Feb. 6, 1934. A. C. WEIGEL 1,946,248

DEVICE FOR SECURING DRY STEAM

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Fig: 1.

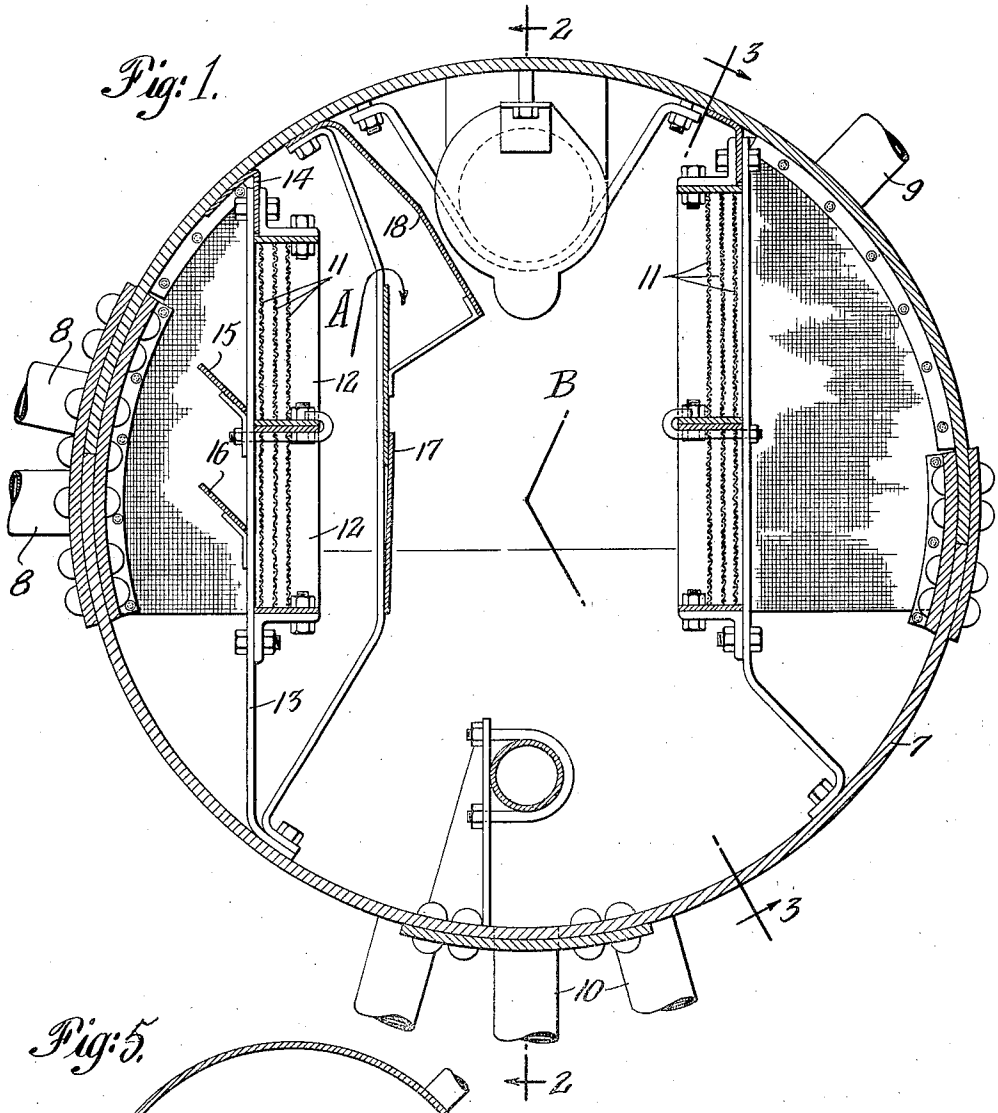
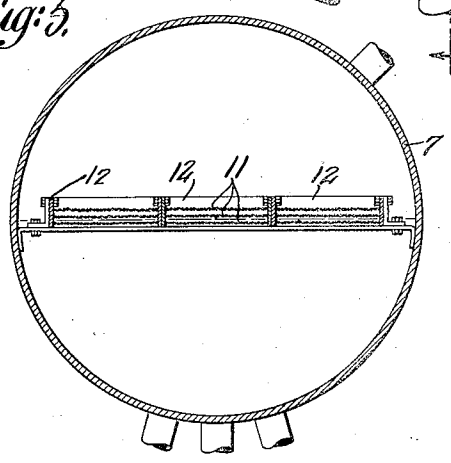


Fig: 5.



