2 Sheets—Sheet 1.

J. C. STEAD.

Feed-Water Heater and Circulator for Steam-Boilers

No. 207,780. Patented Sept. 3, 1878.

Figure 1.

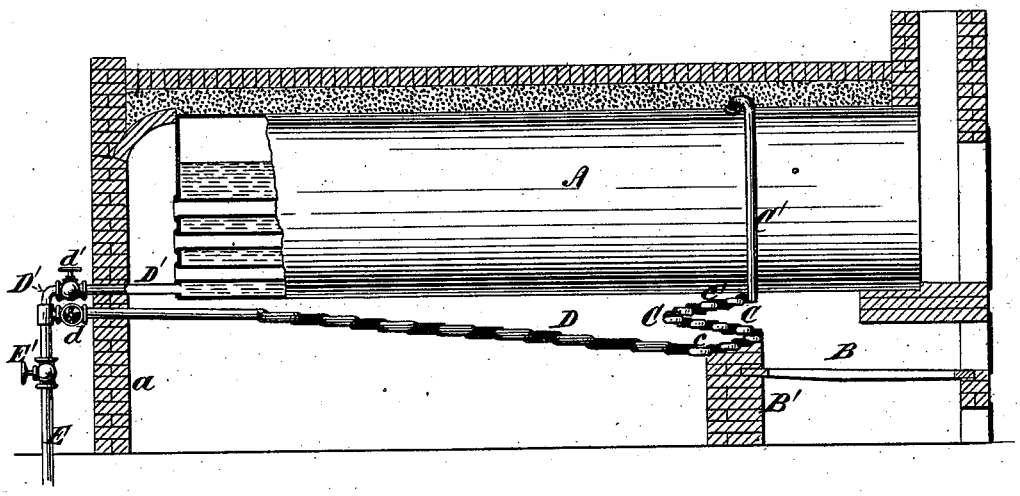
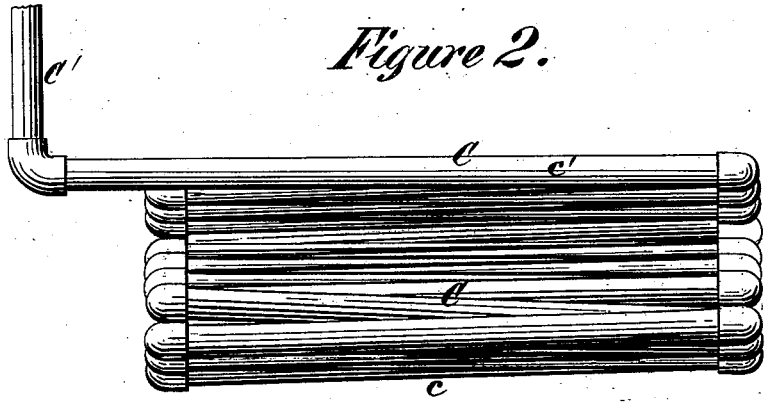


Figure 2.



Witnesses:
Geo. W. Miatt
Edw. Payson

Inventor:
James C. Stead
Per Edw. E. Lumb
Atty.

J. C. STEAD.

Feed-Water Heater and Circulator for Steam-Boilers.

