May 3, 1932. C. A. SELEY 1,856,732

STEAM BOILER

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Fig. 1.

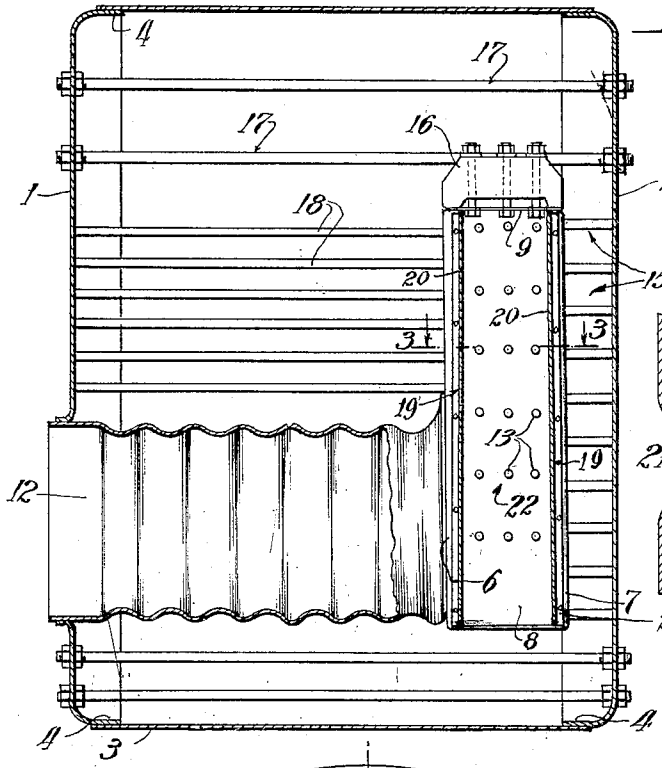


Fig. 3.

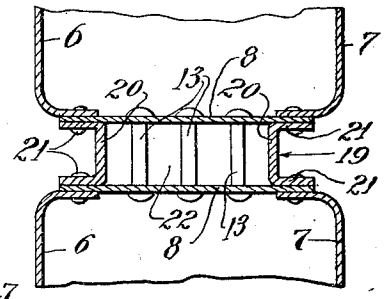
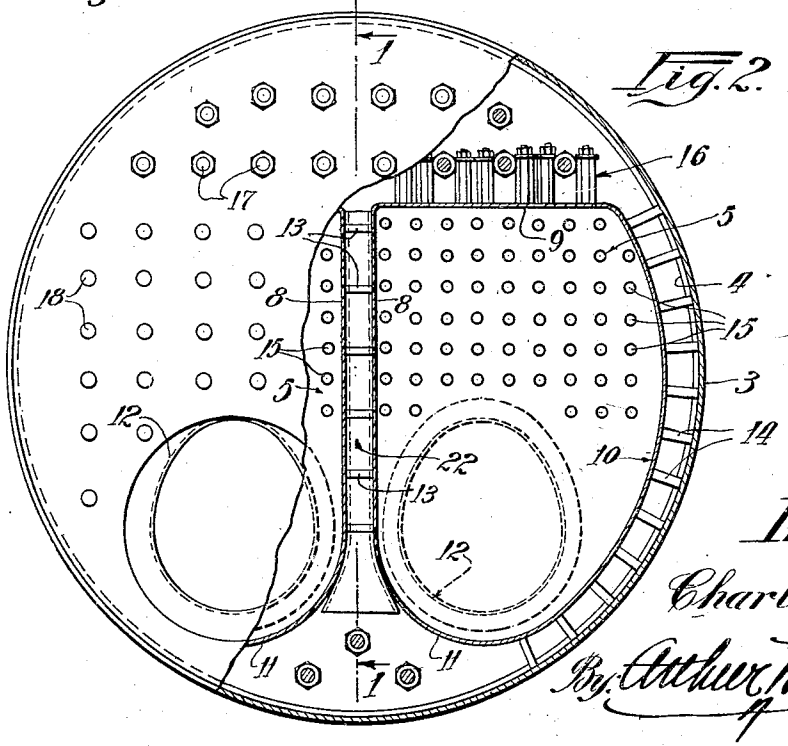


Fig. 2.



Inventor:
Charles A. Seley.
By Arthur Mc Kelvey
Attorney

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Fig. 4.

