

No. 848,496.

PATENTED MAR. 26, 1907.

S. J. ROSS.

MEANS FOR PROMOTING CIRCULATION IN STEAM BOILERS.

APPLICATION FILED SEPT. 25, 1905.

Fig. 1.

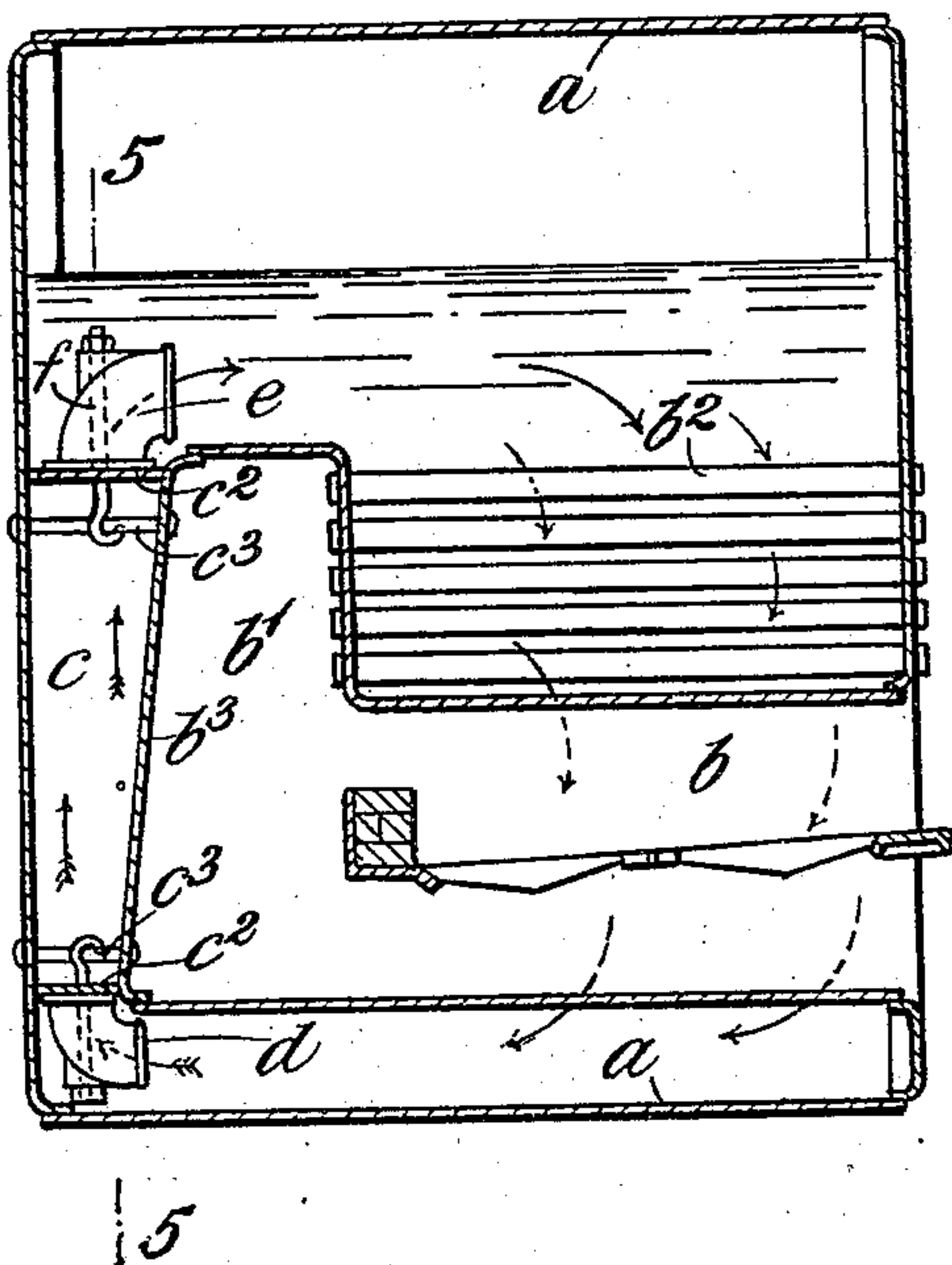


Fig. 2.

