

No. 753,991.

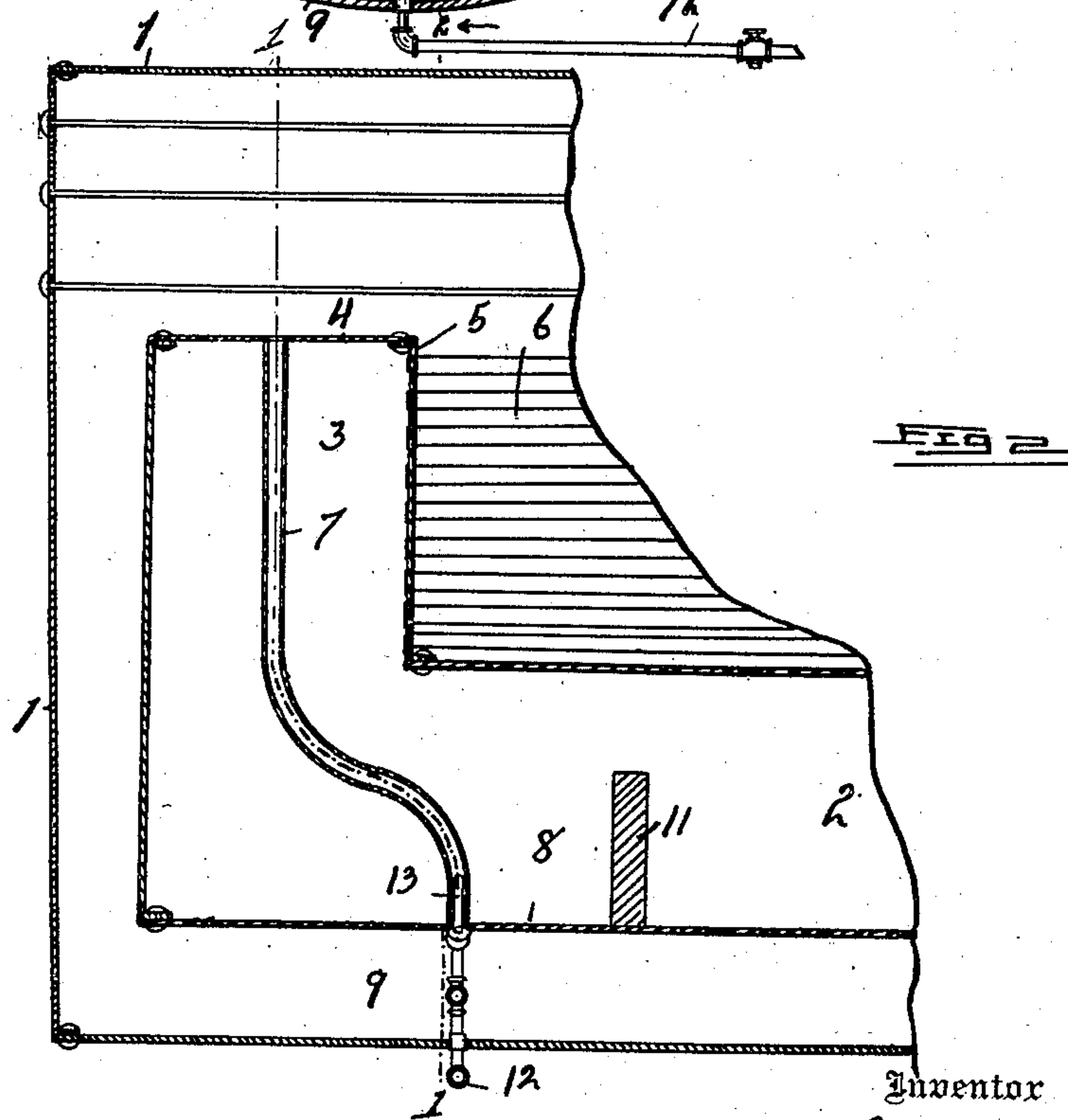
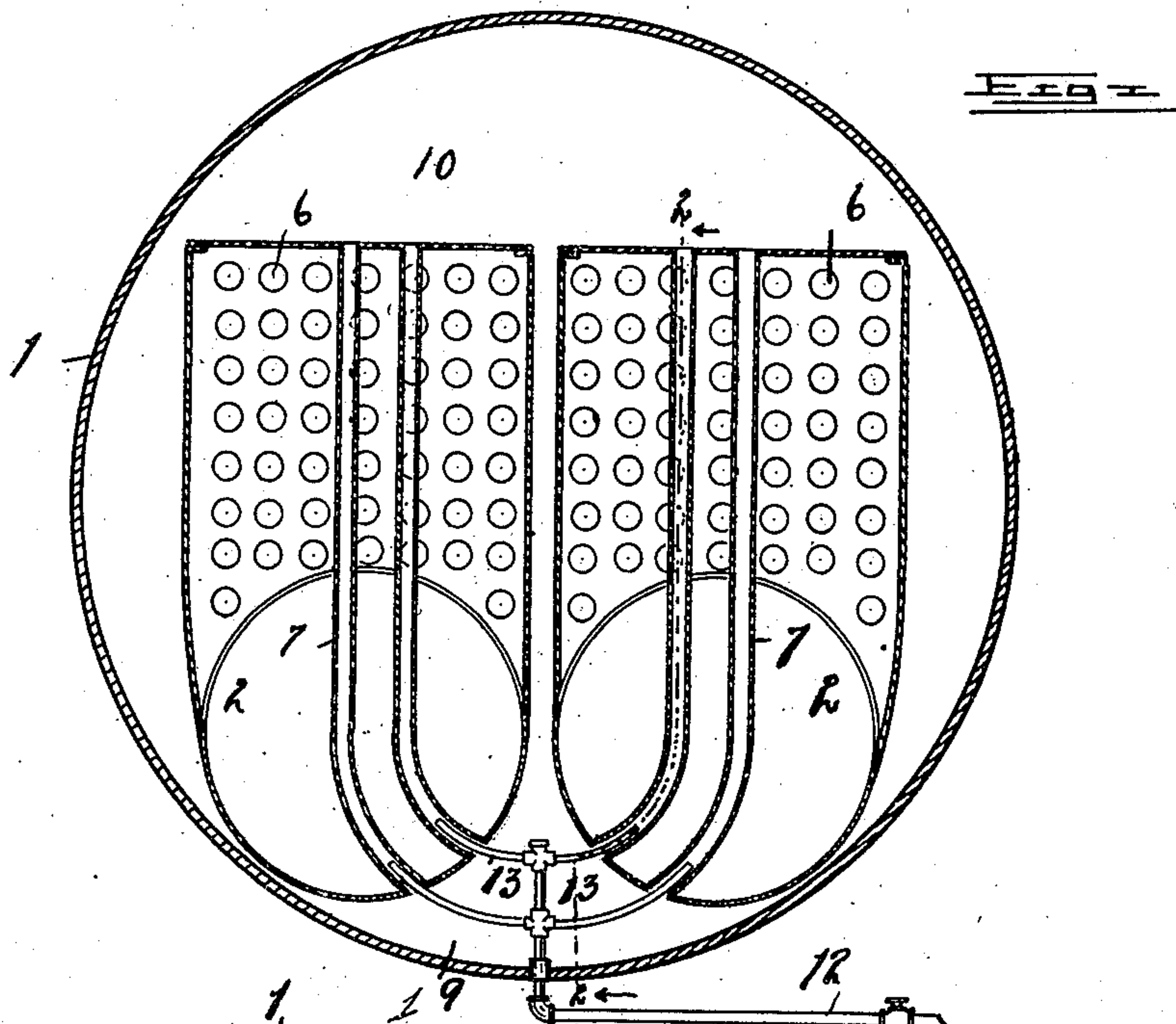
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W. J. MACDONALD.

