No. 660,462. Patented Oct. 23, 1900.

T. F. ROWLAND, W. E. HILL & A. McLACHLAN.

COMBUSTION CHAMBER FOR STEAM GENERATORS.

(No Model.) (Application filed Feb. 7, 1900.)

Fig. 1

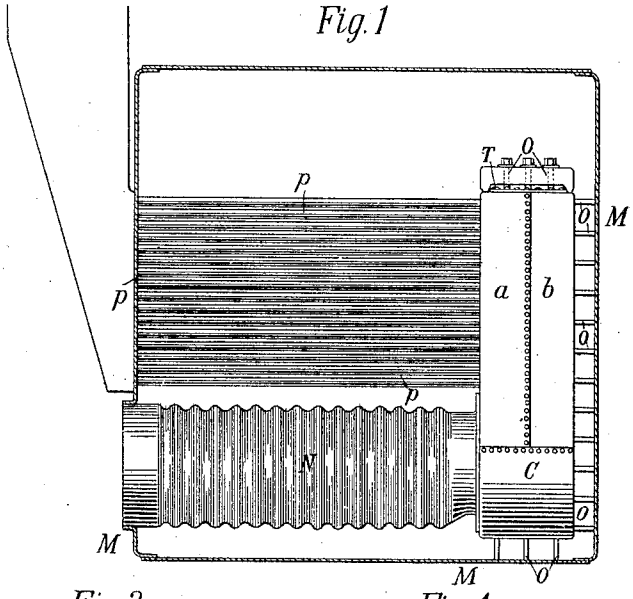


Fig. 2

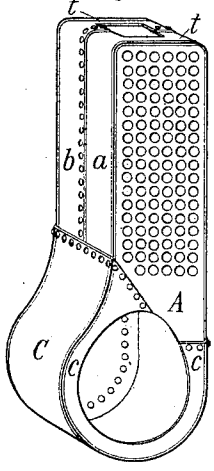


Fig. 3

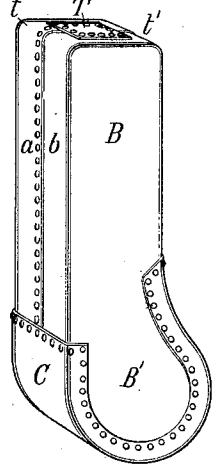


Fig. 4

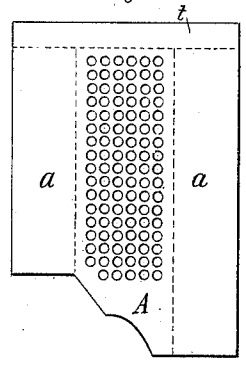


Fig. 5

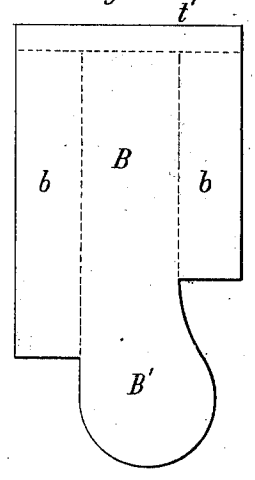


Fig. 6

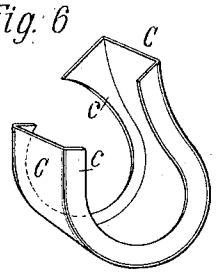


Fig. 7

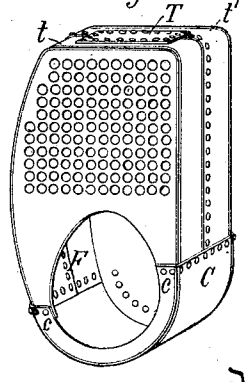
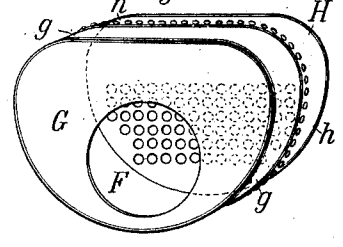


Fig. 8



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UNITED STATES PATENT OFFICE.

THOMAS F. ROWLAND, WARREN E. HILL, AND ANGUS McLACHLAN, OF NEW YORK, N. Y.; SAID HILL AND McLACHLAN ASSIGNORS TO SAID ROWLAND.

COMBUSTION-CHAMBER FOR STEAM-GENERATORS.

SPECIFICATION forming part of Letters Patent No. 660,462, dated October 23, 1900.

Application filed February 7, 1900. Serial No. 4,324. (No model.)

To all whom it may concern:

Be it known that we, THOMAS F. ROWLAND, residing in the borough of Manhattan, city of New York, in the county of New York, and WARREN E. HILL and ANGUS McLACHLAN, residing in the borough of Brooklyn, city of New York, in the county of Kings, State of New York, citizens of the United States, have invented a new and useful Improvement in Combustion-Chambers for Steam-Generators, of which the following is a specification.

Our invention relates more especially to combustion-chambers for use in the usual forms of marine boilers with internal return-flues or tubes or with boilers having internal non-return flues, but is adaptable to other well-known forms of boilers and furnaces.

