J. C. STEAD.

Feed-Water Heater and Circulator for Steam-Boilers.

No. 207,779. Patented Sept. 3, 1878.

Figure 1.

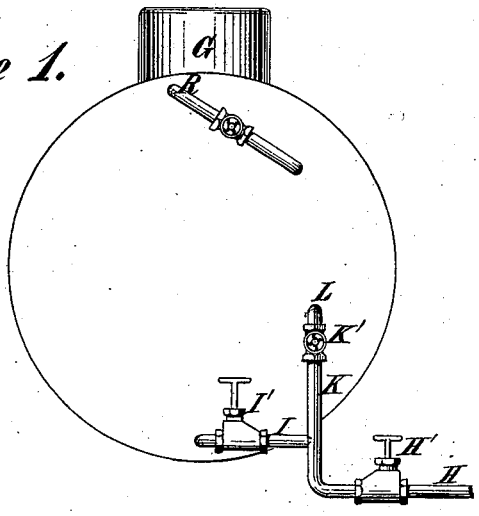

Figure 2.

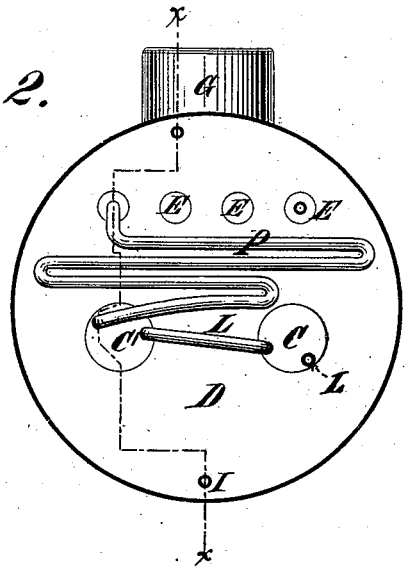

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Figure 3.

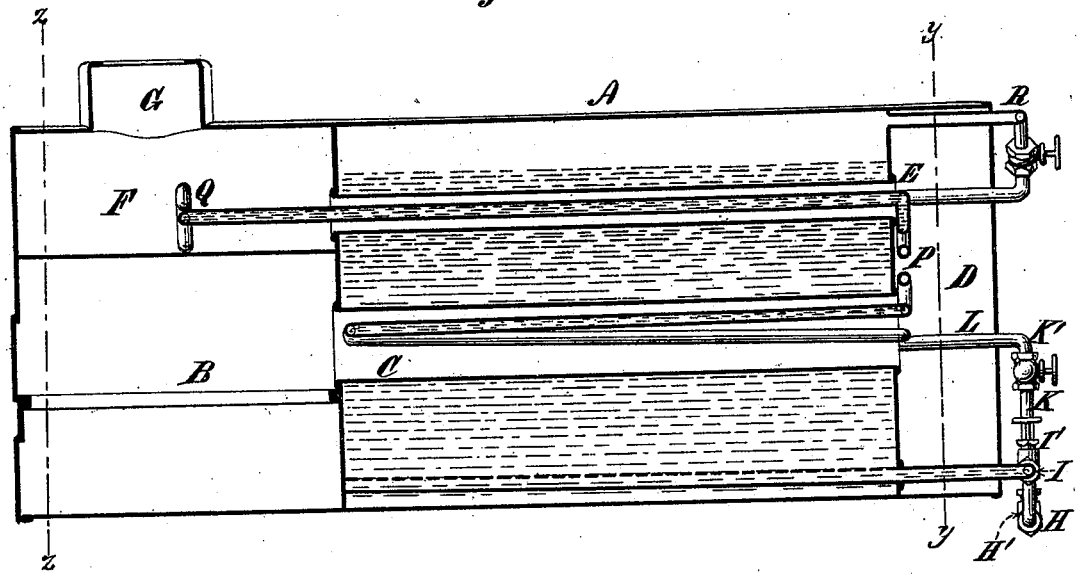
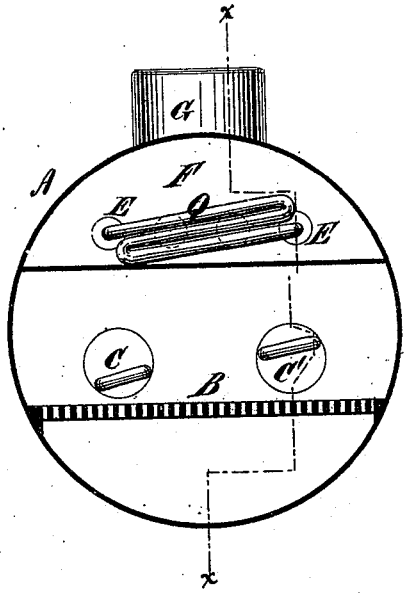


Figure 4.



