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CONTROLLED CIRCULATION BOILER WITH NOVEL ORIFICE-SCREEN MEANS


Application March 25, 1953, Serial No. 345,175

4 Claims. (Cl. 122—360)

This invention relates to controlled circulation boilers and has specific reference to such a boiler provided with a novel orifice-screen arrangement disposed within the inlet headers of the various heat absorbing circuits of the boiler.

The invention provides a controlled circulation boiler fired by a suitable burner and having a plurality of heat absorbing tubes positioned therein. The inlets of these tubes are connected to an inlet header while the outlets are connected to a suitable drum from the lower portion of which depends a downcomer leading to a circulating pump. The circulating pump is connected to the downcomer and is effective to force boiler water into the inlet header from which it flows through the heat absorbing tubes and into the drum. An orifice mount having a suitable orifice therein is positioned within the inlet header at the inlet end of each of the heat absorbing tubes. One end of each of these mounts projects into the interior of the header and an outwardly extending radial shoulder is provided on each of the mounts intermediate their ends but adjacent this innermost end. In order to retain these orifice mounts in place at the inlets of the heat absorbing tubes and to prevent foreign matter which enters the header from clogging the orifice, suitable screen members are associated with the orifice mounts. Each of these screen members accommodates two orifice mounts and is made up of a base plate bored to receive the inner ends of the two orifice mounts so that the plate bears against the shoulders of the mounts. A screen is secured to this base plate and therewith forms a completed closure for the ends of the orifice mounts. The screen member is retained in engagement with the orifice mount by means of a stud welded to the header extending through the central portion of the screen member with nuts or the like threaded on the end of the stud.

It is an object of this invention to provide a controlled circulation boiler with an orifice-screen arrangement which is extremely compact, readily removable and especially well adapted for use in headers of small transverse section.

Other and further objects of the invention will become apparent to those skilled in the art as the description proceeds.

With the aforementioned objects in view, the invention comprises an arrangement, construction and combination of the elements of the boiler in such a manner as to attain the results desired as hereafter more particularly set forth, showing details of the illustrative embodiments; said embodiments being shown by the accompanying drawings wherein:

Figure 1 is a diagrammatic representation of a controlled circulation hot water boiler.

Figure 2 is a sectional view taken along 2—2 of Figure 1 showing the disposition of the heat absorbing circuits in the boiler.

Figure 3 is a sectional view taken along line 3—3 of Fig. 1 showing a portion of the inlet header and a preferred embodiment of the orifice-screen arrangement disposed therein.

Figure 4 is a sectional view taken along line 4—4 of Figure 3.

Figure 5 is a view similar to that of Fig. 4 but showing a modified form of orifice mount.

While the illustrative boiler disclosed in the drawings is of the hot water type it is to be understood that insofar as this invention is concerned it may equally well take the form of a steam generator.

Referring now to the drawings, wherein like characters are used throughout to designate like elements, the diagrammatic hot water boiler of Fig. 1 comprises casing 10 within which is positioned a plurality of heat absorbing circuits or tubes 12 and into which fuel is introduced through burner 14. The inlet ends of tubes 12 are connected to and communicate with the interior of header 16 while the outlets of these tubes are connected to drum 18. In order that a emergency orifice mount 12 can be connected to a given header the connections are staggered as shown in Fig. 3 with adjacent connections being transversely displaced with respect to the headers. Boiler water is circulated from drum 18 through downcomers 20 to pump 22 which forces it through heat utilizing member 24, which may be of any form, here illustratively shown as a radiator, and then into inlet header 16 through a suitable inlet opening.

From header 16 the water flows into and through heat absorbing tubes 12 and back into the drum 18.

