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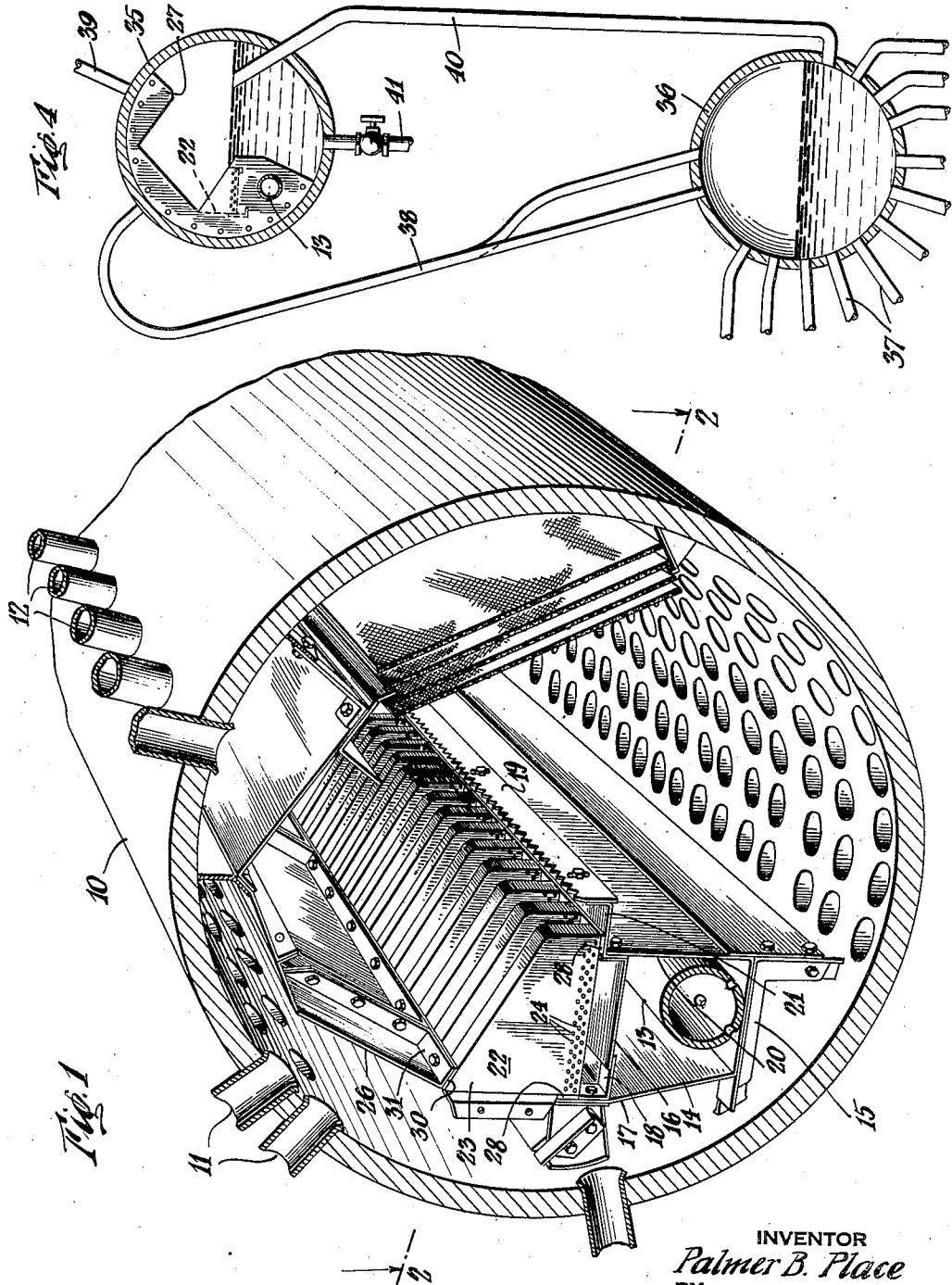
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2,232,265

