

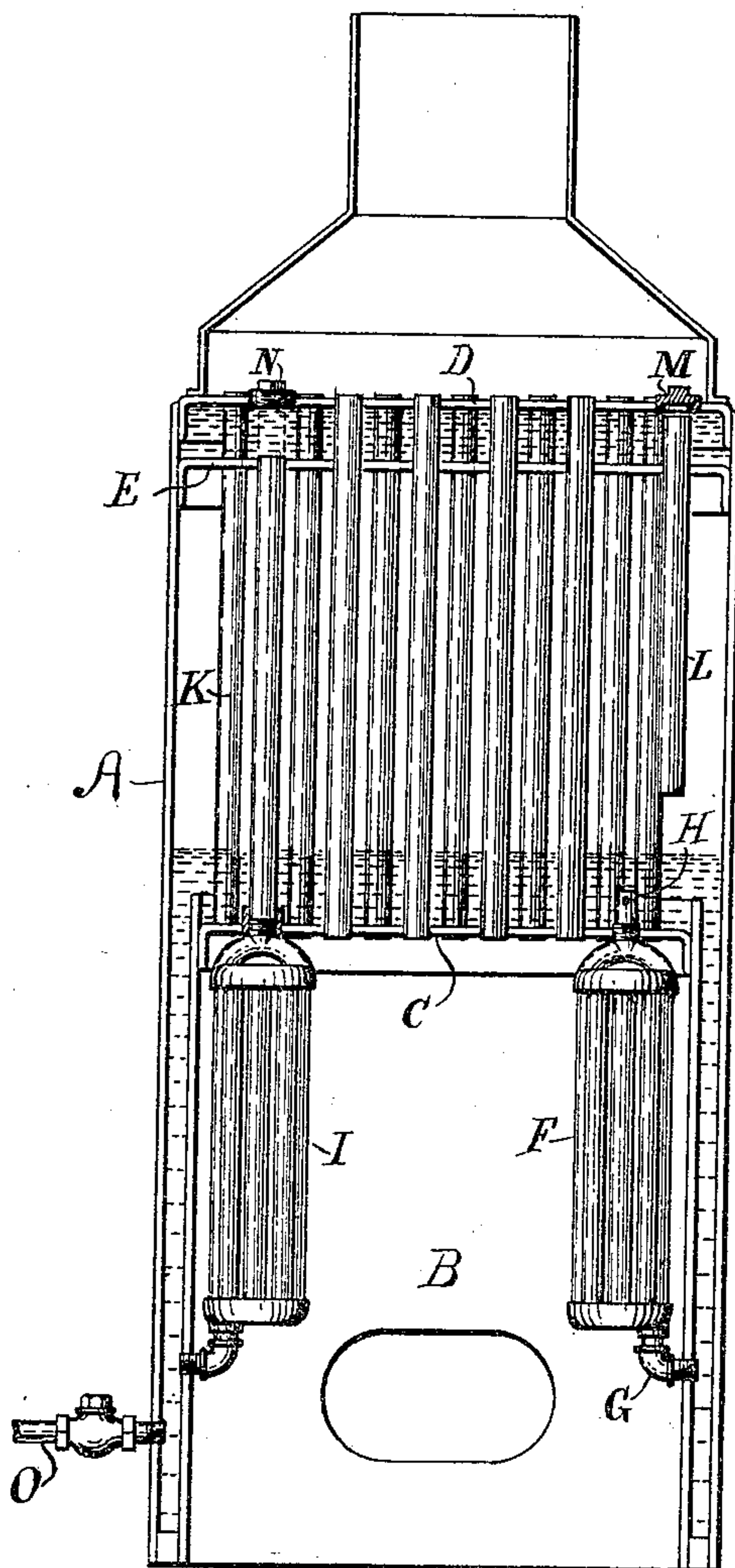
No. 620,948.

Patented Mar. 14, 1899.

C. R. MOORE.
STEAM BOILER.

(Application filed Dec. 12, 1898.)

(No Model.)



WITNESSES:

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CHARLES R. MOORE, OF ELMIRA, NEW YORK, ASSIGNOR TO THE LA FRANCE
FIRE ENGINE COMPANY, OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 620,948, dated March 14, 1899.

Application filed December 12, 1898. Serial No. 698,982. (No model.)

To all whom it may concern:

Be it known that I, CHARLES R. MOORE, a citizen of the United States, residing at Elmira, in the county of Chemung and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification.

My invention relates to improvements in steam-boilers of the vertical smoke-flue type wherein a water-chamber is provided within and at the top of the boiler below the upper head to protect the tops of the smoke-flues; and the object of my improvements is to provide such a boiler with means whereby a constant automatic circulation of water or heavily-saturated steam will be insured from the leg of the boiler into and through said water-chamber while the boiler is in operation. I attain this object by the construction illustrated in the accompanying drawing, in which I have shown a vertical section of a boiler embodying my improvements.