Fig. 3.

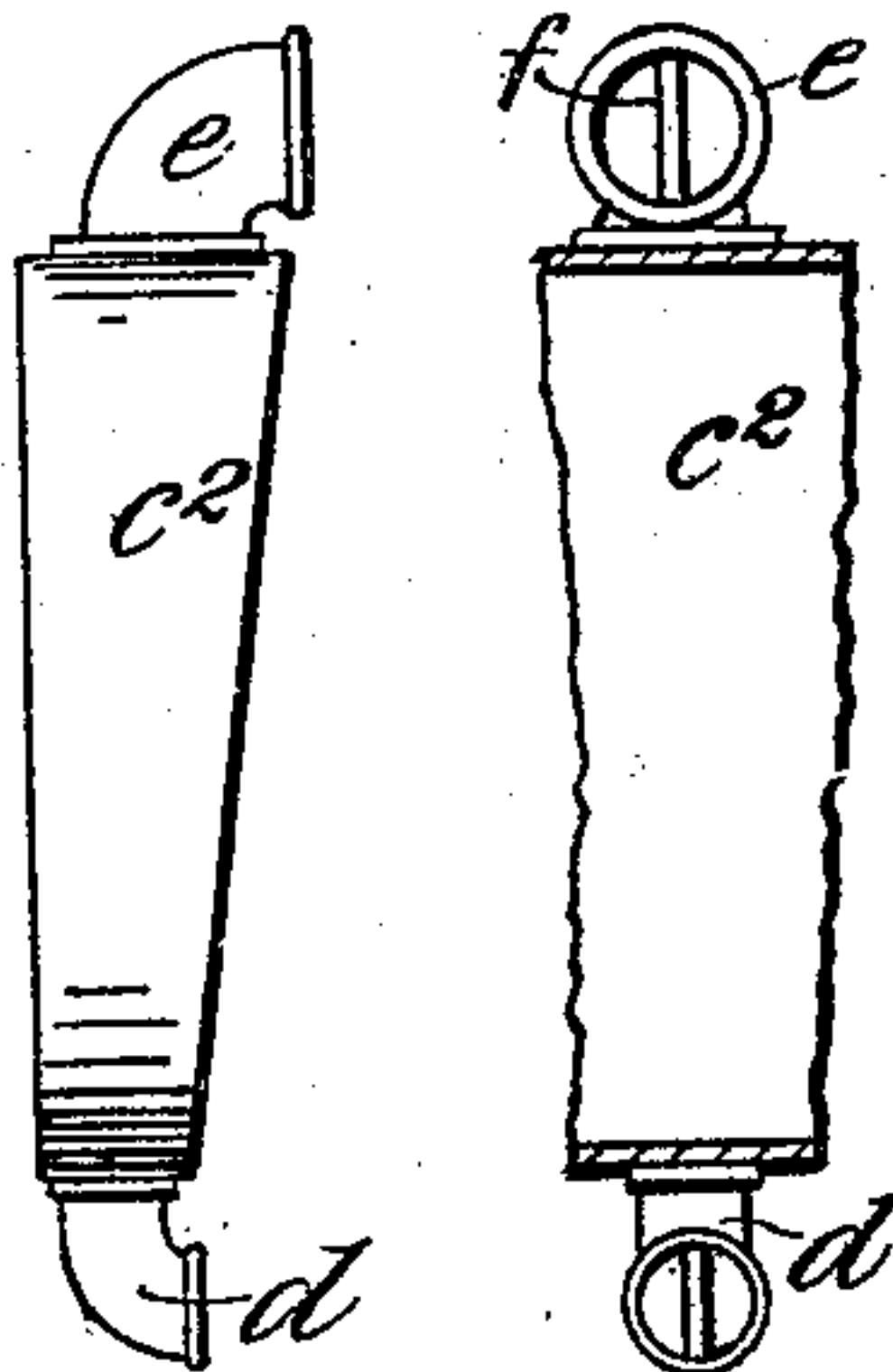


Fig. 4.

