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BLOW-OFF DEVICE FOR STEAM BOILERS

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BLOW-OFF DEVICE FOR STEAM BOILERS

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1 Claim. (Cl. 122—382)

This invention relates in general to steam boilers, and more particularly, to improvements in means for removing scale forming substances and other impurities from the boiler water.

While, for convenience, the invention is illustrated and described as applied to a steam locomotive boiler, it will be understood that it finds a wide field of utility for other analogous purposes.

Those skilled in the art to which this invention pertains know that steam boilers, especially locomotive boilers, are subject to scale formation on the inner surfaces of the boiler, crown sheet, and tubes due to the impurities carried into the boiler in the feed water, and that in this art, a number of attempts have been made to provide a so-called blow-off device by which the sediment, sludge and other scale producing impurities in the water can be removed from the boiler after each run of the locomotive. These devices are unsatisfactory for the reason that much of the scale formation takes place in the boiler while it is in operation and before blowing off, and the result is that blowing off the boiler intermittently, that is, after a predetermined time, does not remove the scale. Furthermore, the boiler has to be placed out of service in order that this scale can be removed. It has also been determined that scale formation in the boiler results from scale forming substances in the boiler water either those in solution or in suspension and it is one of the principal objects of the present invention to remove these substances from the boiler and the boiler water automatically and substantially continuously, while the boiler is in operation and without requiring any constant attention on the part of the engineer or fireman.

This invention has as further objects, the provision in a steam boiler of an improved means for substantially continuously removing sediment, scale forming substances and the like, which collect at or near the bottom, while the boiler is in operation; the provision of an improved blow-off device which is adapted to substantially continuously remove injurious substances from the boiler water during operation of the boiler, whereby to lengthen the period of service and life of the boiler and to shorten the period of lay-up for cleaning; the provision of an improved blow-off device which increases the efficiency in operation, preventing passage of sediment to the cylinders and pistons and other working parts of the engine; the provision of an improved device of the character described which as an auxiliary may be employed for heating the feed water to the boiler without the transmission of the waste substances, sediment, sludge and the like to the said feed water; the provision of an improved blow-off device for steam boilers in which the sediment receptacle is connected so that boiler water containing the removed sediment enters the receptacle at a point which prevents stirring up of the refuse contents of the receptacle to prevent the formation of scale in the discharge passageway of the device and as well permits of returning the refuse water to the feed water; the provision of an improved blow-off device for steam boilers which rapidly removes the impurities collecting at the lower portion of the steam boiler, while the latter is in operation, by tapping into the boiler at a plurality of separated points; and the provision in a blow-off device of means which permits of periodic cleansing of the sediment collector without shutting down the boiler and in fact, while the boiler is in operation on a locomotive for example, during its run.

This invention also includes an improved construction of the sludge collector or filterer which permits of returning the refuse water to the tank of the water supply for the boiler for example, to the locomotive tender without the transmission of any impurities to the feed water.

The foregoing and such other objects and advantages as may appear or be pointed out as this description proceeds are attained in the structural embodiment illustrated in the accompanying drawings in which:

Fig. 1 is a plan view schematically showing a steam locomotive and tender with the device of this invention installed thereon;

Fig. 2 is a side elevation of the structure shown in Fig. 1;

Fig. 3 is a transverse vertical sectional view taken on the line 3—3 of Fig. 2, showing the arrangement of taps in the locomotive boiler;

Fig. 4 is an enlarged vertical sectional view of the sediment collector or filtering device of this invention;

Fig. 5 is a detail of an alternative form of the invention; and

Fig. 6 is a further alternative form of the device shown in Fig. 4.

Referring now more particularly to the drawings and first to Figs. 1 and 2, a steam locomotive is generally outlined in dotted lines, the boiler 5 having the conventional fire-box 6, the bottom portion thereof being of the conventional construction such as is shown in Fig. 3, that is, the shell 5a is spaced from the crown sheet 7 and the water legs 8 terminate in the mud ring 9. It is
at the latter point, that a large percentage of the sediment representing impurities of the feed water will collect in the operation of the boiler.
The locomotive tender is shown at 10 and has the
usual water tank 11.

Referring again to Figs. 1 and 2, I provide a plurality of taps 12, 12 which are taken off from the steam boiler at separated points along the mud ring and along the lower portion of the barrel of the boiler, all connecting with an outlet pipe formed in sections 13 and 14 extending along a convenient part of the boiler externally thereof. These pipe sections 13 and 14 are substantially unrestricted and allowing free flow of boiler water under boiler pressure through to the blow-off device of this invention.

The pipe 13 is tapped by a short pipe section 15 having a shut-off cock 16 arranged therein, which cock may be employed to shut off the water from the boiler in the event of accident to the blow-off device.