STEAM WASHING APPARATUS

Original Filed Jan. 22, 1937

2 Sheets-Sheet 1



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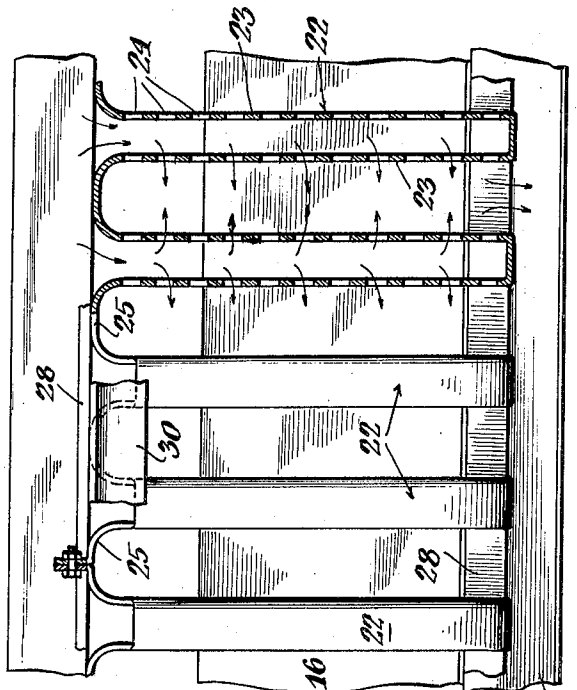
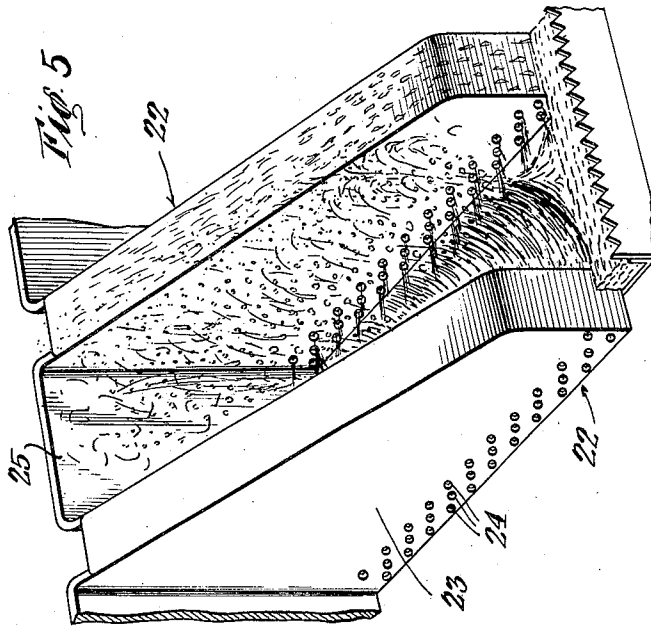
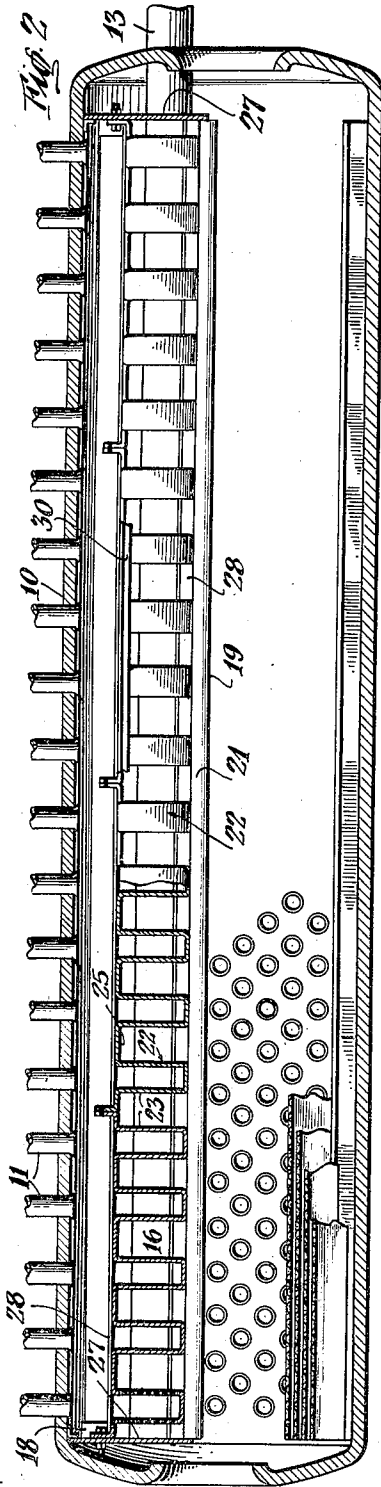


Fig. 3

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2,232,265

STEAM WASHING APPARATUS

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Continuation of application Serial No. 121,829,
January 22, 1937. This application August 3,
1938, Serial No. 222,835

3 Claims. (Cl. 261-124)

The present invention relates to an improved method of washing steam and to improvements in steam washing apparatus for this purpose.