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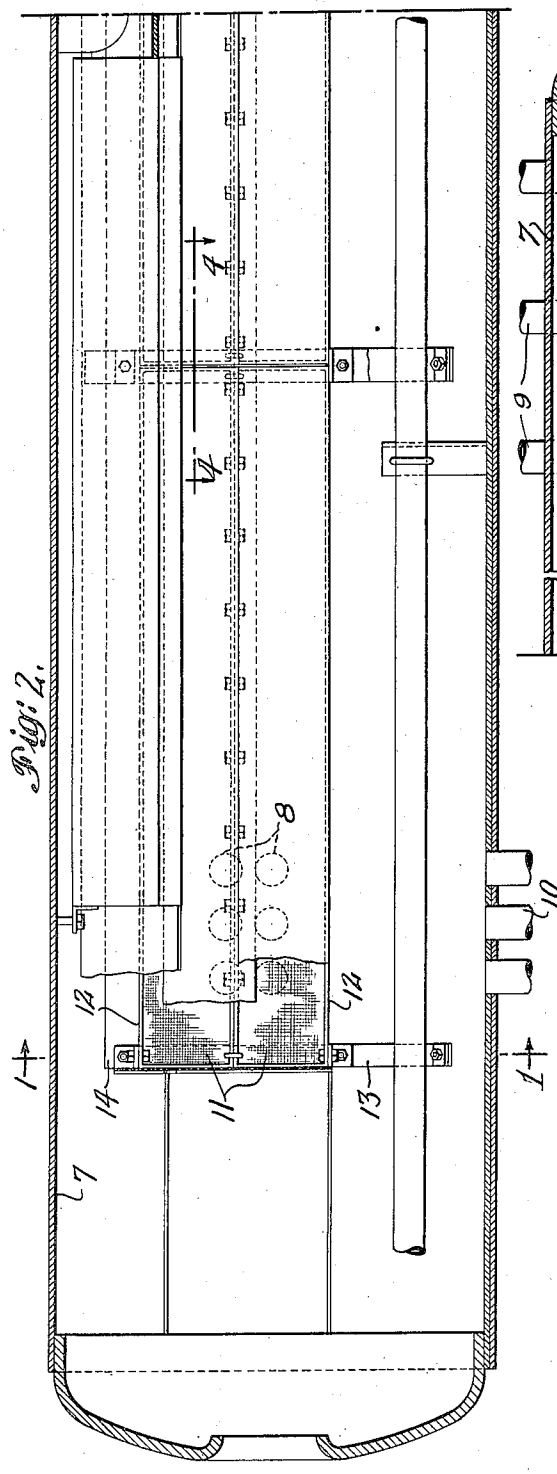

Fig. 2.

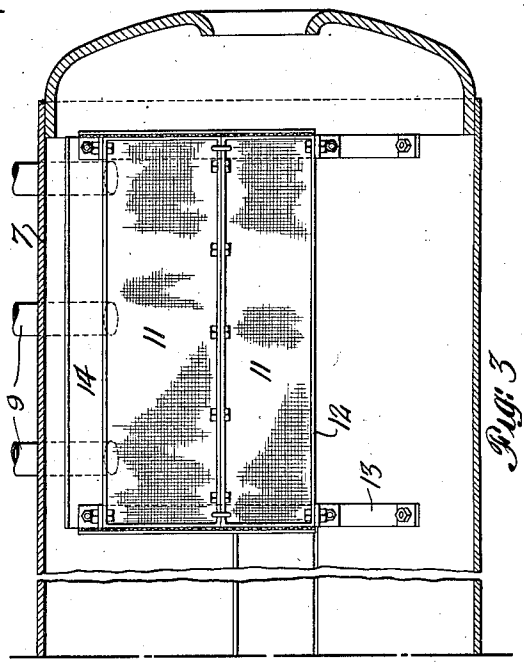

Fig. 3

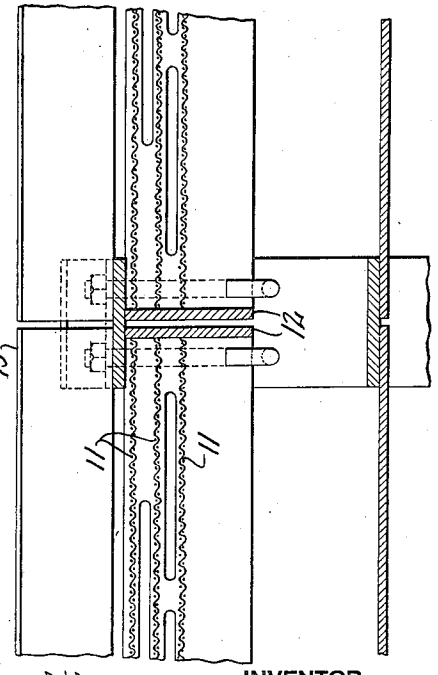

Fig. 4.

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UNITED STATES PATENT OFFICE

1,946,248

DEVICE FOR SECURING DRY STEAM

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Application February 6, 1932. Serial No. 591,265

10 Claims. (Cl. 122—491)

This invention relates to improvements in devices for securing dry steam and it has for its primary object the provision of means for effectively and simply removing water from steam in boiler drums.

