravity priming of the pumping unit, the part of the line between the tank and the said unit having a portion positioned below the inlet of the pumping unit and a portion positioned above said inlet, and a fluid actuated ejector device connected to the last mentioned portion of said part of the line adjacent the high point thereof whereby to draw off from said portion of the line any air, steam, and the like which accumulates and is pocketed therein by influx or leakage from the tank or the boiler.
4. For a locomotive having a boiler with its water supply tank, a feed water system comprising a water delivery line from the tank to the boiler, a feed water pumping unit in said line between the tank and the boiler and positioned with its inlet below the normal low water level of the tank for gravity priming of the pumping unit, the part of the line between the tank and the said unit having a portion positioned below the inlet of the pumping unit and a portion positioned above said inlet, a fluid actuated ejector device connected to the last mentioned portion of said part of the line adjacent the high point thereof whereby to draw off from said portion of the line any air, steam, and the like which accumulates and is pocketed therein by influx or leakage from the tank or the boiler, an exhaust steam line on the locomotive delivering into said tank, and a fluid connection from the ejector device delivering into said exhaust steam line.
5. For a locomotive having a boiler with its water supply tank, a feed water system comprising a water delivery line from the tank to the boiler, a feed water pump in said line, a feed water heater connected into the line, the part of the line between the tank and the pump

inlet and another portion below the first mentioned portion, by which arrangement the first mentioned portion of the line and the pump inlet are subject to possible influx or leakage of air, steam, and the like from the heater and the boiler, and a fluid operated ejector device connected to the first mentioned portion adjacent the high point thereof whereby to draw off from said portion of the line and from the pump inlet any such gases which may be there trapped as a result of the relative locations of the high and low portions of the line.

6. For a locomotive having a boiler with its water supply tank, a feed water system comprising a water delivery line from the tank to the boiler, a feed water pump in said line, a feed water heater connected into the line, the part of the line between the tank and the pump having a portion positioned above the pump inlet and another portion below the first mentioned portion, by which arrangement the first mentioned portion of the line and the pump inlet are subject to possible influx or leakage of air, steam, and the like from the heater and the boiler, a fluid operated ejector device connected to the first mentioned portion adjacent the high point thereof whereby to draw off from said portion of the line and from the pump inlet any such gases which may be there trapped as a result of the relative locations of the high and low portions of the line, a locomotive feed heater exhaust or condensate line on the locomotive extending back to the tank, and a connection from the ejector device delivering into said condensate line.

7. For a locomotive having a boiler with its water supply tank, a feed water system comprising a water delivery line from the tank to the boiler, a feed water pump in said line, a feed water heater connected into the line, the part of the line between the tank and the pump having a portion positioned above the pump inlet and another portion below the first mentioned portion, by which arrangement the first mentioned portion of the line and the pump inlet are subject to possible influx or leakage of air, steam, and the like from the heater and the boiler, a fluid operated ejector device connected to the first mentioned portion adjacent the high point thereof whereby to draw off from said portion of the line and from the pump inlet any such gases which may be there trapped as a result of the relative locations of the high and low portions of the line, said heater being located adjacent the tank end of the water line, an exhaust steam line on the locomotive extending to said heater for heating water therein, and a fluid connection from said ejector delivering into said exhaust line.

8. For a locomotive having a boiler, trailing truck mechanism, and a tank forming part of the tender; a feed water system comprising a water delivery line connected to said tank and extending forwardly toward the boiler, a centrifugal feed water pump in said line, between the tank and the boiler and mounted on the locomotive, with its inlet positioned below the normal low water level of the tank, whereby the inlet is normally gravity primed from the tank, the part of the line between the tank and the pump having a portion extending upwardly above the level of said inlet to a location which clears said trailing truck mechanism and having another portion constituting a flexible connection between the tender and the first

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mentioned portion, said latter portion hanging downwardly below the pump inlet, by which arrangement gases tend to accumulate in the line adjacent the pump inlet and destroy the suction of the pump, and an ejector device connected in said high portion of the line and having a steam nozzle with a combining tube adjacent the outlet of the nozzle for withdrawing such gases from said portion.

ing another portion constituting a flexible connection between the tender and the first mentioned portion, said latter portion hanging downwardly below the pump inlet, by which arrangement gases tend to accumulate in the line adjacent the pump inlet and destroy the suction of the pump, an ejector device connected in said high portion of the line and having a steam nozzle with a combining tube adjacent the outlet of the nozzle for withdrawing such gases from said portion, a feed water heater mounted on the tender and associated with the tank end of the water delivery line, a heating line on the locomotive having a flexible connection delivering to said heater on the tender for heating water therein, and a delivery line from said ejector device delivering into said heating line, whereby the lines and flexible connections between the tender and the locomotive proper are heated and the pump inlet is maintained in a primed condition, even when the pump is not operating.

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