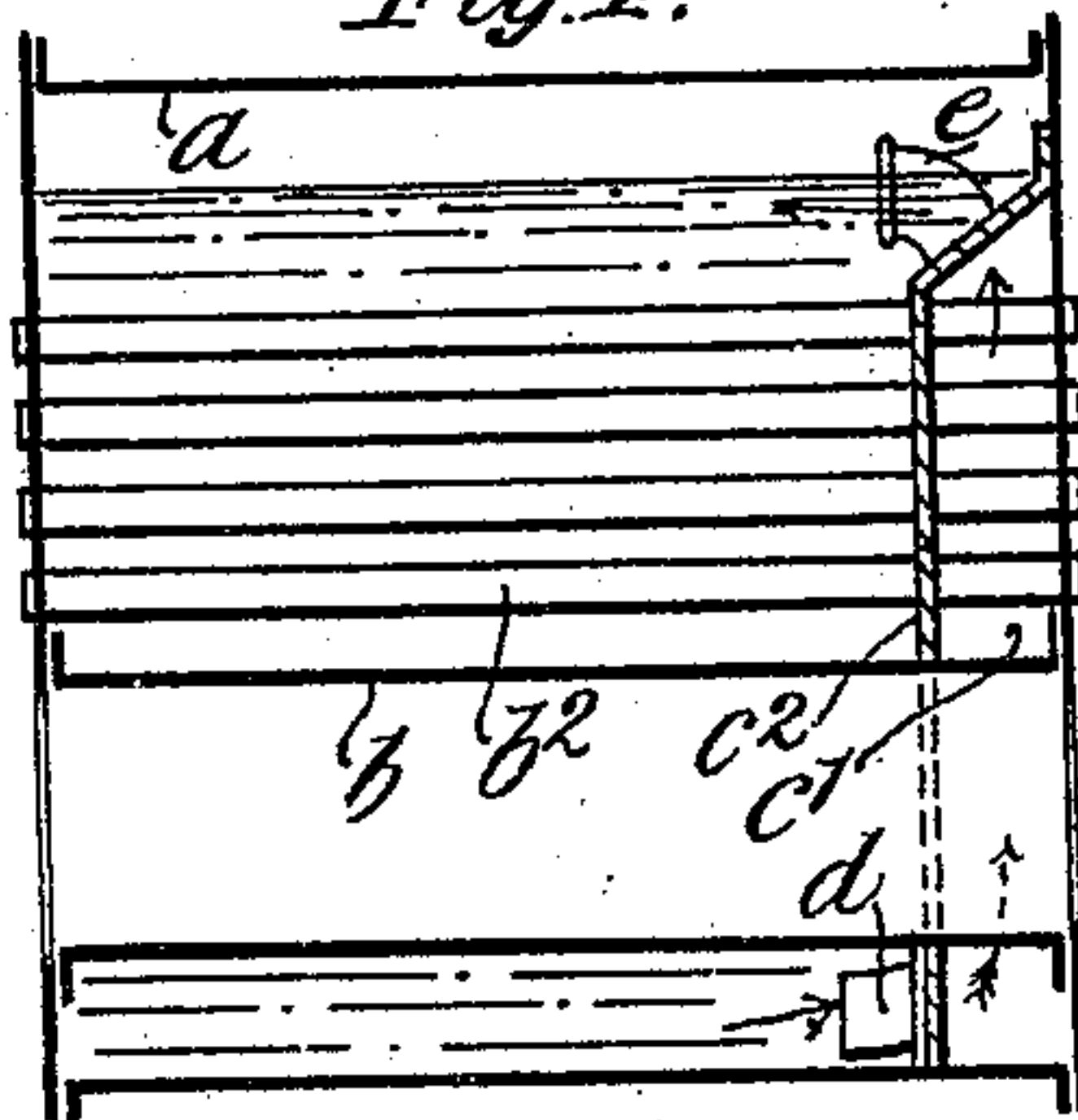


Fig. 6.