The pipe 15 leads to and discharges at the upper portion of a receptacle 17 which may be termed a sediment collector or water filterer, the latter having stop 18 controlled by a valve 19. The valve 19 may be manually operated from time to time from the cab of the locomotive by a system of rods 20 so that while the engine is in operation on a run, the sediment may be blown from the receptacle 17 without shutting down the boiler.

In normal operation, the water from the boiler under boiler pressure flows to the receptacle 17, the valve 19 being closed and this water passes out through a discharge conduit 21 extending from the upper portion of the receptacle 17 and through sections 22 and 23 and a flexible hose 24 and is discharged at 25 into the water tank of the tender. Thus feed water contained in the tank 11 will be heated by the hot water passing through the sediment collector under boiler pressure.

The construction of the blow-off device is best illustrated in Fig. 4. As shown in Fig. 4, the chamber or receptacle 17, which is substantially cylindrical, has an inlet 18a to which the pipe 15 is connected so that water under boiler pressure from the lower portion of the boiler and carrying the sediment, passes into the receptacle 17 at the upper portion thereof. The pipe 18 is connected at or near the bottom of the receptacle 17 for the purpose already described.

Water which enters the receptacle 17 is substantially continuously discharged therefrom subject to restriction as described below by the provision of a screen structure 26 lying within the receptacle and a constricted passageway 27 interposed in the pipe 21 externally of the receptacle.

The screen structure includes a plurality of bushing members 28, 29, and 30, and a retaining cap 31, the uppermost bushing 28 being retained in a reducing bushing 32 which latter is threaded into a suitable opening 33 formed in the top of the receptacle 17. Between each of the bushings 28 and 29, 29 and 30 and between the bushing 30 and cap 31, I provide screen plates 34, 35, and 36 respectively. These plates have perforations in them of progressively decreasing size from the lowermost to the topmost so that sediment or any other impurities in the water entering the receptacle 17 will be checked and prevented from entering the pipe 21. The constricted passageway 27 controls the flow of discharge or refuse water from the receptacle 17. It will be seen that by admitting the boiler water through the pipe 15 at the top of the receptacle, this water entering cannot air up the sediment collecting at the bottom of the receptacle, and thus a substantially well defined demarkation will exist between the water entering and leaving the receptacle insuring that substantially all of the sediment extracted from the water by gravity will remain in the receptacle 17 and not be carried into the pipe 21. This enables me to conduct the refuse water to the locomotive tender, especially in view of the provision of screens. Therefore, by introducing boiler water with its impurities substantially continuously under boiler pressure at the top of the receptacle and removing the water substantially clear of sediment at a point well above the bottom of the receptacle through screens and subject to the rate of flow determined by the constricted passageway 27, I am enabled to return the water which otherwise would be wasted by discharging to atmosphere to the feed water supply thus heating and softening the same. This has not heretofore been practicable to my knowledge for the reason that no effort has been previously made to substantially entirely cleanse the refuse water, by preventing stirring up of the sediment discharged from the boiler water as it enters the receptacle.

In Fig. 5, I have illustrated a novel construction for dispersion of the hot water in the tank of the tender. The pipe 23 is shown and is connected by couplings 24a, 25a and 26a to perforated pipe sections 31, 31 arranged about the tank of the locomotive tender or other water supply tank so that a dispersion or distribution of the hot refuse water is obtained and to thereby enhance heating of the feed water.

An alternative form of the receptacle is shown in Fig. 6, this receptacle 17a having the screen structure 38 arranged in the side wall 39 and discharging laterally of the receptacle with the constricted passageway 40 discharging downwardly instead of horizontally as shown in Fig. 4. The inlet for boiler water is shown at 41 and the outlet for removing sludge is shown at 42. In this form of the invention by virtue of the provision of the screen structure 38, I am enabled to dispose passageway 40 externally of the receptacle 17a and thus prevent clogging as in Fig. 4, and in addition by placing the constricted passageway 40 in a vertical instead of a horizontal position to prevent clogging of the passageway due to the collection of scale, sediment or the like is substantially entirely eliminated.

In both forms of the invention shown in Figs. 5 and 6 it will be seen that the advantages of placing the inlets 16a and 41 at the top and discharging off the water at a point well above the sediment a substantially clean refuse water will be obtained.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

In combination with a boiler and a source of feed water therefor, a boiler blowoff device for the boiler including a receptacle adapted to catch and retain foreign substances from the boiler and having a connection to receive water from the water space of the boiler independently of the source of feed water, a passageway from said receptacle having filtering means and a constriction therein for controlling the rate of flow of water from the receptacle and boiler solely in response to steam pressure in the boiler and independently of the source of feed water said filtering means being located in advance of said constriction.

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