The objects of our improvement are, first, to reduce or wholly overcome the tendency existing in all such combustion-chambers heretofore constructed to leak and crack, and, second, materially to lessen the cost of construction of the combustion-chamber.

Heretofore combustion-chambers have been constructed substantially in the following manner: Sheets of plate-metal have been made into suitable form for the front and back of the chamber, and one or more plates have been bent into shape to form the sides, bottom, and top of the chamber, one set of plates being slightly flanged at the edges. The plates are then riveted together at the corners, the rivets extending through the body of one set of plates and through the flanges of the other set. Thus a stiff rigid box is formed with riveted seams of double thickness at or closely adjacent to the corners of the chamber. The edges of the seams formed between the plates and flanges are calked to prevent leakage of the surrounding water and steam into the chamber. Experience has shown that when cracking of the material forming the walls of the chamber takes place it invariably occurs along the line of the rivet-holes. Leakage is thus constantly occurring along the riveted seams, owing to opening of the seams and loosening of the calking. This cracking and leakage is largely due to the expansion and contraction of the walls of the chamber, combined with the rigidity and inelasticity of the corners of the chamber resulting from the double thickness of metal and row of rivets contiguous to each corner. In steam-generators of the type generally used the gases arising from the fuel pass in a somewhat unmixed and unignited condition from the furnace into the combustion-chamber, where the gases have opportunity to mingle and to become thoroughly ignited. The walls of the combustion-chamber are subjected to extreme heat and to constant and wide fluctuations in temperature. These fluctuations in temperature cause corresponding expansion and contraction of the walls of the chamber. As the walls of the combustion-chamber are firmly held in position by heavy stay or socket bolts, there is little or no opportunity for the outward or inward bending of the plates in response to the expansive action. The expansive and contractive forces therefore make themselves felt largely at the corners of the chamber, and if, as is the case with riveted corners of double thickness, there is excessive rigidity and lack of elasticity the entire expansive and contractive strain will fall upon the seams, rivets, and calking and tend to crack the flanges in the plates and to open the seams between them.

By means of our invention, as hereinafter described, and illustrated in the accompanying drawings, which form part of this specification, we have been able to very materially reduce, if not altogether to obviate, the injurious effects of the unavoidable expansion and contraction of the walls of the combustion-chamber.

Figure 1 is a side view of an internal return-flue marine boiler of common type, the side of the boiler being cut away in order to show the internal parts—to wit, the furnace, combustion-chamber, flues, stay-bolts, and uptake. The combustion-chamber here shown contains our invention, which will hereinafter be more particularly illustrated and described. Fig. 2 is a detailed front view in perspective of our improved combustion-chamber adapted for use in the marine boiler shown in Fig. 1. Fig. 3 is a rear view of the same. Fig. 4 shows the front plate, Fig. 5 the back plate, and Fig. 6 the wrapper-plate,

together composing the combustion-chamber shown in Figs. 2 and 3. Fig. 7 shows a different form of our improved combustion-chamber adapted for use with the side or wing furnace common in steamships. Fig. 8 shows in front perspective a modified form of our invention as applied to the combustion-chamber of an internal boiler having non-return flues.

Referring to Fig. 1, M M M M are the walls or shell of the boiler. N is the furnace, which is usually corrugated. The parts marked *a b* C represent the combustion-chamber. O O O O represent the stay-bolts, holding the combustion-chamber in position relative to the shell of the boiler. P P P P are the flues or tubes extending from the combustion-chamber to the uptake or chimney R.

Figs. 2 to 6, inclusive, are exact reproductions, on a reduced scale, of combustion-chambers for marine boilers manufactured by us out of steel plates nine-sixteenths to five-eighths inches thick, the chambers being over ten feet over all in height, over two feet ten inches in depth, and two feet four inches in width.

Fig. 7 is a reduced reproduction of a combustion-chamber for a wing-furnace made of plate-metal of similar thickness, the chamber being of proportionate dimensions to those shown in Figs. 2 and 3.

Referring to Figs. 2 to 7, inclusive, A is the front plate, showing the holes through which the ignited gases pass to the boiler-tubes. *a a* are flanges integral with the plate A and each of slightly-greater breadth than one-half of the breadth of the proposed side of the chamber. The lower part of the plate S is cut out to form the top of the opening F, against which projects the rear of the fire-box when the furnace is put together. B is the back plate, having flanges *b b*, similar to the flanges *a a*. The lower end of the plate B is cut into a lobe B′, closely conforming to the shape of the lower rear part of the chamber. The flanges *a a* and *b b* are then bent at right angles to the plates A and B. The edges of the flanges are brought together and made slightly to overlap and are then joined by riveting or welding. In this way the upper part of the chamber is formed, the plates A and B forming the front and back and the united flanges *a b* and *a b* forming the sides thereof. A plate C is then bent into shape substantially to form the side wall of the lower part of the combustion-chamber. The outer edges of the plate C are then flanged inward at right angles, as shown at *c c*. The ends of the plate C are then joined to the lower ends of the united flanges *a b a b* and the edges of the flanges *c c* are joined to the plates A and B.

