J. T. WAINWRIGHT.

CIRCULATING DEVICE IN STEAM-BOILERS.

No. 186,774. Patented Jan. 30, 1877.

Fig: 1.

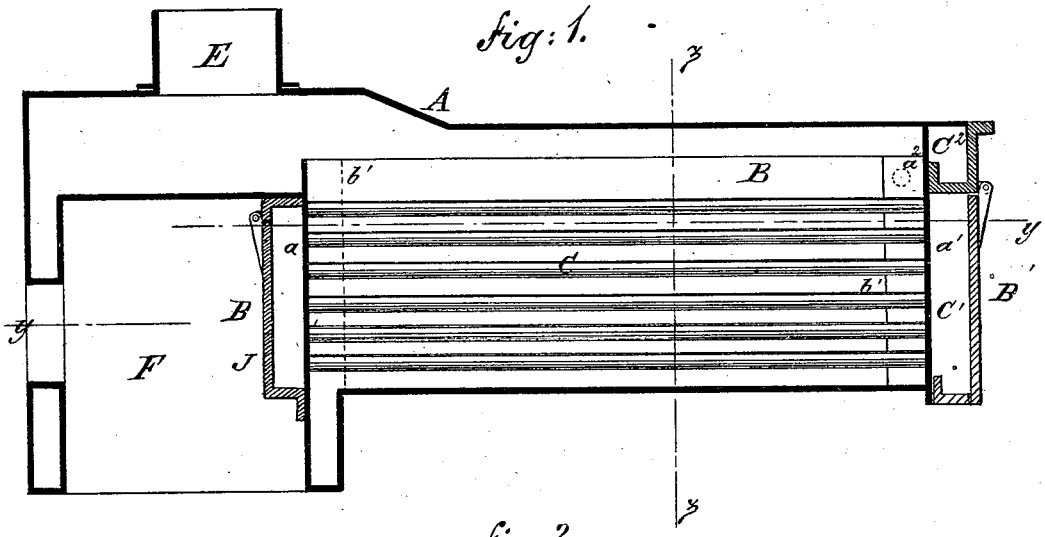


Fig: 2.

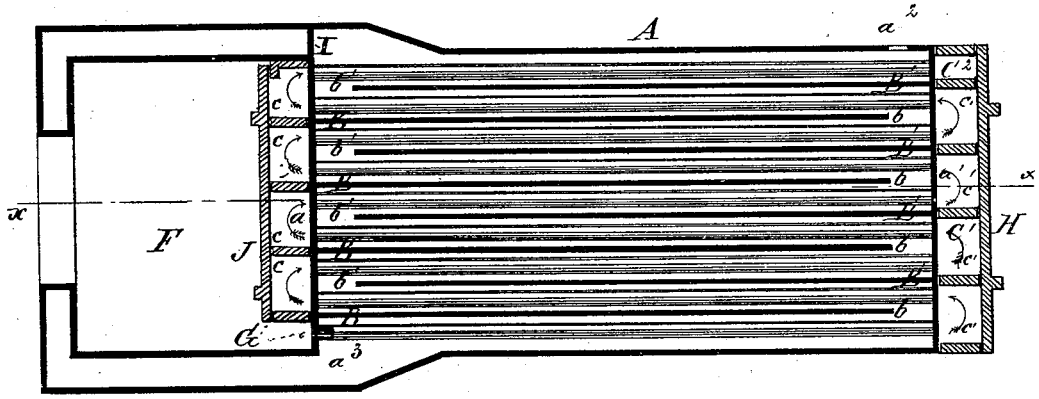
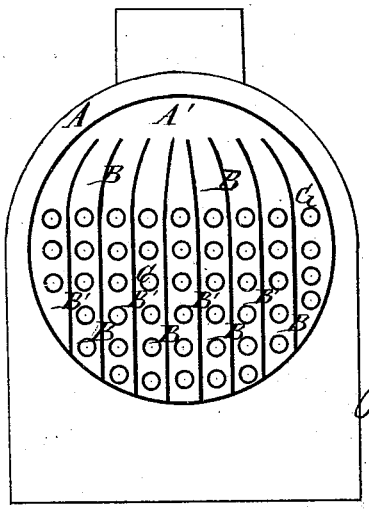


Fig: 3.



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JACOB T. WAINWRIGHT, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN CIRCULATING DEVICES IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **186,774**, dated January 30, 1877; application filed November 4, 1876.