No. 207,780. **Patented Sept. 3, 1878.**

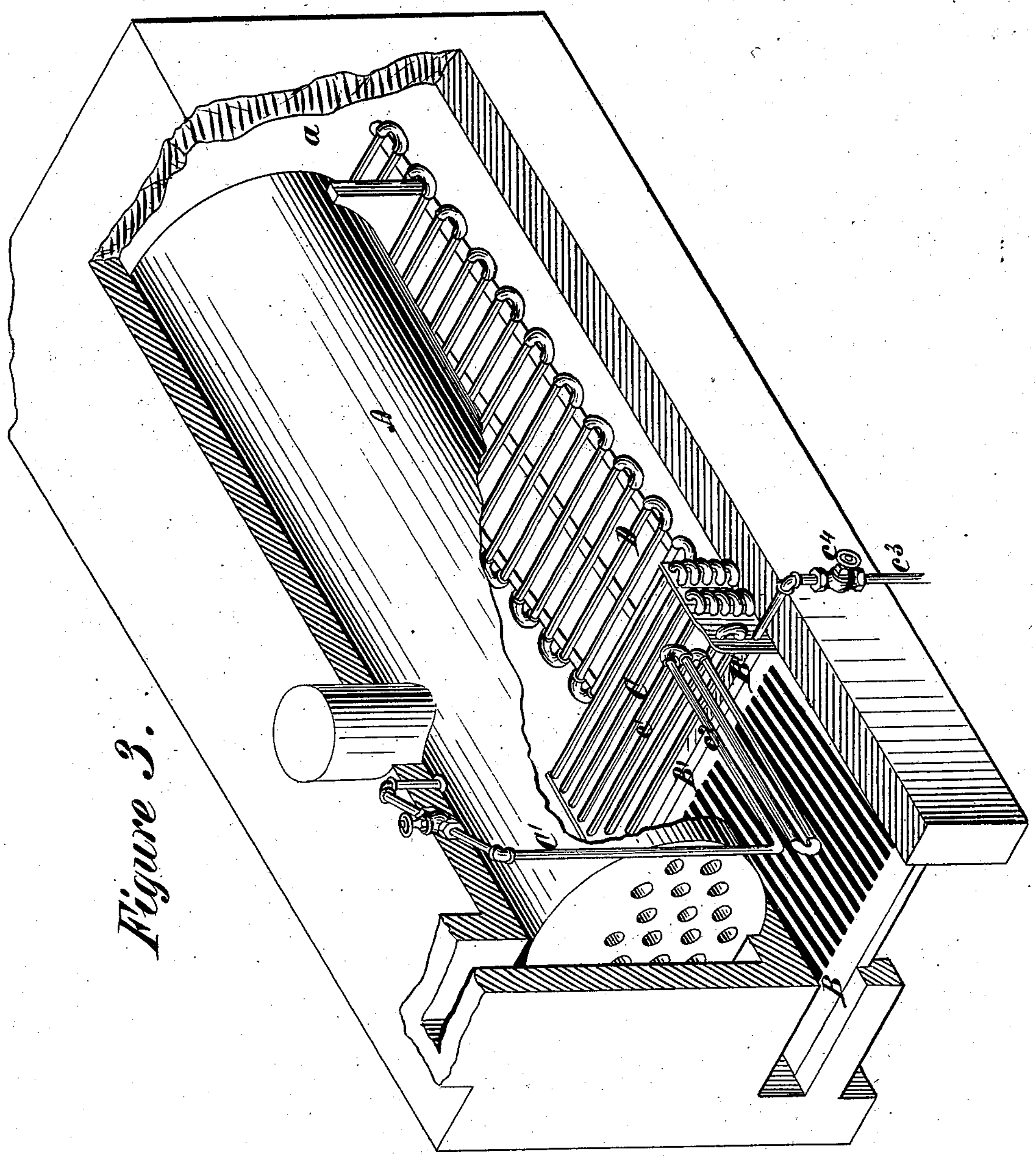


Figure 3.

Witnesses:
Geo. W. Miatt
Edwd Payton

Inventor:
James C Stead
Per Edw. E. Quimby
Atty.

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. **207,780**, 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, (as shown and described in Letters Patent of the United States No. 198,428, granted to me December 18, 1877,) of which the following is a specification:

My invention relates to that class of feed-water heaters and circulators in which a portion of the heater occupies the bridge-wall. Heretofore such portion of the heater has consisted of a drum set on the top of the bridge-wall, and having connections with the bottom and the top of the boiler.

My present invention consists principally in the substitution for the drum of a coil of pipes, the return-bend pipes of which extend longitudinally across the bridge-wall, the lowest pipe of the coil being connected with a pipe through which water is supplied either from the service-pipe or from the water-body in the bottom of the boiler, and the highest pipe of the coil being connected with a pipe leading into the steam-space in the upper part of the boiler. The coil is much superior to the drum as a means of effecting a vigorous circulation of the water in the boiler, and as an auxiliary steam-generator by reason of the greater heating-surface it affords.

My invention also includes the combination of the coil of pipes on the bridge-wall with a supply-pipe composed of return-bend pipes arranged transversely in a plane underneath the back part of the boiler and connected with a pipe entering the lower part of the rear end of the boiler, and also connected with the service-pipe; and, further, my invention includes the combination of the coil on the bridge-wall with a series of return-bend pipes occupying a portion of the side of the furnace above the level of the top of the coil, and connected with a pipe leading into the steam-space in the upper part of the boiler; and, finally, my invention includes the application to the lower part of the coil on the bridge-wall of a blow-off pipe provided with a valve.