In order to have an efficiently operating boiler the flow of water through each of the heat absorbing tubes 12 is regulated in a predetermined manner by means of suitable orifices positioned at the inlets of these tubes. In the illustrative embodiment of Figs. 2 and 3 the orifices are welded to the header 16 adjacent the outer ends of the outlet openings 26. Disposed within these outlet openings and welded to the header 16 are orifice adaptors 30 which extend into the interior of header 16 and are provided at their inner ends with counterbore 30 and radial flange 32. Loosely received within counterbore 30 in abutting engagement with the header 16 is orifice mount 34 which is provided intermediate its end with radial flange 35 complementary to flange 32 of orifice mount 30 and which has orifice plate 36 pressed fitted within its inner end.

With boilers of large capacity it is often necessary to provide different heat absorbing circuits with different sized orifices because one circuit is longer or located within a hotter zone than another circuit. When this is the case it is desirable to provide some means for positively indexing the orifice that is designed for a particular circuit with that circuit. For purpose flange 32 of orifice adaptors 28 is provided with two angularly spaced axially extending pegs 38 received in similarly spaced bores in flange 35 of orifice mounts 34. The angular spacing of these pegs and the size of orifice in a particular boiler is different so that an orifice which is designed for one circuit cannot be installed at the inlet of another circuit which requires a different sized orifice.

Orifice mounts 34 are positively retained within adaptors 28 by means of screen members 40 each of which embraces an adjacent pair of orifice mounts as disclosed in Figs. 3 and 4. Screen member 40 comprises base plate 42 which is provided with bores 44 that receive the inner ends of orifice mounts 34 so that the base plate bears upon the shoulder of flange 35 of the orifice mounts. The base plate has an upturned edge 46 within which is received and welded thereto screen 48 which, together with base plate 42, forms a complete enclosure for the inner ends of the orifice mounts. Each of the perforations in screen 48 is of less area than the orifice formed in orifice plate 36 but the total area of these perforations is greater than that of the two orifices. Extending centrally through screen member 40 is stud 50 which has one end welded to the inner wall of header 16 and which is surrounded by sleeve 52 the latter being welded to screen 48 and bearing against base plate 42. The screen member and orifice assembly is maintained in operative relation within the header by nuts 54 threaded on the end of stud 50.

With this arrangement the screen member and orifice mounts may be readily removed for maintenance or repair by merely removing closure 56 for handhole 58 and thereafter removing nuts 54 from stud 50. Screen member 40 may then be removed from stud 50 and after which orifice mounts 34 may be removed from adaptors 28. The screen members and orifice mounts are loosely fitted so that they may be easily removed by hand.
The illustrative embodiment of Fig. 5 is similar to that of Figs. 3 and 4 except that the orifice arrangement is modified somewhat. In this embodiment the inlet ends of heat absorbing tubes 12 extend completely through wall of header 16 and a short distance into the interior of the header with the innermost extremities of these tubes being slightly flared outwardly.

Loosely positioned within the inner ends of tubes 12 are orifice mounts 60 which extend beyond the ends of the tubes into the interior of the header and which have an orifice of predetermined size formed therein. The periphery of orifice mounts 60 is stepped and provided with a taper which is generally complementary to and engages the base plate 12 thereby limiting the distance the orifice mounts project into the end of the tubes. The innermost end of the orifice mounts is externally threaded for the reception of a nut or the like to facilitate removal of the orifice mount from the tube in the event that such removal is difficult. The inner extremity of orifice mounts 60 is provided with an annular lip 62 which is received within openings 44 formed in base plate 12 with the base plate being engaged radial shoulder 64 formed adjacent the inner end of the orifice mount. Screen member 40 is identical with that of the embodiment of Figs. 3 and 4 and retains orifice mounts 60 within the ends of tubes 12 in the same manner that orifice mounts 34 are retained within adaptors 28.

While we have illustrated and described two preferred embodiments of our invention it is to be understood that such is merely illustrative and not restrictive and that variations and modifications may be made therein without departing from the spirit and scope of the invention. We do not wish to be limited to the precise details set forth but desire to avail ourselves of such changes and alterations as fall within the purview of our invention.

