R. DELAUNAY-BELLEVILLE.

WATER TUBE BOILER.

APPLICATION FILED AUG. 19, 1912.

1,083,199.

Patented Dec. 30, 1913.

Fig. 1.

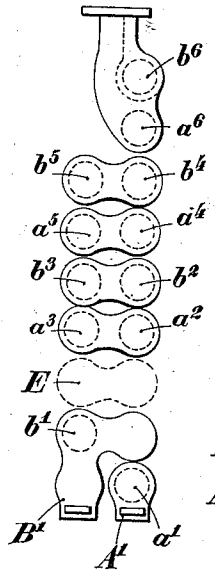


Fig. 2.

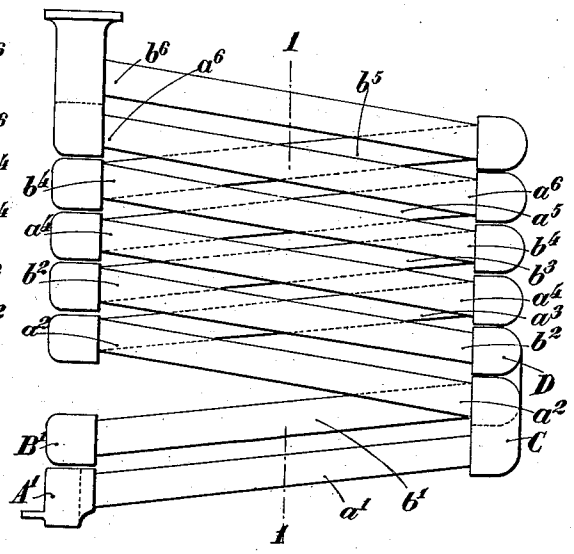


Fig. 3.

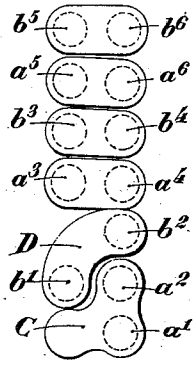
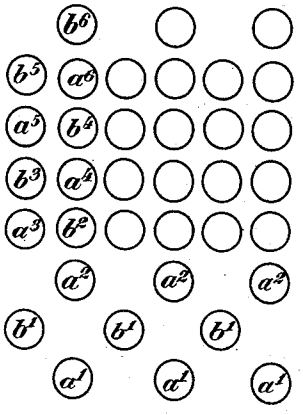


Fig. 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

ROBERT DELAUNAY-BELLEVILLE, OF ST.-DENIS, FRANCE, ASSIGNOR TO SOCIÉTÉ ANONYME DES ETABLISSEMENTS DELAUNAY-BELLEVILLE, OF ST.-DENIS, FRANCE, A CORPORATION OF FRANCE.

WATER-TUBE BOILER.

1,083,199. Specification of Letters Patent. Patented Dec. 30, 1913.

Application filed August 19, 1912. Serial No. 715,953.

To all whom it may concern:

Be it known that I, ROBERT DELAUNAY-BELLEVILLE, citizen of the French Republic, residing at St.-Denis, Department of the Seine, in France, have invented certain new and useful Improvements in and Relating to Water-Tube Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention has for its object improvements in the water tube boilers described in the Letters Patent No. 1,031,776, of July 9, 1912.

These improvements consist in modifying the lower boxes of the vaporizing elements in such a manner as to equalize the production of steam between the two systems of tubes of each element.

In the Belleville elements formed of two coils, the boxes of which are superposed and alternated the coil to which the lowest convolution belongs presents only two tubes to the direct radiation of the furnace. The second coil presents only about a fourth of the surface of its first tube to this radiation; furthermore each tube of the second coil has in front of it the tube of the same row of the first coil which is heated by the gases before they reach the second coil. The result is that the vaporization of the first coil is greater than that of the second.

The object of the invention is to reduce the difference between the steam productions of the two coils. In order to obtain this result the two lower boxes have been modified and their height doubled. The lower box in front of the second coil has been modified to shift the point of departure of the first tube to the left. The point of departure of the second tube of each convolution is at a higher level and the second tubes being more distant from the first present a larger surface to the direct radiation and this interval facilitates the circulation of the gases.

In the accompanying drawing: Figure 1 is a front elevation of the front boxes of the elements. Fig. 2 is a side elevation of the element. Fig. 3 shows the rear boxes viewed from the front. Fig. 4 is a section on the line X—X in Fig. 2 showing a preferred arrangement of the tubes.