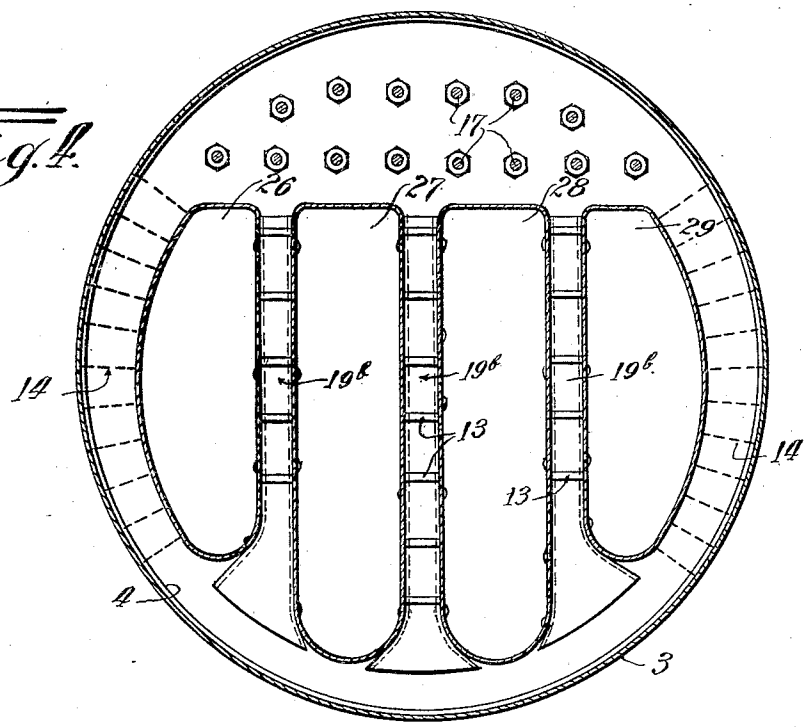
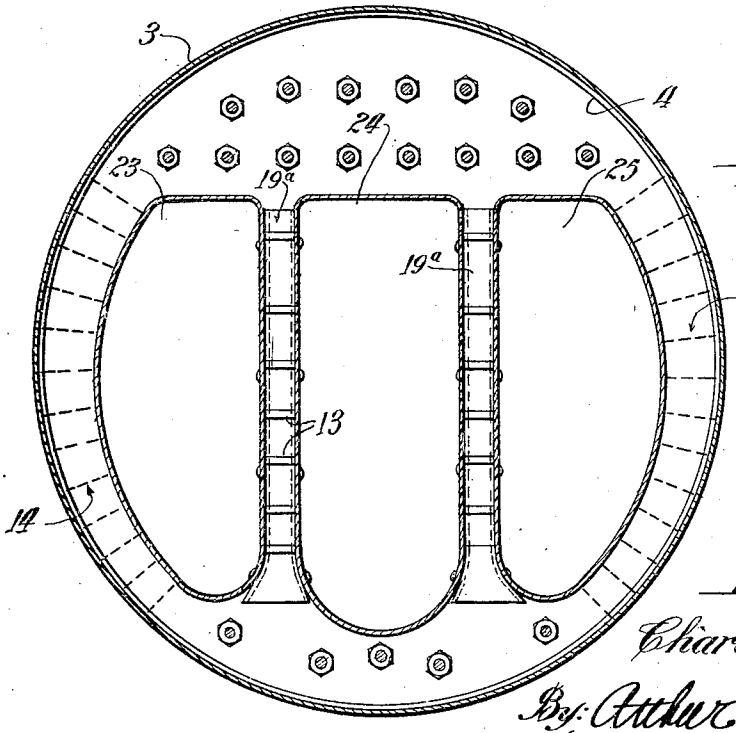


Fig. 5.



Inventor:
Charles A. Seley.
By: Arthur W. Nelson
Attorney.

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1,856,732

UNITED STATES PATENT OFFICE

CHARLES A. SELEY, OF CHICAGO, ILLINOIS, ASSIGNOR TO LOCOMOTIVE FIREBOX COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE

STEAM BOILER

Application filed July 25, 1929. Serial No. 380,780.

This invention relates to improvements in steam boilers and more particularly to marine boilers and it consists of the matters hereinafter described and more particularly pointed out in the appended claim.