In accordance with the invention steam generated in a boiler is washed by a thorough admixture with the relatively pure feed water for the boiler in order to remove impurities from the steam. The apparatus of the invention is particularly adapted to be mounted within the steam and water drum of a boiler and consists essentially of a plurality of box-like compartments mounted on a feed water trough within the boiler drum. Feed water is supplied to the trough so that it flows across the latter and spills over a weir at one side thereof into the drum, the walls of the compartments on the trough being provided with apertured portions submerged in the feed water. Steam entering these compartments from the boiler tubes to pass to the take-off connections leading from the boiler drum jets through the apertures in the compartment walls into a narrow space between adjacent compartments. Jets of steam from adjacent compartments are directed toward each other so as to create an intimate and thorough mixture of steam and water by breaking up the body of water in the space between the compartments into many small droplets.

The invention will best be understood upon consideration of the following detailed description when read in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view of part of a steam and water drum of a boiler provided with a steam washer in accordance with the present invention;

Fig. 2 is a longitudinal sectional view on line 2-2 of Fig. 1;

Fig. 3 is a fragmentary plan view on an enlarged scale showing the steam compartments, part being shown in section;

Fig. 4 is a diagrammatic view illustrating the deconcentrator of the invention mounted with a drum separate from the steam and water drum of the boiler; and

Fig. 5 is an enlarged perspective view of part of the apparatus illustrating its steam washing action.

Referring to the drawings, the numeral 10 designates the steam and water drum of a boiler to which steam is delivered through the tubes 11 and from which the steam is taken off through the tubes 12, both sets of tubes being arranged in rows along the axis of the drum. An apertured pipe 13 for supplying feed water to the boiler ex-

tends longitudinally of the interior of drum 10 within a chamber 14 supported on the inner wall of the drum by angle irons 15. The chamber 14 is closed at its bottom, ends and along each side to prevent direct commingling of the feed water with water in the drum. Its upper end is partially closed by a plate 16 forming part of a trough onto which the feed water rises to flow thereacross and spill over a serrated weir 19 into the boiler drum. As shown herein the plate 16 terminates short of the rear longitudinal wall 17 of chamber 14 and is attached to the latter by angle irons 18. The forward edge of the plate 16 has a flange for attaching it to the adjacent front wall 20 of chamber 14. A plate 21 extending forwardly from the upper edge of the inner wall 20 of chamber 14 forms a continuation of the trough. Plate 21 has oppositely directed flanges along its longitudinal edges, the rear flange being utilized to mount it on the wall 20 and weir 19 being adjustably mounted on the forward flange of the plate 21.

A plurality of box-like steam receiving compartments 22 extend transversely of the trough 16, 21 in closely spaced relation along the latter. The compartments 22 are open at their rear ends to receive steam from the delivery tubes 11 and, in the embodiment described herein, are also open at their bottoms. The side walls 23 of the compartments are provided adjacent their lower edges with a plurality of rows of small discharge apertures 24 through which steam escapes from the compartments to jet at high velocity into the body of water on the trough 16, 21. The intervals between the compartments 22 at the rear ends thereof are closed by plates 25 which, in effect, constitute continuations of a partition 26 extending from the top rear edges of the compartments to the inner wall of drum 10 at a point between the delivery tubes 11 and take-off tubes 12. The steam space between partition 26 and tubes 11 is closed near the ends of drum 10 by end partitions 27 connected with partition 26 and the outer side walls of the endmost compartments.

In the embodiment of the invention illustrated herein the compartments 22 are divided into two groups each consisting of a number of compartments connected together so that they may be removed as a unit. For this purpose the plates 25 that close the intervals between the rear end edges of the compartments forming each group are attached to adjacent compartments, for example, by welding or otherwise integrally joining them to the side wall plates 23 of adjacent com-

partments. Bars 28 are also suitably attached to the bottom edges of the side wall plates 23 at their forward ends and to the lower portions of their rear edges. The compartments forming each group are also joined at the rear of their top walls by bars 30 which also serve to support the compartments from an angle portion 31 at the lower edge of the partition 26.