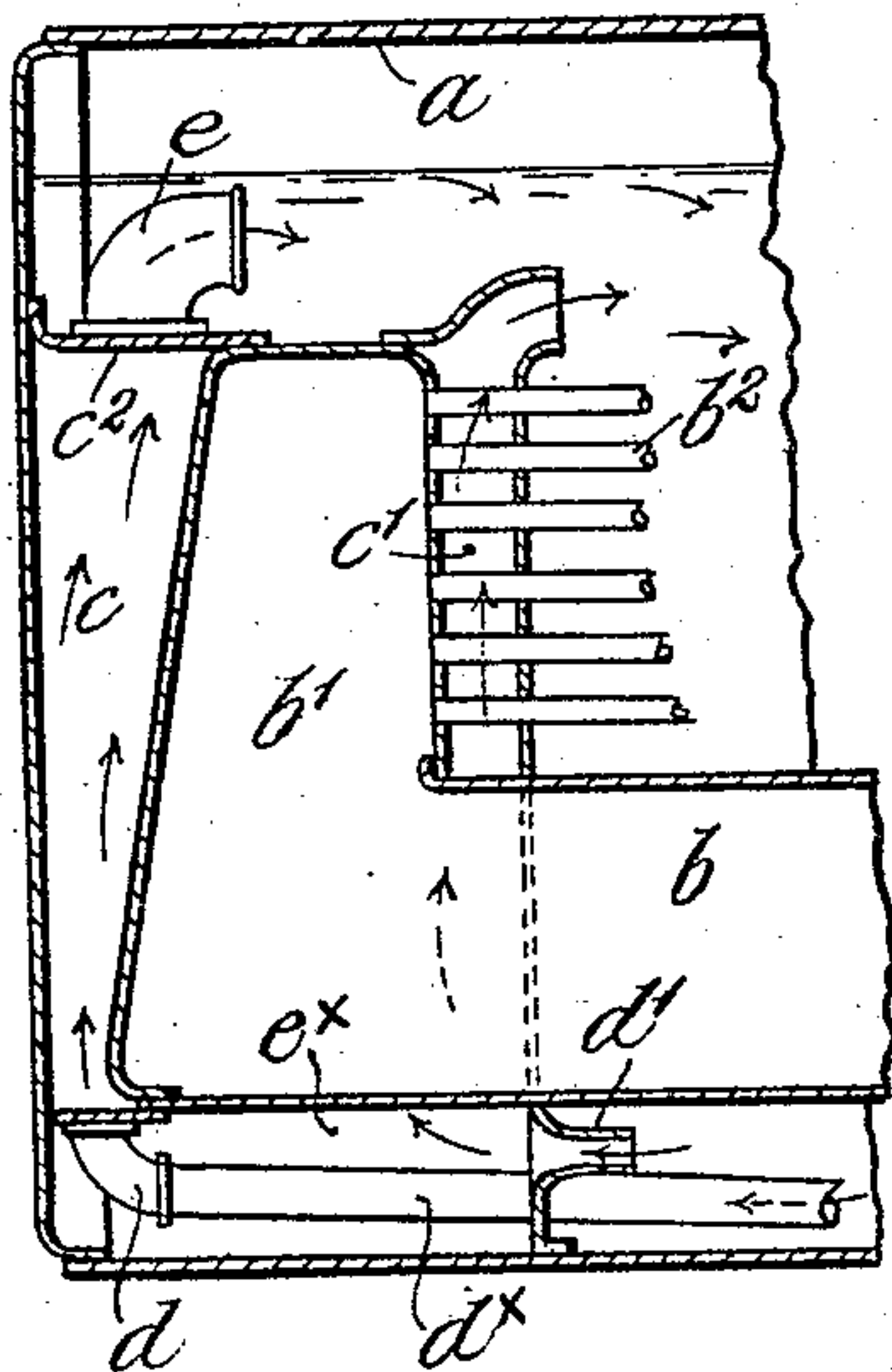