The joining of the parts is done by riveting or in most cases preferably by welding. In the accompanying drawings we have shown the parts joined by riveting; but by means of our invention, as hereinafter stated, the parts may be joined by welding instead of riveting the seams. It is evident that instead of flanging the wrapper-plate and joining its flanges to the front and back plates the same result may be accomplished as follows: The front plate A may be made of substantially the same shape as the back plate B, the opening F being cut in the lower part thereof and may be flanged throughout its whole length, the lower part, however, being less deeply flanged than the upper part. The lobe B′ of the back plate B may also be slightly flanged, and the wrapper-plate C may be made without flanges. The wrapper-plate and the flanged front and back plates may then be joined as before.

The top of the combustion-chamber shown in our drawings is made by upsetting or turning in part of the top of the plate A and its flanges *a a* and of the plate B and its flanges *b b* to form the flanges *t* and *t′*. When the edges of the flanges *a a* and *b b* are joined, the edges of the flanges *t* and *t′* are similarly joined, leaving an aperture in the center of the top. A cover-plate T is then joined to the flanges *t* and *t′* by riveting or welding. The top, however, may be formed by fitting a flanged top plate over the top of the chamber and joining the flanges of the top plate to the walls of the chamber or in any other suitable manner.

In whatever manner the plates forming our combustion-chamber are joined it is to be noted that by using the deeply-flanged front and back plates the seams in the upper part of the chamber are reduced from four to two in number and that the cost of manufacture of the combustion-chamber is therefore correspondingly reduced. It is also to be noted that there are no seams at or near the corners of the combustion-chamber, but that said corners are integral, of the same thickness as the walls, and are elastic and capable of responding to the expansive and contractive forces generated by the fluctuations in temperature. The elasticity of the corners also tends to lessen the injurious effect of the expansion and contraction of the walls of the chamber upon the connections between the furnace-flues and the bolts on one hand and the walls of the combustion-chamber on the other. It is also to be noted that whenever the joining of the different plates in our combustion-chamber is accomplished by welding instead of riveting the defects due to the existence of riveted seams are wholly obviated. By the use of the flanged plates of our invention the welding of plates into a combustion-chamber is for the first time made commercially practicable, it being impracticable to make a welded combustion-chamber in any other manner except by the use of flanged plates, which permit the welding to be done along seams not situate at or contiguous to the corners of the chamber.

When our invention is applied to the combustion-chamber of internal non-return furnaces, as illustrated in Fig. 8, the wrapper-

plate may, if desired, be omitted, flanged front and back plates being sufficient.

In Fig. 8, G represents the front plate with an opening against which projects the furnace. *g g* show a flange extending at right angles from the front plate and integral therewith. H is the back plate, showing in dotted lines the openings leading into the boiler-chamber, and *h h* show a flange similar to that on the front plate. The edges of these flanges are then brought together and joined by riveting or welding. It is evident that the wrapper-plate may, if desired, be omitted, even with combustion-chambers of internal return-furnaces such as are illustrated in Figs. 1 and 2. This may be accomplished by making the front plate substantially of the same shape as the back plate, a hole being cut out for the opening F and by deeply flanging the front and back plates throughout their entire length. The said flanges thus joined will constitute not only the upper part of the sides of the combustion-chamber, but also the lower sides and bottom thereof. Thus there would be but a single seam or hole extending from the top of the combustion-chamber along one side around the bottom and up the opposite side of the chamber. We prefer, however, to use the wrapper-plate in the construction of combustion-chambers of the form shown in Figs. 2 and 3; but in other forms of combustion-chamber the wrapper-plate may be omitted with advantage.

Our invention may be applied to differing forms of furnaces, and the shape of each plate and of its flanges may be more or less altered to suit any given case without departing from the spirit of our invention, the flanges, however, being always integral with the plates. In all cases, however, our invention is present where the use of one or more flanged plates permit the reduction in number of the seams, the location of the seams away from the corners and the making of integral and elastic corners and the practical use of welding instead of riveting for joining the flanges.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A combustion-chamber having the upper part thereof composed of one or more integrally-flanged front plates, one or more integrally-flanged back plates, having the edges of said flanges joined, substantially as and for the purposes above set forth.

2. A combustion-chamber composed of front and back plates having integral flanges and having said flanges joined at their edges, substantially as and for the purposes above set forth.

3. A combustion-chamber composed of front and back plates having integral flanges and having said flanges joined at their edges, top flanges integral with the front and back plates and the flanges thereof and joined to form a top to said combustion-chamber with an aperture therein, and a cover-plate joined to the top flanges, substantially as and for the purposes above set forth.

4. A combustion-chamber composed of an integrally-flanged front plate, an integrally-flanged back plate having a lobe at its lower end, and having said flanges joined at the edges, a wrapper-plate joined at its edges to the lower edges of the front and back plates and their united flanges; and a top plate for said combustion-chamber and joined thereto in any suitable manner; substantially as and for the purposes above set forth.

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