The vaporizing tubes of an element end on the façade and on the back of the boiler at boxes resting one upon the other. These boxes are marked as follows: A^1 is the lower front box of the first coil. B^1 is the lower front box of the second coil. C is the lower rear box of the first coil. D is the lower rear box of the second coil. E is a spacer interposed between the first front box of the second coil and the second front box of the first coil.

The tubes are designated by the letters a for the first coil and b for the second. Each exponent indicates the row of the tube in its coil in the upward direction. In Figs. 1 and 3, each letter a or b with its exponent indicates the heading of the tube in the corresponding order in the upward direction in each coil.

Fig. 1 represents the front boxes; the exponents of uneven number indicate the heading of the tubes which proceed from the front boxes toward the rear, in rising; the exponents of even number indicate the heading of the tubes which proceed from the rear to the front in rising.

In Fig. 3 which represents the rear boxes viewed from the front the exponents of uneven number indicate the heading of the tubes which rise from the front toward the rear and the exponents of even number indicate the origin of the tubes which proceed from the rear toward the front in rising.

In the first fork of the first coil the first tube a^1 proceeds from the front box A^1 and passes to the rear box C. This box C is vertical, the left hand part being only a support; the water rises from a^1 to a^2 in the box C and the second tube proceeds from this point a^2 and ends at a^2 on the front box (Fig. 1) a box higher than if the rear box were horizontal, then the horizontal boxes are superposed and alternate uniformly with those of the other coil.

In the first fork of the second coil the tube b^1 proceeds from the left hand of the front box B^1 and ends in rising at b^1 of the rear box D which is the first lower rear box of the second coil. This box D is vertical the

water rises in it from b^1 to b^2 from which point the second tube proceeds and in rising ends at the point b^2 of the front boxes higher by one box than if the rear box were horizontal.

Between the second and third front box there is a vacant space corresponding to the height of a box; this absent box is replaced by a spacer E shown in broken lines.

Owing to the arrangement described the tubes *a* of the first row (first coils) benefit by the radiation for approximately four-fifths of their surface and the tubes *a* of the second row (of the same coils) benefit by the radiation for about one half of their surface. The tubes *b* of the first row (second coil) benefit by the radiation for approximately one half their surface but the tubes *b* of the second row (second coils) are not reached by the radiation.

In the arrangement illustrated in Fig. 4, the tubes *b* of the first row (second coils) benefit by the radiation for about three-fifths of their surface and the tubes *b* of the second row (second coils) benefit by it for approximately one half their surface—partly to the right and partly to the left. On the other hand as regards the coil *a* there is no change in the first row of tubes but the second row is more distant than before and presents much less surface to the radiation. The vaporization of the coil *b* will be increased and that of the coil *a* reduced. The general operation will be more uniform.

It should be noted that all the tubes of each coil except the lower tube are raised to the extent of one box; consequently the inclination of these tubes has not changed it is still double the inclination of the tubes in an ordinary element comprising a single coil. Furthermore the points at which the vaporizing tubes leave are distinct from their connection with the lower collector but the connection with the steam collector is effected by means of a single partitioned socket as shown in Fig. 1.

The arrangement indicated and described above may be modified in its details without departing from the principle of the invention.

I claim:

1. A boiler unit of the kind described, comprising two coils composed of a plurality of tubes, and a lower front box adapted to situate the point of departure of the first tube of the second coil above and to one side of the point of departure of the first tube of the first coil, said point of departure of the first tube of the second coil being in the same horizontal plane with the rear end of the first tube of the first coil.

2. A boiler unit of the kind described, comprising two coils composed of a plurality of tubes, a lower front box adapted to situate the point of departure of the first tube of the second coil above and to one side of the point of departure of the first tube of the first coil and in the same horizontal plane with the rear end of the first tube of the first coil, and two vertical lower rear boxes one for each coil, said boxes adapted to raise the entire nest of tubes by the height of one box except the first tube of each coil.

3. A boiler unit of the kind described, comprising two coils composed of a plurality of tubes, a lower front box adapted to situate the point of departure of the first tube of the second coil above and to one side of the point of departure of the first tube of the first coil and in the same horizontal plane with the rear end of the first tube of the first coil, and two vertical lower rear boxes one for each coil, said boxes adapted to raise the entire nest of tubes by the height of one box except the first tube of each coil, and the rear box of the second coil adapted to situate the point of departure of the second tube of the second coil above the point of departure of the second tube of the first coil.

In testimony whereof I affix my signature, in presence of two witnesses.

ROBERT DELAUNAY-BELLEVILLE.

Witnesses:

H. C. COXE,

LOUIS TORSO.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."