Heretofore boilers of this type have been provided with a water-chamber at the top, surrounding the upper end of the smoke-flues; but the water has been pumped directly into said chamber from the feed-pump and delivered thence into the water space or leg of the boiler. This has disadvantages, inasmuch as the feed-water tends to cool this water-chamber and condense the steam below it in the steam-space of the boiler. Moreover, the feed-pump has to be watched carefully in order to keep this chamber filled and yet not raise the level of the water in the boiler above the normal point, since when the feed is shut off the water may be driven entirely out of the water-chamber. It has also been customary for some time past to construct boilers of the smoke-flue type with a high fire-box, filling said fire-box above the fire-space with circulating nests, coils, or tubes, and it has been found that where such circulating media open vertically into the boiler above the crown-sheet the water in circulating through will be thrown to the top of the boiler, saturating the steam therein and rendering the boiler practically useless unless means are provided to divert this flow in lateral directions. I have

in my present improvements taken advantage of this fact, as will presently appear.

In the drawing, A represents the shell of the boiler, B the fire-box, and C the crown-sheet, located at some distance above the fire-space.

D represents the head of the boiler, and E a diaphragm in the boiler a short distance below the head. The smoke-flues pass through and are expanded into the diaphragm and head, forming thereby a water-tight compartment at the top of the boiler.

At F, I have shown a nest of tubes running between headers, the bottom header of which is connected by a coupling G to the leg of the boiler and the upper header of which is screwed into and projects through the crown-sheet at H, this projection H being plugged at the top and provided with lateral openings, as indicated, whereby the water in circulating is thrown laterally over the crown-sheet of the boiler. This type of nest is used in what is known as the "La France" fire-engine boiler, and the fire-box is filled with a greater or less number of these circulating-nests, according to the size of the boiler, only one being shown in the drawing for the purpose of illustration. Were the projection H not plugged, it would be found that the water circulating through the nest would be thrown clear to the top of the boiler. Taking advantage of this fact, I supply the water-chamber with water from the leg of the boiler by connecting one of the series of nests, as I, to a pipe K, which passes up through the diaphragm E and opens into the water-chamber, and it will readily be seen that when the nest I is heated the water therein will rise through the pipe K and flood the water-chamber, since the cooler column of water around the leg of the boiler being heavier than the heated column in the nest I and pipe K will force the hotter and therefore lighter column upward. The water and steam from the water-chamber will descend through the pipe L and pass back into the boiler proper, said pipe extending downward, preferably, from near the top of the water-chamber in order that said chamber shall be kept filled. The pipes L and K are expanded

into the diaphragm E, screw-plugs M and N being provided in the head D for the purpose of inserting the expander.

O represents the connection from the feed-pump to the boiler.

In operation it will be seen from the above that so long as the boiler is fired a circulation from the leg of the boiler will take place through the nest I and the pipe K into the water-chamber at the top of the boiler, and thence through the pipe L back into the water-space, the steam which may be generated during such circulation rising into the steam-space of the boiler. Thus at all times while the boiler is under fire the water-chamber will be filled with water, or at any rate, heavily-saturated steam, this water or saturated steam protecting the top ends of the smoke-flues and preventing leakage around their connections with the head of the boiler. By this means also the water-chamber is filled at all times with hot water or steam and condensation of the steam in the steam-space of the boiler beneath the diaphragm is prevented. Also I gain additional heating-surface from the tops of the smoke-flues for generating steam in the boiler.

Instead of the nest I a single-pipe connection may be made between the leg of the boiler and the water-chamber; but I prefer to insert the nest or some other arrangement of tubes within the fire-box, whereby a larger heating-surface is provided, thereby insuring a more rapid and efficient circulation into and through the water-chamber. Therefore while I have illustrated my invention as applied to the La France boiler it will be apparent that it may be applied with equal facility to any boiler wherein the fire-box will permit of the insertion of a circulating medium, whether it be in the nature of a nest of tubes or a coil or a single circulating-tube.

I have shown the pipe K as opening into the bottom of the water-chamber. This will allow the water to drain back therefrom into the boiler when the fire is banked or out; also, all the water may be drawn off from the boiler from a single draw-off cock at the leg

of the boiler. As soon, however, as the boiler is fired and before heat enough is generated to injure the flue-tops there will be a circulation of water or saturated steam back into the water-chamber sufficient to protect the tubes. The pipe K may, however, be extended to the top of the water-chamber, as indicated by the broken lines, if it is desired to trap the water in the chamber when there is no circulation.

Having thus described my improvements, what I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with an upright smoke-flue boiler, of a water-chamber surrounding the flues at their upper ends, a pipe connection leading from the leg of the boiler through the fire-box into said water-chamber, and an eduction-pipe leading from said water-chamber into the boiler below the water-chamber, whereby a constant circulation of water or heavily-saturated steam is produced around the tops of the flues when the boiler is in operation.

2. The combination, with an upright smoke-flue boiler, of a water-chamber surrounding the flues at their upper ends, a plurality of pipes located in the fire-box of the boiler and having their lower ends connected with the leg of the boiler and their upper ends to a pipe leading into said water-chamber, and an eduction-pipe leading from near the top of said water-chamber into the boiler below the water-chamber, for the purpose set forth.

3. The combination, with an upright smoke-flue boiler, of a water-chamber surrounding the flues at their upper ends, a system or series of circulating media, as nests, tubes or coils, in the fire-box of the boiler, one of said media being connected with said water-chamber, and an eduction-pipe leading from said chamber into the boiler below the chamber.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES R. MOORE.

Witnesses:

A. S. DIVEN,
C. TRACEY STAGG.