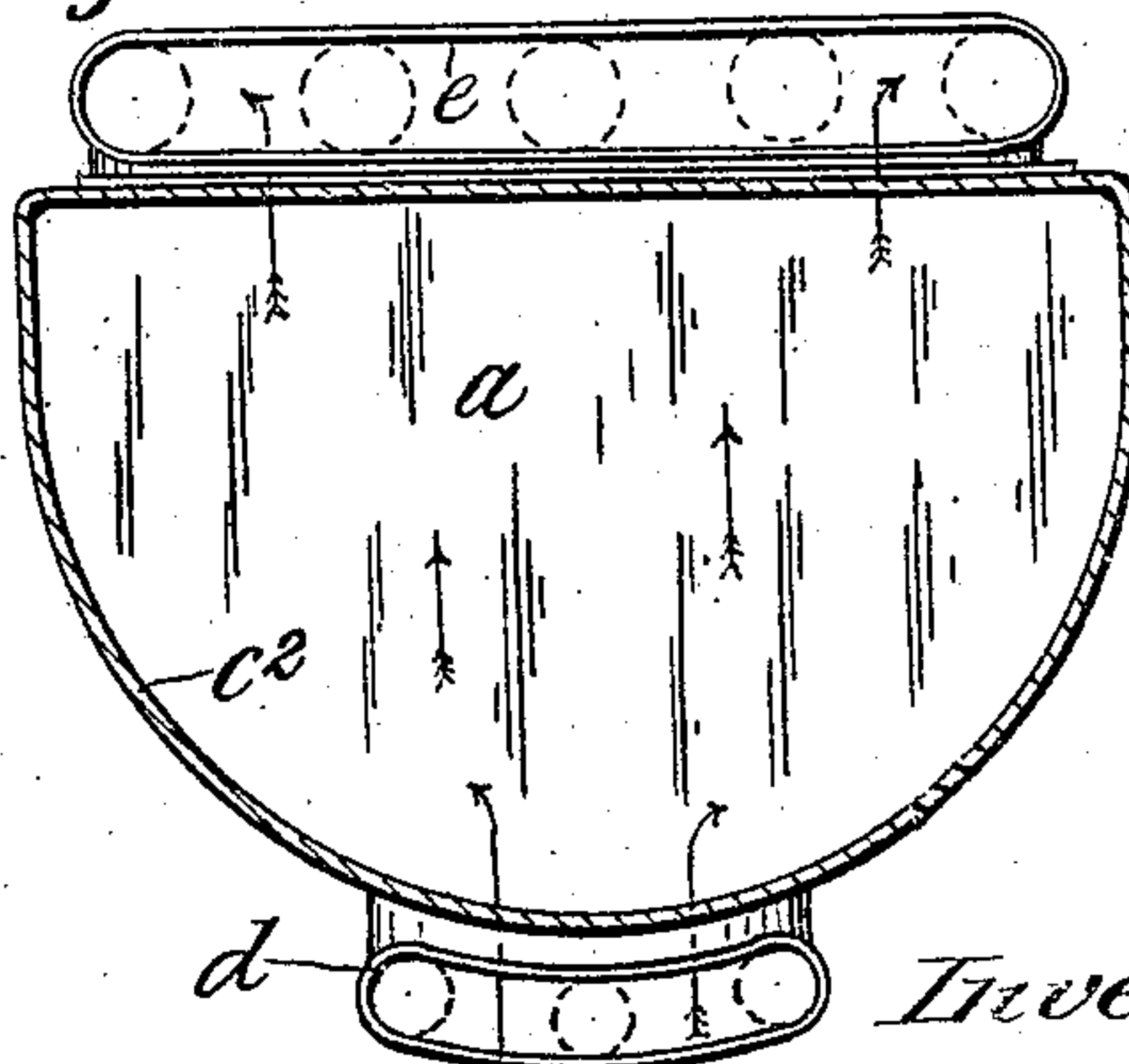