The boilers with which my invention is concerned are those used upon steam vessels and commonly referred to as "Scotch marine boilers." Such boilers whether of the single or double ended type include, a shell and end plates, furnaces and combustion chambers and fire tubes extending between the combustion chambers and end plates. The number of furnaces in each boiler of this kind of course depends upon the size of the boiler and such a number varies from one furnace in the smallest boiler to four in the largest.

In single ended boilers there is a combustion chamber for each furnace and in a double ended boiler there are two furnaces opening from opposite ends of the boiler into the same combustion chamber. Where more than one combustion chamber is employed they are disposed in relatively close spaced, side by side arrangement and extend from a plane spaced a short distance above the bottom of the shell to a point above the axis thereof, the bottom of the associated furnace being approximately in the same plane as the bottom of the combustion chamber. With such boilers it is apparent that the highest efficiency thereof is not obtained because of insufficient boiler water circulation, due to the substantially quiescent state of the boiler water at the bottom of the shell beneath the furnaces and combustion chamber.

The primary object of the invention is to provide a simple and efficient thermically actuated means whereby boiler water is withdrawn from the bottom of the boiler and is discharged at a point above the top ends of the combustion chambers whereby circulation and steaming qualities are increased with the assurance that the top of each chamber will be flooded even though the water level falls below normal.

Another object of the invention is to provide means which is formed at least in part by the combustion chambers themselves which acts to cause an upward flow of water between said chambers, thus keeping the same clean and free from deposits acting to reduce the transmission of heat through the walls of said chambers.

These objects of the invention as well as others, together with the many advantages thereof, will more fully appear as I proceed with my specification.

In the drawings:—

Fig. 1 is a longitudinal vertical section through a single ended marine boiler embodying my invention as taken on the line 1—1 of Fig. 2.

Fig. 2 is a view partly in front end elevation and partly in section of the boiler shown in Fig. 1.

Fig. 3 is a detail horizontal sectional view on an enlarged scale as taken on the line 3—3 of Fig. 1.

Fig. 4 is a transverse vertical section through a four furnace boiler of this kind, in the plane of the combustion chambers thereof.

Fig. 5 is a transverse vertical section through a three furnace boiler of this kind, in the plane of the combustion chambers thereof.

Referring now in detail to that embodiment of the invention illustrated in Figs. 1 to 3 inclusive of the drawings wherein a single ended, two furnace boiler is shown, 1 indicates the front end plate, 2 indicates the rear end plate and 3 indicates the shell of the boiler. In this instance the shell is a cylindrical one which engages at its ends upon and is secured in any suitable manner to the inturned flanges 4—4 on said end plates.

A short distance inwardly from the rear end plate 2 is located a pair of upright, combustion chambers 5—5 spaced a short distance apart and one upon each side of the perpendicular median plane of the boiler as a whole. Each combustion chamber comprises front and rear sheets 6 and 7 respectively, an upright inner sheet 8, a flat top sheet 9, an outer side sheet 10 disposed substantially concentric with respect to the shell 3 and a curved sheet 11 connecting said inner and outer sheet together at the bottom as best shown in Fig. 2.

With each combustion chamber is associated a furnace or fuel burning chamber 12 which opens at one end into the bottom end of said combustion chamber through the front sheet thereof and opens at its other end through the front end plate 1 of the boiler where it is secured to the integral annular flange thereof. The furnace shown in Fig. 1 is of the annularly corrugated type now known as the Morrison furnace.

The adjacent flat sides of the combustion chambers as provided by the inner sheets 8 are stay bolted together as at 13 while the outer sheet of each chamber is radially stayed as at 14 to the shell and the rear sheet of each combustion chamber is stayed to the rear end plate 2 as at 15. The top sheet of each combustion chamber is girder stayed as at 16 and the end plates 1 and 2 are longitudinally stayed together as at 17 in a plane above the tops of said combustion chambers. 18 indicates the fire tubes connecting the front sheet of each combustion chamber with the front plate 1, of the boiler shell. In this respect it is pointed out that the normal water level is disposed in a plane a short distance above the tops of the combustion chambers so that the same are covered or flooded with water at all times.