To all whom it may concern:

Be it known that I, JACOB T. WAINWRIGHT, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and Improved Boiler, of which the following is a specification:

Figure 1 is a vertical longitudinal section on line *x x* in Fig. 2. Fig. 2 is a horizontal section on line *y y* in Fig. 1. Fig. 3 is a transverse section on line *z z* in Fig. 1.

Similar letters of reference indicate corresponding parts.

My invention relates to improvements in steam-boilers; and it consists, first, in the arrangement of partitions or deflecting-plates between tubes in a boiler, which extend from the bottom of the boiler-shell upward above the water-line, and are attached alternately to the front and rear heads of the boiler; and, second, in an arrangement of partitioned smoke-boxes at the front and rear of the boiler, or other equivalent means, by which the products of combustion are made to pass back and forth through alternate rows of tubes in its passage to the chimney. The products of combustion pass through the boiler-tubes in a direction contrary to that taken by the injected feed-water.

The object of the invention is to utilize the greatest possible amount of heat by conducting the products of combustion back and forth several times through the boiler, and by introducing the feed-water near the point of exit of the products of combustion, causing it to move between the partitions or deflecting-plates toward the warmer portions of the boiler in a direction contrary to that taken by the products of combustion.

Referring to the drawing, A is the shell of an ordinary horizontal boiler, and C are the usual tubes arranged in vertical rows. Vertical partitions or deflecting-plates B B′ are attached to the lower portion of the shell, and extend upward above the water-line, and are curved toward the center line of the boiler. These partitions are shorter than the distance between the tube-sheets, and are attached alternately to the front and rear tube-sheets. The partitions B are attached to the front tube-sheet *a*, leaving the spaces between their ends *b* and the back tube-sheet a^1, and the partitions B′ are attached to the back tube-sheet a^1, in alternation with the partition B, leaving spaces between their ends *b′* and the front tube-sheet. Water is injected into the boiler at a^2, and flows between the boiler-shell and the first partition or deflecting-plate B to the front of the boiler, thence backward between the partitions B and B′, and so on, toward the hotter portions of the boiler, in a zigzag course between the several partitions or plates B B′. A smoke-box, J, is placed in the fire-box F, over the ends of all the tubes, excepting the first vertical row, (indicated by G.) The said smoke-box is divided vertically by partitions, that inclose spaces *c*, each of which covers two vertical rows of tubes. C^1 is a smoke-box, placed at the back of the boiler, and divided by vertical partitions, that inclose spaces *c′*, each of which covers two vertical rows of tubes; but the partitions in the smoke-box C^1 are placed between the sets of tubes covered by the spaces *c* in the smoke-box J, and similarly the partitions in the smoke-box J are placed between the sets of tubes opening into the spaces *c′* in the smoke-box C^1, so that the products of combustion pass from the fire-box F into the flues G, and thence to the smoke-box C^1, following the direction indicated by the arrows through the boiler-flues and spaces in the smoke-boxes J and C^1 until they are discharged into the flue C^2, that leads to the chimney.

It will thus be seen that the products of combustion enter the flues at a point remote from the point at which the feed-water is introduced, and are discharged into the chimney-flue near the feed-water pipe.

It will also be seen that the feed-water, being introduced at this the coolest part of the boiler, does not affect the temperature of the water in the boiler, as it would if it were introduced in the ordinary way.

The water traverses the boiler back and forth between the partitions and around the tubes in a direction contrary to that taken by the products of combustion in their passage through the tubes toward the chimney.

The smoke-boxes J and C^1 are provided with hinged covers H, which may be opened for the purpose of cleaning the tubes or tube-sheet.

When my improvement is applied to loco-

motive boilers the water-leg of the boiler is stopped off, as shown at I in Fig. 2, to prevent a direct circulation around the fire-box. When it is applied to a vertical boiler the partition may be spiral and continuous, and the partitions in the smoke-box also may be arranged spirally.

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

1. The partitions or deflecting-plates B B′, in combination with the boiler-shell A and tubes C, substantially as and for the purpose herein shown and described.

2. The smoke-boxes J and C^1, having vertical partitions, in combination with a boiler, A, having vertical partitions B B′ and tubes C, substantially as shown and described.

JACOB T. WAINWRIGHT.

Witnesses:

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