The foregoing, together with such other objects and advantages as may hereinafter appear, or are incident to my invention, are realized by means of a construction which I have illustrated in the preferred form in the accompanying drawings, wherein—

Fig. 1 is a vertical section through a steam drum embodying my improvements and taken on the line 1—1 of Fig. 2.

Fig. 2 is a section taken on the line 2—2 of Fig. 1, drawn on a smaller scale.

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2 illustrating certain details of the invention, said section being drawn on an enlarged scale, and

Fig. 5 is a cross section through a drum illustrating still another application of the invention.

In certain types of boilers there are tubes which deliver into the steam and water drum at a side thereof in a direction substantially parallel to a horizontal plane, coinciding with the longitudinal axis of the drum, and there may be other tubes which discharge into the drum above and at a very pronounced angle with respect to such horizontal plane, while again other tubes discharge into the lower part of the drum.

Such an arrangement is generally illustrated in Fig. 1 wherein the drum is indicated at 7, the tubes which discharge substantially parallel at said horizontal plane being indicated at 8, the tubes which discharge above said plane and at a steep angle with respect thereto at 9, and the tubes which discharge into the bottom of the drum at 10.

The tubes 8 discharge at or near the normal water line of the drum and to secure effective separation of water from the steam delivered thereby I provide the following members. A substantially vertical screen indicated as a whole by the reference character A is disposed opposite the discharge ends of the tubes 8. This screen comprises three spaced wire mesh screens 11 secured to suitable framing 12, the framing, in turn, being supported from the interior of the drum by any suitable means such as the members 13 and 14 to which the framing may be bolted as indicated. The framing may be of sectional character, say two sections high, and as many sections wide as may be required (see Figs. 1 and 4). In advance of the wire mesh screens I place inclined baffles 15 and 16 which are carried by the members which support the framing and the number of which, vertically considered, correspond to the number of rows of tubes 8, there being one such baffle at approximately the delivery ends of each row.

These screens function in about the following manner. The water contained in the mixture delivered by the tubes clings to the wires and runs downwardly. I have discovered, however, that where the tubes discharge in a direction substantially at right angles to the screens the water which normally collects upon the screens is, so to speak, blown off and through the screens into the space B from which the steam is withdrawn from the drum. I have also discovered that where the tubes discharge in an angular direction, less than a right angle, with respect to the screens, this difficulty is overcome and the tendency of the water to run down the screens and separate from the steam is emphasized.

For the above reasons I locate the baffles 15 and 16 in advance of the screens 11, their purpose being to deflect the mixture discharged from the tubes 8 in a generally downward direction with respect to the screens. This arrangement is particularly effective where there are a plurality of screens such as the three screens shown, the screens being spaced apart a substantial distance.

If desired, further baffling may but need not necessarily be employed. Here reference is made to the baffle 17 and the baffle 18, the former being substantially vertical and placed somewhat near the screens 11 with its lower end depending in the water. The upper baffle 18 extends from the wall of the drum inwardly and downwardly, the two baffles providing a channel through which steam flow occurs as indicated by the arrow. By these baffles there is a further removal of water from the steam before it enters the compartment B. Ordinarily, however, these baffles are not required, except perhaps where unusual water conditions obtain.

At the right hand side of the drum, because the tubes 9 discharge relatively steeply downwardly, I secure effective separation merely by the employment of a plurality of vertically disposed wire mesh screens 11, no direct baffling being required.

The general arrangement of the framing and screens at the right and left hand sides of the drum are, respectively, indicated in Figs. 2 and 3.

In Fig. 4 I have shown the detailed manner

of securing the sections of framing 12 together, namely, by means of hook bolts the hooked portions of which engage the adjacent horizontal members of the framing. These hook bolts pass through openings in the members 13 and are provided with nuts for pulling them up to firmly secure the framing sections in place. The baffles 15 are also held in place by these hook bolts.

Referring now to Fig. 5, I have shown the multi-wire mesh screen arrangement horizontally disposed in a drum to take care of ebullience produced by the upward discharge of tubes connected to deliver into the lower part of the drum. Apparently what occurs within the water contained in a steam and water drum is as follows: The discharge from the tubes is a mixture of steam and water and the steam tends to form bubbles composed of water cells filled with steam. The small bubbles have a tendency to create larger and larger bubbles. The bubbles, of course, rise, and when they reach the surface of the water they form what might be termed large pimples which break, the film or shell of water being shattered and it and the depressed water below it flying up into the steam space of the compartment B. Since these pimples form on the surface of the water contained in the drum it will be seen that any screen device which is located below the surface of the water will be relatively ineffective because even though it might break up large bubbles in the body of water itself, the bubbles will reform above the screen as will the pimples which, when bursting, will produce the conditions above mentioned. I, therefore, propose to locate a substantially fine screen above the normal water level of the drum, but inasmuch as the water level varies, the provision of a number of juxtaposed parallel screens, as described, will serve to meet most operating conditions encountered, particularly if the lowermost screen is located approximately at the normal level of the drum. If the water level falls below that the screen will function just the same and the screen will function if the water level rises as long as it does not rise substantially above the level of the uppermost screen. In certain installations only such a screen as shown in Fig. 5 will be required—in others only such an arrangement as shown in Fig. 1 will be required—while in still other arrangements it may be desirable to combine the arrangement of Figs. 1 and 2 to a more or less extent.

