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BOILER FEED APPARATUS

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Fig. 1.

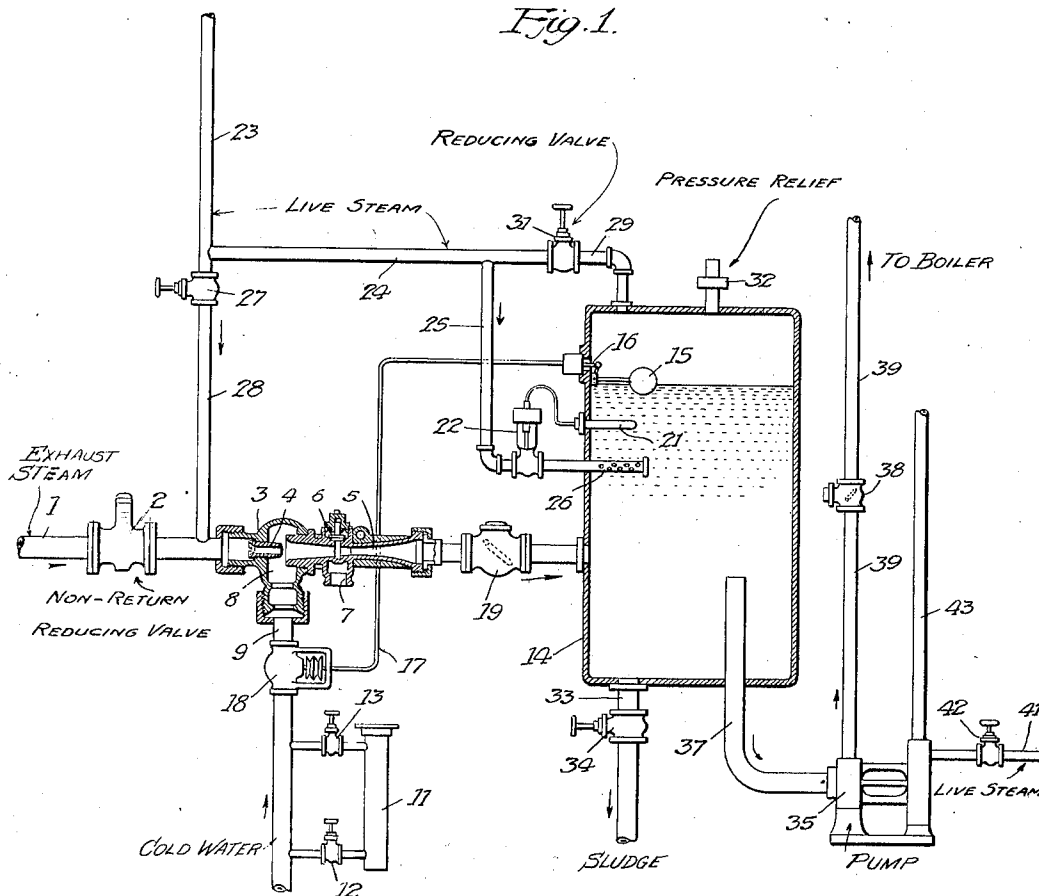
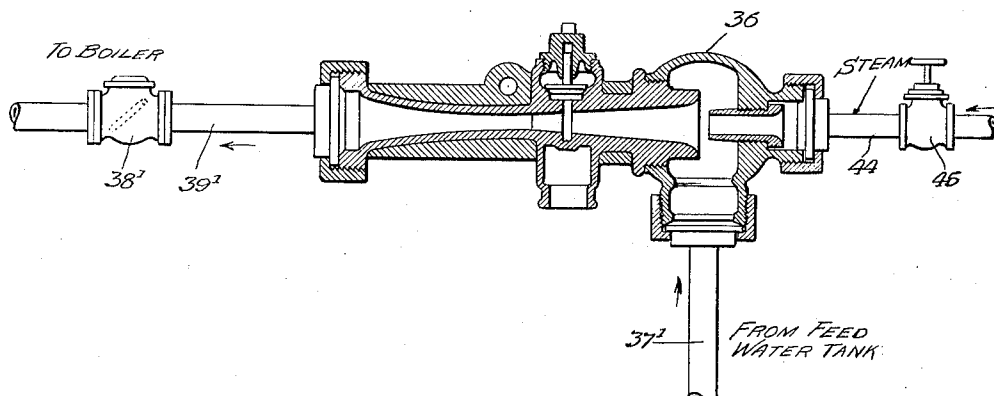


Fig. 2.