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UNITED STATES PATENT OFFICE.

JAMES C. STEAD, OF GREEN POINT, NEW YORK.

IMPROVEMENT IN FEED-WATER HEATERS AND CIRCULATORS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. **207,779**, dated September 3, 1878; application filed July 8, 1878.

To all whom it may concern:

Be it known that I, JAMES C. STEAD, of Green Point, New York, have invented certain Improvements in Feed-Water Heaters and Circulators for Steam-Boilers, of which the following is a specification:

My improvements relate to that class of feed-water apparatus which is composed of a heating-coil, one end of which is connected with the water-body in the bottom of the boiler and with the service-pipe, and the other end is connected with the steam-space in the boiler; and my invention consists in the combination of such a coil with the inside flues and end connections of an inside-flue boiler.

The accompanying drawings represent a horizontal return-flue boiler provided with my feed-water heater and circulator, and are as follows:

Figure 1 is a view of the rear end of the boiler, showing the external connections of the feed-water coil. Fig. 2 is a transverse section of the boiler through the line *y y* on Fig. 3. Fig. 3 is a longitudinal vertical section upon the irregular line *x x* in Figs. 2 and 4, and Fig. 4 is a transverse vertical section through the line *z z* on Fig. 3.

The drawings represent a return-flue boiler, A, having a furnace, B, at its front end, from which the products of combustion pass through the flues C C′ to the rear connection D, and thence through the return-flues E E E E into the front connection F, from which they make their escape into the smoke-stack G.

The feed-water is introduced into the boiler from the service-pipe H, and may be directed into the bottom of the boiler by means of the pipe I, or into the feed-water coil, and thence into the top of the boiler by means of the pipe K, according to which of the two valves I′ and K′ is open while the other is closed. In use, it is intended that the feed shall take place through the pipe K into the coil; and during the feeding operation, therefore, the valve I′ is closed and the valve K′ is open. The valve K′ is affixed to the lower extremity of the coil-pipe L, in which the feed-water is heated. This pipe traverses back and forth, longitudinally, the flue C, then crosses through the rear connection to the other flue, C′, which it traverses back and forth on a slightly higher elevation. The coil then makes several turns, P, back and forth through the rear connection, then extends forward through one of the return-flues into the front connection, where it again makes several turns, Q, back and forth, and is then returned through one of the other return-flues, E, to the rear end of the boiler, where it is joined to a valve on the end of the pipe R, which is connected with the steam-space in the boiler.

When the feeding operation is completed, the service-pipe valve H′ is closed, and, the other valves being open, the coil then acts as a circulator. Water from the bottom of the boiler enters into the coil through the pipes I and K, and passing upward is discharged into the steam-space in the boiler through the pipe R.

It will be seen, on reference to Figs. 2 and 4, that the return-bends of the pipe traversing the flues are arranged on successively higher elevations, so that the feed-water and the water from the bottom of the boiler enter that part of the coil which is lowest, and gradually rises as it flows through the coil.

That part of my invention which consists in arranging the convolutions of the heating-coil in the end connections of the boiler is applicable to upright tubular boilers. When so employed, the heating-coil, after making several turns back and forth in the upper part of the furnace, is carried through one of the vertical flues to the upper connection, where it makes several turns back and forth, and thence is carried into the steam-space in the boiler.

It will be seen that the pipe I extends horizontally through the water-body in the bottom of the boiler nearly to the front end of the boiler, and is closed at the end, but is provided with a series of perforations, *i*, upon its upper side. The object of thus extending and perforating the pipe I is to draw water from the lower part of the water-body along the whole length of the boiler.

I claim as my invention—

1. The combination of an inside-flue boiler with a heating-coil traversing the flue or flues of such boiler, and having convolutions in the end connections of the boiler, and being connected at one end with the service-pipe and

with the water-body in the bottom of the boiler, and at the other end with the steam-space of the boiler, the connections being provided with the usual valves, whereby the feed-water may be introduced into the coil or directly into the boiler, and whereby, when feeding is intermitted, the coil acts as an auxiliary steam-generator, and causes a vigorous circulation of water from the bottom of the boiler into and through the coil, and thence into the steam-space in the upper part of the boiler, substantially as described.

2. In combination with the feed-water-heating coil, having a connection with the steam-space in the upper part of the boiler, the draw-off pipe I, provided with the perforations *i*, and extending through the lower part of the water-body along nearly the whole length of the boiler, substantially as described.

JAMES C. STEAD.

Witnesses:
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