I claim:—

1. In a boiler, the combination with a steam and water drum and boiler tubes delivering thereinto, of a screen disposed within the drum opposite points of delivery by said tubes, said screen being composed of sections, each comprising a screen and framing, means for securing the frames together, and means for supporting the screen from the drum.

2. In a boiler, the combination with a steam and water drum and boiler tubes delivering thereinto, of a foraminous water removing screen vertically disposed in the interior of said drum opposite points of delivery by said tubes and to be impinged by the discharge from said tubes, and baffle means inclining downwardly from the regions where the boiler tubes deliver into the drum to the screen whereby the mixture delivered by the tubes is directed generally downward to the screen for such impingement.

3. In a boiler, the combination with a steam and water drum and boiler tubes delivering thereinto, of a foraminous water removing screen vertically disposed in the interior of said drum opposite points of delivery by said tubes and to be impinged by the discharge from said tubes, baffle means inclining downwardly from the regions where the boiler tubes deliver into the drum to the screen whereby the mixture delivered by the tubes is directed generally downward to the screen for such impingement, and baffling on the other side of said screen giving a tortuous path for steam flow.

4. In a boiler, the combination with a steam and water drum and boiler tubes delivering thereinto, of a screen vertically disposed in the interior of said drum opposite points of delivery by said tubes and to be impinged by the discharge from said tubes, said screen including a plurality of closely spaced vertically extending wires, and baffle means inclining downwardly from the regions where the boiler tubes deliver into the drum to the screen for directing the mixture delivered by the tubes generally downward to the screen for such impingement.

5. In a boiler, the combination with a steam and water drum and boiler tubes delivering thereinto, of a water removing device including a screen having spaced vertically extending wires, said device being disposed within the drum so as to have the discharge of the tubes impinge on the screen in a generally downward direction and at an angle between a right and a straight angle.

6. In a boiler, the combination with a steam and water drum and boiler tubes delivering thereinto, of a water removing screen device within the drum, said device being so arranged with relation to the tubes that the discharge of the tubes impinges on the screen at an angle substantially less than a right angle.

7. In a boiler, the combination with a steam and water drum and rows of boiler tubes delivering thereinto in a substantially horizontal direction, of a screen vertically disposed in the interior of said drum opposite the points of delivery by said tubes and to be impinged by the discharge from said tubes, and baffle means including a baffle for each row of tubes inclining downwardly to said screen for directing the mixture from the rows of tubes to the screen in a generally downward direction whereby impingement on the screen is at an angle between a right and a straight angle.

8. In a boiler, the combination with a horizontally disposed steam and water drum and a bank of boiler tubes connected to discharge upwardly into the drum at its bottom portion, of a foraminous horizontal screen disposed within the drum adjacent the normal water level in the drum, said screen being of an area approximating the projected area of that portion of the drum into which the tubes of the bank are connected.

9. In a boiler, the combination with a horizontally disposed steam and water drum and a bank of boiler tubes connected to discharge upwardly into the drum at its bottom portion, of a foraminous horizontal screen disposed within the drum adjacent the normal water level in the drum, said screen being composed of a plurality of superimposed spaced foraminous members, and being of an area approximating the projected area of that portion of the drum into which the tubes of the bank are connected.

10. In a boiler, the combination with a horizontally disposed steam and water drum and a bank of boiler tubes connected to discharge up-

wardly into the drum at its bottom portion, of a foraminous horizontal screen composed of a plurality of foraminous members spaced one above the other so that, cross-sectionally considered, the screen is thick, said screen as a whole being located adjacent the normal water level in the drum but with at least the top member above said level and being of an area approximating the projected area of that portion of the drum into which the tubes of the bank are connected.

ALBERT C. WEIGEL.

DISCLAIMER

1,946,248.—*Albert C. Weigel*, East Orange, N. J. DEVICE FOR SECURING DRY STEAM. Patent dated February 6, 1934. Disclaimer filed February 26, 1937, by the assignee, *Combustion Engineering Company, Inc.*

Hereby disclaims from the scope of the terms "screen device" and "screen" in claim 6 any structure as a water removing means other than wire screen only.

[*Official Gazette April 20, 1937.*]