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BOILER FEED APPARATUS

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3 Claims. (Cl. 261-77)

This invention relates to boiler feed water heaters and the embodiment herein illustrated is designed particularly for the heating and ejecting of feed water for locomotive boilers.

5 In the effort to increase the operating efficiencies of locomotives, feed water heaters have in many cases been employed, usually of the kind which raise the temperature of the feed water to somewhat under 212° F. and hold it at that temperature at atmospheric pressure until required
10 in the boiler. However, the injection of water of less than 200° F. temperature into locomotive boilers tends to lower the pressure and temperature in the boiler and of course considerable
15 time is required for raising such freshly injected feed water to the proper steaming temperature of the locomotive. This invention provides means whereby a quantity of feed water can be heated to a temperature substantially above 212° F. and
20 held at a pressure considerably above atmospheric pressure so that when this feed water is injected into the boiler there is less resultant pressure and temperature drop in the boiler and less time is needed for further heating of the injected feed
25 water. For the preliminary heating of this feed water I employ exhaust steam which issues from the locomotive cylinders in a very considerable quantity under normal operating conditions.

The principal object of this invention is to provide improved apparatus for preheating of and
30 injecting of feed water in locomotives and various other objects of the invention should become apparent upon a perusal of this specification and the drawing attached thereto.

35 In the drawing:

Fig. 1 is a somewhat diagrammatic illustration of a preferred form of the invention; and

Fig. 2 is a partial sectional view of a feed water injector which may be used to supplant the feed
40 water pump shown in Fig. 1.

In the drawing a pipe 1 is connected with the exhaust steam line leading from the locomotive cylinder (not shown) and is provided with a suitable non-return reducing valve 2 for insuring a
45 supply of exhaust steam to the injector 3 not exceeding a desired maximum pressure.

The exact form of the exhaust steam injector is not a part of this invention, but a preferred form is shown here in the drawing which consists of a steam nozzle 4, a delivery tube 5, a waste
50 valve 6, a waste overflow pipe 7, the body 8 and a water inlet pipe 9. Water is delivered from the main water tender tank through the pipe 9, a part of which may, if desired, be by-passed for
55 water treatment through the chemical container

11 by an obvious manipulation of the valves 12 and 13. The water is delivered by the injector into a tank 14 and is prevented from rising beyond a predetermined maximum height by means of a suitable float ball 15 which operates a link
60 16, which in turn by varying the pressure on a fluid contained in a pipe 17 actuates the siphon controlled valve 18 to close the latter valve when the maximum desired water level in the tank 14 has been attained, but to permit the valve to be
65 opened at other times. When exhaust steam is being delivered by the pipe 1 and the valve 18 is open due to a low water level the steam will inject the water past the check valve 19 into the tank 14. The reducing valve 2 will be so set and
70 the injector so proportioned that the latter will force the water into the tank 14 against a considerable pressure which will be preferably about 40 pounds per square inch, although this may be
75 varied considerably.

A thermostat 21 will be employed to operate a valve 22 of suitable construction for admitting live steam from a live steam supply pipe 23
80 through the pipes 24 and 25, through a perforated pipe 26 to thereby raise the temperature of the feed water in the tank 14 to any desired temperature.

In case the supply of exhaust steam should be lacking live steam may be conducted from the pipe 23 through a reducing valve 27, which would
85 be opened for this purpose and regulated to reduce the steam pressure preferably to about five pounds per square inch. This live steam would then be admitted through the pipe 28 into the exhaust steam injector to enable the operator to
90 replenish the supply of water in the tank 14 even though exhaust steam might not at that time be available for the purpose.