The boiler above described, fairly exemplifies a single ended Scotch marine boiler. Such boilers are especially adapted for use in steam vessels and although they have been accepted for this purpose, their efficiency does not approach the maximum desired.

It is apparent that in operation, the places or areas of highest temperatures and water steaming and circulating efficiencies are the top portions of the furnace and portions of the combustion chambers above the top half of the associated furnace. While the boiler water in contact with the bottom half of each furnace and the bottom portion of each combustion chamber is not entirely quiescent, its movement is indeed more slow and sluggish with the results that the complete circulatory cycle of boiler water is impeded. This permits the settlement and adhesion of boiler water sediment upon adjacent boiler parts, further reducing circulation and making clean out operations more frequent.

To overcome the objections noted, I close the ends of the narrow spaces between adjacent combustion chambers, thus in effect forming ducts or channels each having an inlet mouth at the bottom end of an area greater than that of the discharge mouth at the top end.

To provide such a duct which is best shown in Fig. 3, I provide members 19 of channel cross section and dispose the same near the ends of the spaces between associated combustion chambers. Each of said members comprises a web 20 and outwardly extending flanges 21—21, the bottom end of the web being widened or flared as best shown in Fig. 2 and preferably terminating in the plane of the bottom wall of each combustion chamber. It is here pointed out that said widened or flared bottom ends of the web do not follow around the bottom of the associated combustion chambers but are cut away to be spaced therefrom as best shown in Fig. 2. The top ends of said members preferably terminate in the plane of the top ends of said combustion chambers.

In making up such a boiler, the sheets or walls 8—9—10 and 11 of each combustion chamber are made as a band, the margins of which overlap and are riveted to internal flanges on the end sheets 6 and 7 and when the members 19 are arranged in place, the flanges thereof are disposed in overlapping arrangement with respect to associated band parts to be secured in place by the same rivets that secure said band margins to the sheet flanges mentioned. From the above it is apparent that, adjacent walls of the combustion chambers together with the members 19 provide a duct 22 between the combustion chambers, which duct is open at the top and bottom.

When a boiler embodying my invention is in use, the water in the duct is prevented from having a fore and aft movement and is confined in such a manner as to have only an upward movement. Thus when the water in said duct is heated, it rises in said duct due to difference in thermic heads and a part is generated into steam to pass into the steam space of the boiler and the extremely hot remaining water floods into the top boiler water to increase its temperature. The action referred to is thermosiphonic in that it draws water into its bottom end and discharges it at the top end. In this water movement, the usually quiescent water at the bottom of the boiler moves from both ends of the boiler toward said inlet mouth with the result that it sweeps the adjacent surfaces clean of such matter as tends to adhere thereto. Even though the water level falls below the plane of the top sheet of the combustion chamber, the same is always kept flooded and covered and therefore cannot collapse.

In Fig. 5 I have shown a modified form of the invention as applied to a boiler having three combustion chambers 23—24 and 25 respectively spaced a short distance apart. The adjacent side sheets of each combustion chamber are spaced apart, but secured together in this instance by means of channel like members 19a to provide the siphonic action duct to draw water from the bottom of the boiler to the space above said combustion chambers.

In Fig. 4 the invention is illustrated as applied to a boiler having four combustion chambers 26—27—28 and 29 respectfully. The adjacent side sheets of each chamber are made flat and are spaced apart but are con-

nected together by the channel like members 19^b to provide the siphonic action duct between them for the purpose mentioned.

It is apparent that the advantages of creating greater water circulating efficiency in a boiler of this kind is inherent in all structures described.

While in describing the invention I have referred in detail to the form, arrangement and construction of the various parts thereof, the same is to be considered merely as illustrative so that I do not wish to be limited thereto except as may be specifically set forth in the appended claim.

I claim as my invention:—

A steam boiler embodying therein a shell, a plurality of laterally spaced combustion chambers therein, a furnace opening into each combustion chamber, and means arranged between said combustion chambers and cooperating with the sides thereof to provide an unrestricted duct open at its top and bottom, said duct being substantially coextensive with the sides of the combustion chambers, with its upper end terminating substantially at the level of the tops of said combustion chambers and operating to draw water from the bottom of the boiler and to discharge the same adjacent the top ends of the combustion chambers.

In testimony whereof, I have hereunto set my hand, this 19th day of July, 1929.

CHARLES A. SELEY.