The boiler feed water enters drum 10 through the pipe 13 and flows from the latter through apertures spaced along its axis into the chamber 14 and rises onto the trough formed of the plates 16 and 21, the water flowing across the trough and spilling over the weir 19 into the drum. The weir 19 is located at such a height that the side walls 23 of the compartments 22 are immersed in the feed water to a depth submerging the rows of apertures 24.

Steam entering drum 10 through the delivery tubes 11 enters the compartments 22 inasmuch as its path to the take-off tubes 12 is cut off by the partitions 26, 27 and the plates 25 constituting a continuation of the latter. The steam escapes from the interior of chamber 22 through the apertures 24 and jets at high velocity into and close to the surface of the body the feed water located on troughs 17, 21 in the intervals between the compartments 22 so that impurities are removed from the steam by washing it in continuously renewed fresh feed water.

The compartments 22 are so closely positioned adjacent each other longitudinally of the drum as to form narrow confined spaces, for example two to two and a half inches wide, which are closed at the sides by the side walls 23 of adjacent compartments and at their rear ends by the plates 25. The steam jets emerging at high velocity from the small apertures in the opposed side walls 25 of adjacent compartments are directed toward each other and violently break up the parts of the shallow body of water lying at the lower portions of these narrow confined spaces between the compartments. This causes such a thorough admixture of the steam and water as to, in effect, form a spray in these narrow confined spaces, there being no perceptible water level on the trough between the compartments in the vicinity of the apertures 24.

It has been observed in an actual embodiment of the invention that the jets of steam emerging from the apertured compartment wall at one side of each narrow confined space throw the water against the jets from the opposite compartment wall, breaking the water into small droplets. These droplets are tossed about by the steam; some of them are thrown up 10 to 12 inches above the trough and then drop down to be tossed up again; others are thrown against the side walls of the compartments and run down over the surfaces keeping them continually wet. In other words there is a vigorous splashing or agitation of the steam and water which brings the two into very intimate contact since breaking up of the body of water into very fine droplets and throwing them up and back and forth in the confined spaces between compartments results in substantially increasing the area presented by the surfaces of the droplets of fresh feed water to the steam.

Due to the finely divided and turbulent state of both steam and water in the spaces between compartments there is an intimate and thorough contact between the steam and the fresh feed water and the impurities are effectively separated

from the steam. In addition, the relatively large surfaces constituted by the side walls of the compartments are maintained thoroughly wetted and wash steam coming in contact therewith.

In Figure 4 is illustrated an arrangement in which the feed water is fed into a drum 35 separate from and located above the steam and water drum 36 of the boiler. The steam washing apparatus is mounted within drum 35 so that the apertured side wall portions of the compartments 22 are located below the level of feed water in the drum. Steam entering the boiler drum 36 from the generating tubes 37 flows to the washing apparatus drum 35 through tubes 38 and leaves the latter through tubes 39, the feed water passing to drum 36 by way of tubes 40. Since fresh feed water enters drum 35 it is not necessary to provide the deconcentrator with a trough though one might be utilized if desired. A blow-down connection 41 is provided for discharging any sludge that may accumulate in deconcentrator drum 35.

This application is a continuation of my co-pending application, Serial No. 121,829, filed January 22, 1937.

What I claim is:

1. Steam washing apparatus comprising a drum; means for circulating water through said drum and maintaining a continuously renewed body of water therein; a substantially vertical partition extending longitudinally within said drum and dividing its interior into a pair of chambers, one at each side of said partition; connections for admitting steam to one of said chambers; connections for withdrawing steam from said other chamber; a plurality of box-like compartments supported within said drum adjacent said partition and extending transversely of the drum in closely spaced relation along its axis, each of said compartments being open at one end to communicate with said steam receiving chamber and having confronting apertured side wall portions partially immersed in said body of water so that steam entering said compartments and discharged through said apertures form substantially colliding jets in said water in the space between said compartments, said partition preventing the flow of steam from said one chamber to said other chamber except through said compartments and the water in said drum.