CIRCULATING SYSTEM FOR STEAM BOILERS.

APPLICATION FILED NOV. 5, 1903.

NO MODEL.



Witnesses:

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UNITED STATES PATENT OFFICE.

WILLIAM J. MACDONALD, OF DETROIT, MICHIGAN.

CIRCULATING SYSTEM FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 753,991, dated March 8, 1904.

Application filed November 5, 1903. Serial No. 179,922. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. MACDONALD, a citizen of the United States, residing at Detroit, in the county of Wayne, State of Michigan, have invented certain new and useful Improvements in Circulatory Systems for Steam-Boilers; and I do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to a circulatory system for steam-boilers; and it consists in the construction and arrangement of parts hereinafter fully set forth, and pointed out particularly in the claims.

The object of the invention is to provide means for producing a free circulation of water in a steam-boiler of the Scotch type, whereby the cool water at the bottom of the boiler below the furnace may be carried upwardly and deposited in the upper portion above the flues, thereby maintaining all parts of the boiler at practically the same temperature and avoiding unequal expansion.

The above object is attained by the structure illustrated in the accompanying drawings, in which—

Figure 1 is a diametrical sectional view through a steam-boiler involving my invention as on line 1 1 of Fig. 2. Fig. 2 is a partial longitudinal section as on line 2 2 of Fig. 1.

Referring to the characters of reference, 1 designates the shell of the boiler, which is herein illustrated as of the double-furnace type, having the fire-spaces 2, as commonly constructed. At the rear of each fire-space is a combustion-chamber 3, having a crown-sheet 4. Crossing transversely the upper portion of each combustion-chamber is a tube-sheet 5, in which the rear ends of the flues 6 are expanded.

Passing vertically through each of the combustion-chambers and expanded at their upper ends in the crown-sheet 4 are the tubes 7, whose lower ends curve forwardly, downwardly, and laterally and are expanded in the

walls 8, surrounding the furnaces. The lower ends of said tubes open into the water-space 9 at the bottom of the boiler, thereby establishing a communication between the water-space 9 and the upper portion 10 of the boiler. The caloric current from the furnaces passes rearwardly over the bridge-wall 11 and impinges upon the tubes 7, thence upwardly around said tubes, and forwardly through the flues 6. This contact of the heat with said tubes 7 tends to rapidly bring the water therein to a high temperature and causing an upward circulation of the water therethrough. This upward movement of the water in the tubes draws the water from the space 9 at the bottom of the boiler and induces a circulation which maintains all of the water in the boiler at comparatively the same temperature, so that unequal expansion is obviated. For the purpose of accelerating the circulation through the tubes 7 while getting up steam and before the boiler is under pressure a steam-pipe 12, connected with another boiler or source of steam-supply (not shown) is passed through the shell of the boiler at the bottom and provided with the branches 13, extending into the tubes 7, whereby a jet of steam may be introduced into the lower ends of said tubes to cause a more rapid circulation of the water therethrough, as will be well understood. By means of this arrangement the cold stratum of water which is usually present at the bottom of boilers of this type, especially at the starting of the fires in the furnaces, is obviated, for the reason that the circulation of water which is induced through the tubes 7 as soon as the caloric current comes into contact therewith carries the water from the lower space 9 of the boiler and discharges it into the upper portion thereof, drawing the water from the sides of the boiler to maintain the circulation, whereby the uneven temperature which ordinarily exists is overcome and injury to the shell and to the interior sheets of the boiler by unequal expansion is obviated.

Having thus fully set forth my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a circulatory system for steam-boilers, the combination with the boiler-shell and com-

bustion-chamber the top of said chamber having a crown-sheet, of the circulatory tube expanded in the crown-sheet of said chamber at its upper end, passing downwardly and forwardly through the combustion-chamber in the rear of the furnace and expanded in the lower wall of said chamber at its lower end, the lower end of said tube communicating with the water-space below the combustion-chamber, and the upper end of said tube communicating with the water-space in the upper portion of the boiler.

2. In a circulatory system for steam-boilers, the combination with the boiler-shell, the furnace and combustion-chamber, the top of said combustion-chamber having a crown-sheet and a bridge-wall dividing the combustion-chamber from the furnace, circulatory tubes expanded at their upper ends in the crown-sheet of the combustion-chamber, said tubes extending downwardly through said chamber and forwardly to a point in the rear of the

bridge-wall, their lower ends being expanded in the sheet forming the bottom of said chamber, said tubes establishing communication between the water-space below the furnace and the water-space in the upper portion of the boiler.

3. In a circulatory system for steam-boilers, the combination with the boiler-shell, the furnace and the combustion-chamber, a circulatory tube passing through the combustion-chamber communicating at its upper end with the water-space of the boiler and at its lower end with the water-space below the combustion-chamber, and a steam-pipe entering the lower end of said tube and standing therein free from the walls thereof.

In testimony whereof I sign this specification in the presence of two witnesses.

WILLIAM J. MACDONALD.

Witnesses:

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