Fig. 5.



Witnesses,

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MEANS FOR PROMOTING CIRCULATION IN STEAM-BOILERS.

No. 848,496.

Specification of Letters Patent.

Patented March 26, 1907.

Application filed September 25, 1905. Serial No. 280,071.

To all whom it may concern:

Be it known that I, SIDNEY JOHN ROSS, a subject of the King of Great Britain, residing at 37 Lower Clapton road, London, N. E., England, marine engineer, have invented certain new and useful Improvements in or Relating to Means for Promoting Circulation in Steam-Boilers, of which the following is a specification.

10 This invention has reference to means for promoting circulation in steam-boilers, more especially those of the cylindrical or shell types.

15 An important feature of the invention is that in the carrying out of the same the use of special cross-tubes or circulating-tubes is dispensed with and that there is no need to make holes in the walls of the flues or combustion-chambers.

20 According to the invention a portion of the water-space—say, for instance, the wet back in what is known as a “wet-back” marine boiler or any other suitable space, according to the type of boiler—is utilized as a means 25 for promoting circulation, such water-space being inclosed more or less at the sides by suitable light sheet-metal or other walls or division-plates, so as to form a vertical water-chamber, as it were, which is practically 30 only in free communication with the rest of the water-space at its upper and lower parts. The arrangement is such that when the water in the inclosed space or in the wet back becomes heated (as it does, for instance, by the 35 rush of the flames which strike the wall of the wet back as they turn up into the return-tubes) it naturally flows in an upward direction, fresh water entering the bottom of the said space to take its place, thus setting up an 40 efficient and positive circulation within the boiler.

45 In order to provide for a longitudinal circulation of the water, the wet back or other circulation-space may be provided with elbows, nozzles, cowls, or the like fitted, for instance, at both the lower and upper ends thereof. Those cowls at the top may have their mouths directed forward or so as to throw the water along the tops of the furnace-crowns toward the front of the boiler, 50 where it will descend and flow back under the flues to the circulating arrangement again, and so on.

55 In order that the invention may be readily understood, I will now proceed to describe the same by reference to the accompanying drawings, in which—

Figure 1 is a longitudinal section showing a wet-back marine boiler with the improved arrangement applied thereto. Fig. 2 is a 60 separate side view of the casing for the wet-back space provided with ordinary elbows—that is to say, elbows of circular section, Fig. 3 being a front view thereof. Fig. 4 illustrates the application of the circulating 65 means to a dry-back boiler. Fig. 5 is a transverse section through the wet back on the line 5 5 of Fig. 1, but showing wide flat elbows such as it is preferred to use. Fig. 6 shows a modification having a circulation- 70 casing at both sides of the fire-box.

The same letters of reference indicate corresponding parts throughout the drawings.

a is the boiler; *b*, the furnace; *b'*, the combustion-chamber, and *b²* the usual return- 75 tubes for the fuel gases. The rear water-space or wet back usual in such boilers is indicated at *c*, Fig. 1, while *c'* indicates the corresponding part in a dry-back boiler, as in Fig. 4, or on the opposite side of the combustion-chamber in a wet-back boiler, as in 80 Fig. 6. To render such a space efficient for circulation purposes, there is fitted around it entirely inside the boiler a casing shell or sheathing *c²*, to which the lower elbows or 85 hoods *d* and the upper elbows or hoods *e* are secured, these consisting either of plain tubular elbows, as in Fig. 3, or wide flat elbows, as in Fig. 5, the latter giving a freer circulation, almost analogous to a cascade arrangement. 90