What is claimed is:

1. In a controlled circulation boiler, the combination of a header having an inlet opening and a plurality of pairs of outlet openings with tubes 12 the ends of each of which is provided an axial lip directed inwardly of the header, a screen member in the form of a complete box-like enclosure having a base plate, the roof and side of said box-like enclosure being perforate with each perforation being of less area than that of each orifice but all the perforations being of a greater total area than that of the two orifices, said base plate having spaced openings which receive the lips formed on the orifice mounts so that the base plate bears against the radial shoulder formed in said mounts at the radial inner portion thereof of which is provided an axial lip directed inwardly of the header, a screen member in the form of a complete box-like enclosure having a base plate provided with openings which receive the lips formed on the orifice mounts so that the base plate bears against said radial shoulders, a stud welded in said header opening and extending through the screen member and member disposed on said stud and effective to retain said screen member in engagement with said orifice mounts and thereby retain said orifice mounts in place.

2. In a boiler of the type described the combination of a header having an inlet and two closely spaced outlets, tube means positioned within said outlets, an orifice mount inserted in each of said tube means, each of said orifice mounts having an orifice of predetermined size disposed therein, means effective to limit the distance that said orifice mounts are inserted in said tube means so that said orifice mounts project into the header, the end of said mounts that project into said header having an outwardly extending radial shoulder at the radial inner portion of which is provided an axial lip directed inwardly of the header, a screen member in the form of a complete box-like enclosure having a base plate, the roof and side of said box-like enclosure being perforate with each perforation being of less area than that of each orifice but all the perforations being of a greater total area than that of the orifices, said base plate having spaced openings which receive the lips formed on the orifice mounts so that the base plate bears against the radial shoulder formed in said orifices, said base plate having spaced openings which receive the lips formed on the orifice mounts so that the base plate bears against the radial shoulder formed in said mounts and thereby retain said orifice mounts in place within said said tube means.

3. In a controlled circulation boiler the combination of a header having an inlet and a pair of outlets, each of said outlets having a tube extending therethrough into the header, the end of said tubes extending into the header being flared outwardly, an orifice mount disposed within one of said ends of said tubes and extending therefrom into said header, said orifice mount having an orifice of predetermined size disposed therein and a tapered outer extremity of said orifice mount having the flared portion of the tube ends to limit the distance said mount can be inserted in said tube so that said mount projects into the header, the end of said mount that projects into the header being internally threaded and having an outwardly extending radial shoulder at the radial inner portion of which is provided an axial lip directed inwardly of the header, a screen member in the form of a complete box-like enclosure having a base plate provided with openings which receive the lips formed on the orifice mounts so that the base plate bears against said radial shoulders, a stud welded in said header opening and extending through the screen member and member disposed on said stud and effective to retain said screen member in engagement with said orifice mounts and thereby retain said orifice mounts in place within the ends of said tubes.

4. In a boiler of the type described the combination of a header having an inlet and two closely spaced outlets, a tubular orifice adaptor secured within each of said outlets and having a flanged end extending into the interior of said header, a cylindrical orifice mount telescoped a predetermined distance within the flanged end of each of said adaptors and having a flange intermediate its ends and overlying the flange of said adaptor, one of said flanges having angularly spaced projections snugly but slidably received in similarly angularly spaced relieved portions formed on the other flange, said orifice mounts having an orifice of predetermined size disposed therein, a screen member comprising a base plate bored to receive the inner ends of the orifice mounts and bear against the flanges formed on said mounts, a screen secured to said base plate and therewith forming a complete enclosure so constructed and arranged that water in passing from the inlet of the header to the orifices in said orifice mounts must flow therethrough, a stud welded to said header intermediate said spaced outlets and extending through the screen means, and removable means disposed on said stud and effective to retain said screen member in engagement with said orifice mounts and thereby retain said orifice mounts in place within said header.