Jan. 30, 1945. J. E. BIERY 2,368,443

BAFFLE FOR STEAM AND WATER SEPARATORS

Filed March 24, 1942

Fig. 1

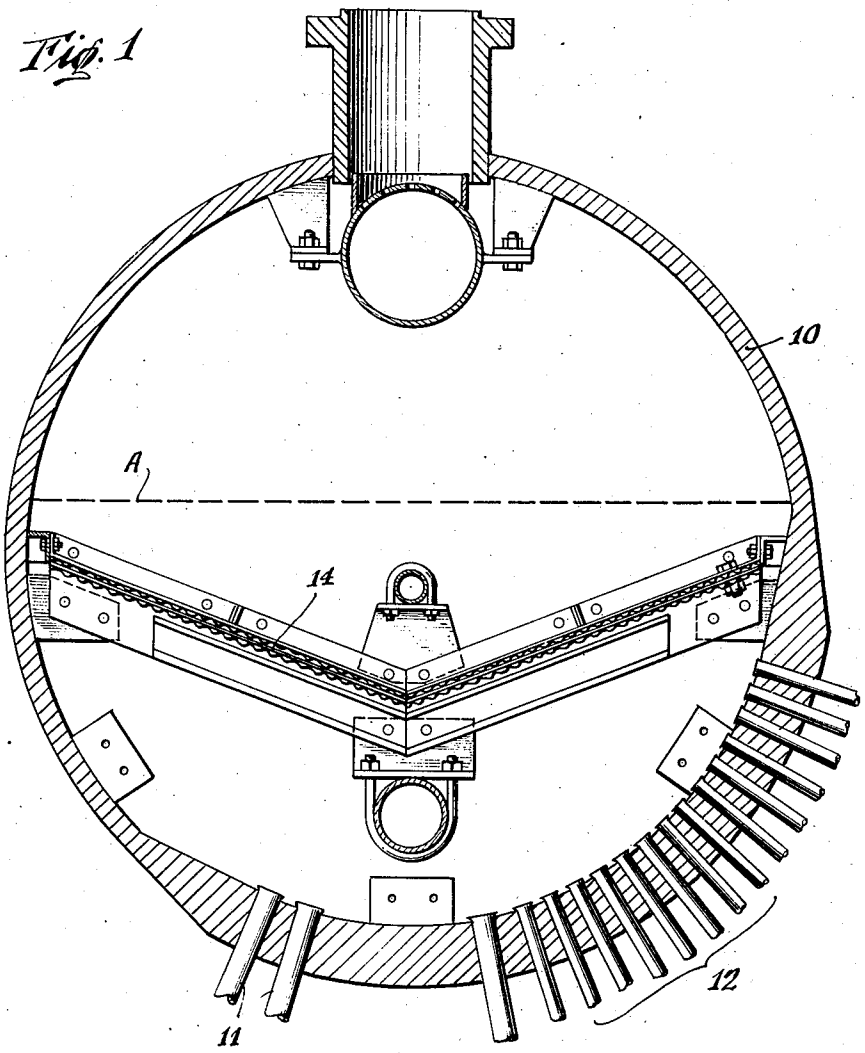
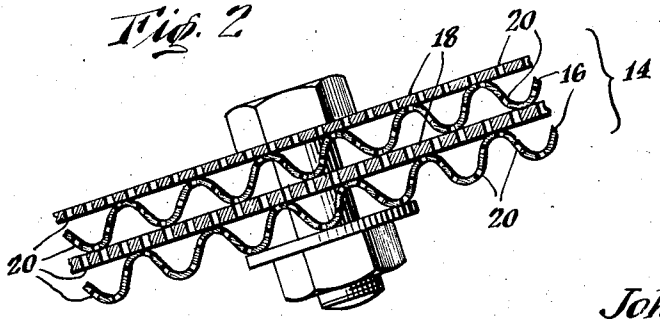


Fig. 2



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Patented Jan. 30, 1945 2,368,443

UNITED STATES PATENT OFFICE

2,368,443

BAFFLE FOR STEAM AND WATER SEPARATORS

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Application March 24, 1942, Serial No. 435,962

8 Claims. (Cl. 122—491)

This invention relates to improvements in steam and water separators of the type mounted in a steam and water drum of a boiler.

In bent tube boilers, the tubes in which the greatest quantity of steam is generated are often connected into the steam and water drums below the water level therein. Discharge of the steam and water mixture from these tubes causes a violent bubbling and throws water into the steam space above the water level in the drum. Much of this water is carried out of the drum with the steam through the steam offtake, so that what is known as wet steam results. Various arrangements of baffles immersed in the water within the drum have been used to overcome this difficulty.

An object of this invention is to provide an improved construction of immersed baffle for eliminating bubbling within the water and for distributing the steam liberated from the water more uniformly throughout the steam space of the drum so as to effect a more thorough separation of the water and producing drier steam.

The invention will be best understood upon consideration of the following detailed description of an illustrative embodiment thereof when read in conjunction with the appended claims and the accompanying drawing, wherein—

Figure 1 is a transverse cross sectional view through a steam and water drum in which the improved baffle is mounted; and

Figure 2 shows a portion of the improved baffle on an enlarged scale.

In Fig. 1 the numeral 10 designates the steam and water drum of a boiler into the bottom of which steam generating tubes 11, 12 are connected in rows arranged longitudinally of the drum below the normal water level A near the center line of the drum. The mixture of steam and water discharged from these tubes forces its way upwardly through the water in the drum and would cause violent bubbling at the water surface A unless means were provided to suppress it. A baffle 14 comprising superimposed layers of corrugated sheets 16 and flat sheets 18 in alternation is removably supported along its side edges by angles fastened snugly to the drum to form a seal between the baffle and drum. The space at the ends of the baffle 14 may be sealed by imperforate plates (not shown) extending between the baffle ends and the heads of drum 10; or the baffle may extend to the drum heads. This seal precludes a rush of mixture around the edges of the baffle which would occur if there were a substantial gap there.