2. In steam washing apparatus having a steam and water drum, connections for delivering steam to and taking it off said drum, a trough mounted above the water level in said drum, a weir along one edge of said trough, and means for supplying water to said trough so as to flow across the latter and spill over said weir into said drum; a plurality of box-like compartments spaced along said trough each open at one end to receive steam from said delivery connections and having confronting side wall portions immersed in the water on said trough and formed with small apertures through which steam jets from the interior of said compartments into the water located on said trough on its way to take-off connections, said compartments being mounted closely adjacent each other to define restricted spaces therebetween so that the steam jetting from the apertures in the opposed side walls of said compartments breaks up said body of water and intimately commingles therewith; and partition means preventing the flow of steam from said delivery to said take-off connections except

through said compartments and the water on said trough.

3. Steam washing apparatus comprising; a drum; connections for delivering steam to and taking it off said drum; a trough extending along the interior of said drum; a weir along the edge of said trough remote from said delivery connections; means for supplying water to said trough so as to flow across the latter and spill over said weir into said drum; a plurality of box-like compartments extending transversely of said trough in spaced relation along the latter, each of said compartments being open at the end adjacent said delivery connections for receiving steam therefrom and having confronting apertured wall portions immersed in the water on said trough so that steam entering said compartments jets into water on said trough in passing from said delivery to said take-off connections, said compartments being mounted closely adjacent each other to define restricted spaces therebetween so that the steam jetting from the apertures in the opposed side walls of said compartments breaks up said body of water and intimately commingles therewith; and partition means closing the intervals between said ends of said compartments and the space between the tops of the latter and the inner surface of said drum intermediate said delivery and take-off connections for assuring the flow of steam through said compartments and the water on said trough.

4. In a steam washing apparatus as recited in claim 1 wherein said plurality of compartments is divided into several groups each comprising a number of adjacent compartments interconnected by plates which close the intervals between adjacent compartments; and other means interconnecting and serving to rigidly join adjacent compartments comprising a group so that they may be removed as a unit from said drum.

5. In steam washing apparatus as recited in claim 3 wherein said plurality of compartments is divided into several groups each comprising a number of adjacent compartments interconnected by plates which close the intervals between adjacent compartments; other means interconnecting and serving to rigidly join adjacent compartments comprising a group so that they may be removed as a unit from said drum; and means detachably supporting each group of compartments from said partition.

6. In steam washing apparatus having a steam and water drum and connections for delivering steam to and taking it off said drum; a trough extending along the interior of said drum below said connections and above the water level in said drum; a weir along the edge of said trough remote from said delivery connections; means for supplying water to said trough so as to flow thereacross and spill over said weir into said drum; a plurality of spaced box-like compartments extending transversely of said trough and

resting thereon at their bottoms, each compartment being open at the end adjacent said delivery connections to receive steam therefrom and having confronting apertured side wall portions immersed in the water on said trough so that steam emerging from said apertures forms substantially colliding jets in and intimately commingles with said water in passing to said take-off connections, said compartments being mounted closely adjacent each other to define restricted spaces therebetween so that the steam jetting from the apertures in the opposed side walls of said compartments breaks up said body of water and intimately commingles therewith; plates closing the intervals between said compartments to prevent the flow of steam between the open ends of said compartments; a substantially vertical partition closing the space between the tops of said compartments at the open ends thereof and the inner wall of said drum intermediate said delivery and take-off connections; and means supporting said compartments from said partition.

7. Steam washing apparatus comprising a drum; means for circulating water through said drum and maintaining a continuously renewed body of water therein; a substantially vertical, longitudinally extending partition within said drum dividing its interior into a pair of chambers, one at each side of said partition; connections for admitting steam to one of said chambers; connections for withdrawing steam from said other chamber; a plurality of compartments supported within said drum adjacent said partition and extending across the drum in spaced relation along its axis, each of said compartments being open at one end to communicate with said steam receiving chamber and having apertured wall portions partially immersed in said body of water so that steam entering said compartments and discharged through said apertures flows through said water in the spaces between said compartments to pass to said other chamber, said partition preventing the flow of steam from said one chamber to said other chamber except through said compartments and the water in said drum.

8. Steam washing apparatus comprising a closed drum having connections for delivering steam thereto and taking steam therefrom; means separating the steam receiving portion of said drum from the steam delivering portion thereof; means forming a space in said drum connecting with said steam delivery portion thereof, said space being defined in part by two closely spaced parallel vertical walls; means for continuously supplying fresh water to said space; means for directing steam from said steam receiving portion of said drum through said walls into the water in said space in the form of a plurality of substantially colliding jets so as to break up the water supplied to said space and create an intimate commingling of steam and water.

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