The accompanying drawings are as follows: Figure 1 is an elevation of an ordinary stationary boiler, set in brick, with one side wall removed to exhibit the heating-coil. Fig. 2 is a front elevation, on an enlarged scale, of that portion of the coil which is fixed upon the bridge-wall, together with a portion of the pipe leading from the coil to the steam-space in the top of the boiler. Fig. 3 is an isometrical perspective, showing a modified arrangement of the pipes forming the coil on the top of the bridge-wall.

The drawings represent a horizontal boiler, A, set in the usual way, and provided with a furnace, B, at one end. The bridge-wall B′ of the furnace is less than the usual height, and is surmounted with a coil composed of the return-bend pipes C C C. The highest part of this coil is connected with a vertical pipe, C^1, which is carried into the steam-space in the top of the boiler. The other end of the coil is connected with the pipe D, which makes several turns back and forth in the flue underneath the boiler, and is carried out through the rear wall, *a*, and then turned and joined to the pipe D′, which extends back through the wall *a*, and is connected with the lower part of the boiler. Two valves, *d* and *d′*, are provided in that portion of the pipe D which extends outside the back wall, *a*, and between these two valves is a connection with the service-pipe E, provided with a valve, E′. By means of these valves water may be supplied through the service-pipe directly into the bottom of the boiler, or into the coil-pipes D C c^2, from which, after being heated, it will be injected into the steam-space in the upper part of the boiler through the pipe C^1.

The return-bend pipes C on the bridge-wall may be inclined in opposite directions, as shown in Figs. 1 and 2, for the purpose of preventing the formation of any steam-space in any part of the coil against which the flames of the furnace directly impinge. This object, however, is practically accomplished by building the front portion, *b*, of the bridge-wall high enough to shield the lowest tier of the coil-pipes C C C, as shown in Fig. 1, and by connecting the lowest tier, *c*, of the coil with the pipe through which water is supplied to the coil, and the highest tier, c^1, of the coil with the pipe C^1, through which heated water or steam is dis-

charged from the coil into the steam-space. The coil on the bridge-wall is extended by the connection of its highest tier, c^1, with the return-bend pipes c^2, arranged in a vertical plane on the side of the furnace and connected with the lower end of the vertical pipe C^1.

One of the important features of my invention is the connection of the heating-coil with the water-body in the rear end of the boiler, where the water is coolest.

By means of my improved apparatus the feed-water is thoroughly heated before it is allowed to pass into the boiler, and when the feeding operation is completed the apparatus acts as an auxiliary steam-generator, and creates a vigorous circulation of water from the bottom of the boiler into and through the coil, and thence into the steam-space in the top of the boiler.

The lower part of the coil on the bridge-wall is connected with a blow-off pipe, c^3, provided with the valve c^4.

What I claim as my invention is—

1. A continuous heating-coil arranged, substantially as shown and described, upon the top of the bridge-wall, and having one connection with the water-body in the lower part of the boiler, and another with the steam-space in the upper part of the boiler, substantially as and for the purposes set forth.

2. The heating-coil C C C, arranged upon the bridge-wall of the furnace, connected at one extremity with the steam-space in the top of the boiler, and at the other extremity with a pipe leading into the lower part of the boiler farthest from the furnace, substantially as described.

3. The heating-coil C C C, arranged upon the bridge-wall of the furnace, in combination with the system of return-bend pipes D, the service-pipe E, and the pipe D′, connected with the lower part of the boiler, substantially as shown and described.

4. The heating-coil C C C, arranged upon the bridge-wall of the furnace, connected at its lower extremity with a pipe for supplying it with water either from the service-pipe or from the bottom of the boiler, in combination with the system of return-bend pipes C^2, arranged upon one side of the furnace, and connected at its lower extremity with the upper tier, c^1, of the coil on the bridge-wall, and at its upper extremity connected with the vertical pipe C^1, for discharging water and steam into the steam-space in the upper part of the boiler, substantially as set forth.

JAMES C. STEAD.

Witnesses:

ROBERT H. POLLOCK,

EDWD. PAYSON.