In order that pressure may be maintained at all times in the tank 14 a pipe 29 communicates
95 with the interior of the tank 14 and with the live steam supply and is provided with a reducing valve 31 which will be so set as to regulate the pressure in the tank 14 at a desired figure such, for example, as 40 pounds per square inch. It is
100 obvious that instead of employing live steam for maintaining this pressure in the feed water tank a connection may be made with the compressed air supply on the locomotive. To prevent the pressure in the tank 14 from rising too high a
105 relief valve 32 will be provided communicating with the top of the tank as shown, and discharge it into the atmosphere.

Should any sludge accumulate in the bottom of the feed water tank it may be withdrawn from
110

time to time therefrom through the pipe 33 and valve 34.

For feeding the water from the tank 14 into the boiler a pump 35, shown in Fig. 1, or the injector 36, shown in Fig. 2, may be employed. When the pump 35 is used the outlet pipe 37 will conduct the feed water to the pump 35 which will deliver it through the check valve 38 and pipe 39 into the boiler (not shown) as and when needed. The pump will be supplied with live steam through the pipe 41 and valve 42 and its exhaust steam will be taken away through the pipe 43.

In case it is desired to use the live steam injector 36, shown in Fig. 2, the pipe 37' will take the water from the feed water tank 14 in the same manner as does the pipe 37 while live steam will be admitted into the injector through the pipe 44 under control of the valve 45 and will deliver the mixture of steam and water through the pipe 39' and check valve 38' into the boiler (not shown). The construction of the live steam injector is obviously the same as that of the exhaust steam injector 3 and requires no further description, although it should be understood that both of these injectors may be varied in the proportions of their parts to take care of different operating conditions. These variations, however, form no part of this invention.

The device operates as follows: Whenever the water level in the feed water tank is lower than its maximum desired level the float ball 15 will open the valve 18 and as soon as exhaust steam is available or should the operator admit live steam through the reducing valve 27 the injector 3 will begin to operate and deliver water against pressure into the tank 14, pressure being maintained therein by means of the valve 31 and pipe 29 connected with the live steam source or compressed air source. As soon as the proper water level has been attained in the tank 14, the valve 18 will close and cut off the injecting action of the injector 3. The thermostatically controlled valve 22 will serve to maintain the proper water temperature in the feed water tank. The pump 35 or the live steam injector 36 will be employed to inject this preheated feed water into the boiler when and as needed.

When the exhaust steam injector alone is used

it will, of course, raise the temperature of the water which it injects into the tank 14 quite considerably and when both injectors are used the second injector will further increase the temperature of the feed water in an amount depending upon any desired adjustment made by the operator.

It should be understood that this invention is susceptible of incorporation in various embodiments all of which will employ the principles of this invention and remain within the scope of the appended claims.

Having shown and described my invention, I claim:

1. Boiler feed apparatus comprising a closed tank normally sealed apart from the atmosphere, an exhaust steam injector constructed and arranged for heating and supplying water to the tank against pressure, means for controlling operation of the injector in accordance with the tank water level, means independent of the exhaust steam for maintaining a predetermined water temperature within said tank, and means for delivering water from the tank to a place of use thereof.

2. Boiler feed apparatus comprising a closed tank normally sealed apart from the atmosphere, an exhaust steam injector constructed and arranged for heating and injecting water into the tank against pressure, means for maintaining a uniform positive pressure in the tank, means for controlling the operation of the injector in accordance with the water tank level, thermostatically controlled means for injecting live steam into the tank, and means for delivering water from the tank to a place of use thereof.

3. Boiler feed apparatus comprising a closed tank normally sealed apart from the atmosphere, an exhaust steam injector constructed and arranged for heating and injecting water into the tank against pressure, means for controlling the operation of the injector in accordance with the water tank level, thermostatically controlled means for injecting live steam into the tank, means independent of the tank temperature for maintaining a uniform pressure therein, and means for delivering water from the tank to a place of use thereof.

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