In the arrangement shown, there are two flat and two corrugated sheets, the bottom sheet being corrugated. All are disposed (generally transversely) across the path of steam from the tubes and have perforations 20 to permit the upward flow of steam and water mixture therethrough. The corrugations are arranged parallel to the longitudinal axis of the drum so that the steam and water currents flowing across the baffle towards the sides of drum 10 are broken up and deflected in a general upward direction through the perforations in the baffle. In Fig. 1, for example, the greater part of the steam and water mixture is discharged from the tubes 11 and the adjacent tubes 12 near the bottom of the drum. The mixture rises and strikes the baffle substantially at its middle in a stream extending longitudinally of the drum. Thus there is a relatively strong upward current in the middle of the drum which encountering an obstruction such as a baffle tends to deflect outwardly toward the sides of the drum. As this current passes along the bottom of the improved baffle it is skimmed off or diverted upwardly in layers by successive corrugations spaced transversely of the baffle or transversely with respect to the direction of steam flow, causing the mass of steam to be broken up and pass up through the baffle substantially uniformly distributed over its entire area.

A relatively large quantity of steam breaking through a localized area of an ordinary baffle would establish a low flow resistance at that location tending to produce a rush of more steam therethrough. The corrugations of the improved baffle resist the flow of such volumes of steam transversely of the corrugations and instead break up and divert the steam upwardly through the baffle, thereby acting to prevent its continued flow toward the area of low resistance.

The baffle is preferably sloped downwardly from the sides of the drum with its lowest portion located substantially above the tubes that discharge the greatest quantity of steam and water. The object of sloping the baffle is to divide the stream and to aid in its distribution thereby avoiding the possibility of crowding too much through the area of the baffle directly above the area of greatest discharge from the tubes.

Corrugated sheets are well adapted to the improved baffle construction, but other constructions such as plates provided with suitable protrusions may be utilized. The baffle sheets may have their corrugations or protrusions so arranged as to resist the flow thereover in one or more directions such as either longitudinally or

transversely of the drum or to resist the flow in both directions at once.

The perforations in the sheets are preferably all of the same diameter and the number of perforations in the sheets is varied so that the total free areas in the several sheets decreases in the direction of flow therethrough. The perforations may also be varied in each sheet so as to cause different resistances to flow through certain areas of the sheet.

What I claim is:

1. In a steam and water drum having generating tubes connected to discharge a mixture of steam and water below the water level maintained in the drum, and a steam offtake connected into the drum above the water level therein; a perforated plate immersed in the water in said drum in downwardly inclined relation to the path of the steam flowing from said tubes through said water to said offtake and having a plurality of corrugations thereon spaced transversely with respect to the direction of steam flow and acting to reduce the flow of the steam across the surface of said plate and to deflect the said steam upwardly through said perforations.

2. A separator as defined in claim 1 wherein said plate is mounted in said drum so as to be inclined downwardly from the sides of said drum with its lowermost point located approximately above the generating tubes discharging the greatest amount of steam and water.

3. In a steam and water drum having generating tubes connected to discharge a mixture of steam and water below the water level maintained in the drum, and a steam offtake connected into the drum above the water level therein; a baffle immersed in the water in said drum comprising a plurality of reticulated flat and corrugated plates disposed in downwardly inclined relation to the path of the steam flowing from said tubes through said water to said offtake and arranged in alternation with a corrugated plate lowermost, the corrugations of said plates extending parallel to the longitudinal axis of said drum.

4. In a steam and water drum having generating tubes connected to discharge a mixture of steam and water below the water level maintained in the drum, and a steam offtake connected into the drum above the water level therein; a baffle immersed in the water in said drum comprising a plurality of reticulated flat and corrugated plates disposed in downwardly inclined relation to the path of the steam flowing from said tubes through said water to said offtake and arranged in alternation with a corrugated plate lowermost, the aggregate free area of the reticulations being greatest in the lowermost of said plates.

5. In a steam and water drum having generating tubes connected to discharge a mixture of steam and water below the water level maintained in the drum, and a steam takeoff connected into the drum above the water level therein; a baffle immersed in the water in said drum comprising a plurality of reticulated flat and corrugated plates disposed in downwardly inclined relation to the path of the steam flowing from said tubes through said water to said offtake and arranged in alternation with a corrugated plate lowermost, the aggregate free area of the reticulations in said plates decreasing in the direction of flow through the baffle.

6. In a steam and water separating drum having tubes connected for delivering a mixture of steam and water below the water level therein; a perforated plate immersed in the water in said drum in downwardly inclined relation to said level and provided with parallel corrugations on its bottom face arranged transversely with respect to the current of steam flowing through the drum adjacent said bottom face.

7. In a steam and water separating drum having tubes connected for delivering a mixture of steam and water below the water level therein; a perforated plate immersed in the water at said drum in downwardly inclined relation to said level and formed with parallel channels on its bottom face, said channels being arranged transversely with respect to the incline and to the current of steam flowing up the incline adjacent said bottom face.

8. In a steam and water drum having generating tubes connected to discharge a mixture of steam and water below the water level maintained in the drum, and a steam offtake connected into the drum above the water level therein; a perforated plate immersed in the water in said drum in downwardly inclined relation to said level with the lowermost portion thereof disposed opposite the tubes normally most active in the emission of steam into said drum, said plate having a plurality of corrugations thereon spaced transversely with respect to the direction of steam flow and acting to reduce the flow of the steam across the surface of said plate and to deflect the said steam upwardly through said perforations.

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