The casing being internal to the boiler need only be of thin metal, since its purpose is merely to prevent free communication of the water inside and outside it taking place 95 otherwise than through these nozzles or hoods *d* and *e*. It may be secured in place in any convenient way—for instance, by fixing it to the stay-bolts *c³*, usual in this type of boiler. As it is not subject to any material 100 difference of pressure, it is therefore not necessary that its joints should actually be made tight, so long as they are a sufficiently good fit to prevent appreciable leakage or passage of water round its edges. The casing *c²* thus forms an inclosed water-chamber which is 105 practically equivalent to a wide flat circula-

tion-tube without, however, requiring any cutting of the boiler-shell or the fire-box wall for fitting it in position. It will also be seen that the water in the circulation-space c or c' is in contact with the flat back or front wall of the combustion-chamber, and therefore becomes rapidly heated. The aforesaid hoods d and e are secured by tie-bolts f , which may be readily hooked round the stay-bolts c^3 or they may be otherwise fixed in any suitable manner, and instead of a single wide flat elbow, as shown in full lines in Fig. 5, at the top and bottom of the sheathing or casing c^2 a series of plain nozzles, such as in Figs. 2 and 3, may be arranged side by side, as indicated by the dotted circles in the said Fig. 5. The action of the said circulating means or arrangements will be readily understood. With the adjacent parts of the boiler the internal casing or shell c^2 forms in its interior a narrow inclosed water-space open only at the top and bottom through the nozzles. Hence as the flames from the furnace b strike the wall b^3 of the space c (forming the wet back of the combustion-chamber b') the water therein becoming highly heated naturally begins to ascend in the said wet-back space and flows out therefrom at the top hoods or nozzles e . Fresh water from the comparatively cold bottom of the boiler at the same time enters the lower nozzles d . In this way an active circulation throughout the boiler is set up, as shown by the arrows, Fig. 1.

In the arrangement shown in Fig. 4 the same action takes place, the flames and gases in this instance striking the tube-plate behind the space c' as they rush from the furnace b into the tubes b^2 . In this way the water in the said space is heated in the manner described, and a circulation is set up practically in the same way, as in Fig. 1.

The arrangement shown in Fig. 6 combines the features shown in Figs. 1 and 4 in a single arrangement for a wet-back boiler, the spaces c and c' acting as in the previous examples. The wall of the front space c' is, however, continued directly downward, as shown, and provided with short inlet-nozzles or elbows d' at its lower end. The rear space, on the contrary, has its inlet-nozzles connected with long tubes d^x , extending forward through the bottom part c^x of the space c' and passing toward the front of the boiler, in order to draw in water in advance of the nozzles d' , and thus distribute the circulation effect more uniformly. Obviously a similar internal shell or casing, such as c^2 , may be fitted round the flues or furnaces of Lancashire and like boilers to promote circulation in the

same way. In such a case the said shell would be of practically cylindrical shape to correspond to that of the flues.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. A wet-back marine boiler having its wet-back space inclosed at the sides, and provided at top with means for discharging water therefrom in a forward direction, so as to set up longitudinal circulation in the boiler, substantially as described.

2. A wet-back marine boiler, having its wet-back space inclosed at the sides and provided at the top and bottom with forwardly-directed outlet and inlet means, for the purpose of setting up longitudinal circulation in the boiler, substantially as described.

3. In a wet-back marine boiler, the combination of means for inclosing the space behind the combustion-chamber, and means opening below the water-level for discharging the water from the inclosed space in a forward direction, substantially as described.

4. In a wet-back marine boiler, the combination of means for inclosing the space behind the combustion-chamber, an outlet from said space opening below the water-level and discharging water in a forward direction, and an inlet at the bottom of said space to admit the water in a backward direction, for the purpose of setting up a longitudinal circulation in the boiler, substantially as described.

5. In a steam-boiler, the combination of a combustion-chamber an inclosed water-space at one end of said chamber, and a corresponding inclosed water-space in front of said chamber, said spaces being in communication at top and bottom with the main water-space of the boiler, substantially as described.

6. In a steam boiler the combination of a combustion-chamber, an inclosed water-space at one end of said chamber, a corresponding inclosed water-space in front of said chamber, nozzles for directing the water ascending from spaces in a forward direction and means for admitting water to the lower part of either of said chambers from a point near the front of the boiler, substantially as described.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 24th day of August, 1905.

SIDNEY JOHN ROSS.

Witnesses:

C. BARNARD BURDON,
ALFRED NUTTING.