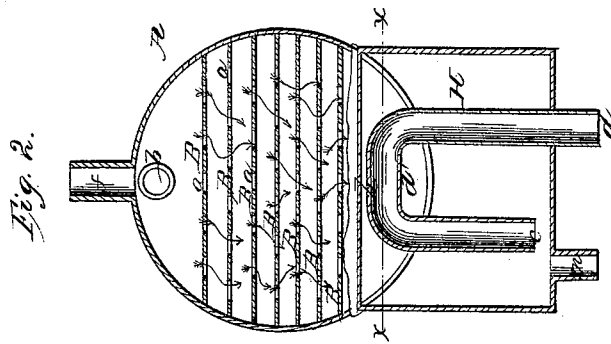
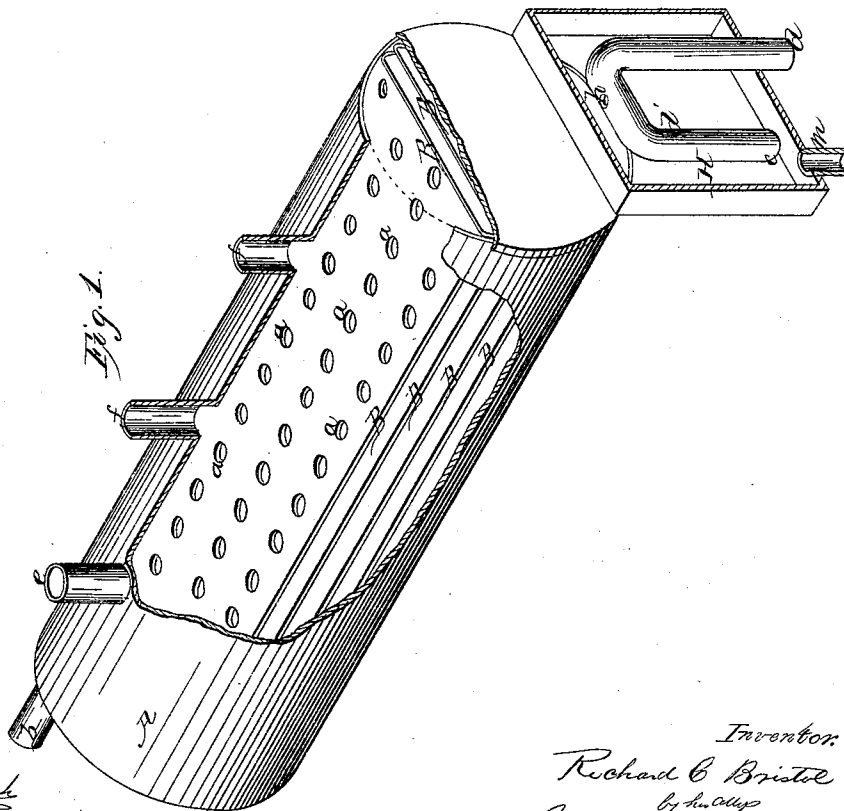


R. C. Bristol,
Steam-Boiler Condenser.

No 37,731.

Patented Feb. 24, 1863.



Witnesses.
Gustave Deland
D. C. Lamm

Inventor.
Richard C. Bristol
by his attys
Mason Tenney & Lawrence

UNITED STATES PATENT OFFICE.

RICHARD C. BRISTOL, OF CHICAGO, ILLINOIS.

IMPROVEMENT IN FEED-WATER HEATERS FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. 37,731, dated February 24, 1863.

To all whom it may concern:

Be it known that I, RICHARD C. BRISTOL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Feed-Water Heaters for Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a perspective view of a feed-water heater constructed in accordance with my invention. Fig. 2 is a transverse section of the same.

Similar letters of reference in both figures indicate corresponding parts.

Feed-water heaters for steam-boilers have been variously constructed, so that the exhaust-steam from the engine and the feed-water have been brought into direct contact with one another in flowing and circulating through the heating-chamber. Many of these are very cumbrous, and those not so are of so small a capacity that the water is only partially heated to the temperature due to exhaust-steam. To obviate these difficulties and insure the imparting of all the heat of exhaust-steam to the feed-water, and in the smallest space, is the design of one part of my invention, while the design of another part of my invention is to prevent the discharge into the boiler along with the heated feed-water of oil which has entered to the heater along with the exhaust-steam.

The invention which I have made is, first, distributing the feed-water through the heating-chamber in small jets or streams by means of a series of perforated plates, arranged one above another, in combination with the circulating of the exhaust-steam through the heater and in contact with the feed-water by the same means, so that it passes over the plates and down through the same, and thus heats both the plates and the feed-water, while the plates give off their heat to the water; second, in taking the heated feed-water from the heater at a point below the surface of the body of water in the lower part of the heater, so that the oil is not discharged with it into the boiler.

To enable others skilled in the art to make and use my invention, I will proceed to de-

scribe the same with reference to the drawings.

Into a cylindric or other shaped heating-chamber, A, I insert several horizontal partition-plates, B B, which are placed a short distance apart, and are finely perforated, as indicated at *a a*. The reticulations are arranged in the respective plates so that those of one plate are not in line with those of another, and thus the feed-water and steam are compelled to flow and circulate in circuitous courses, and by reason thereof the heating of the water is more thorough. The arrows illustrate the courses of the water and steam. The inlet for the feed-water is above the plates, as indicated at *b*, and the outlet below the same, as indicated at *c*. The water may be drawn or forced in at *b*, while the heated water is allowed to flow out and pass to the feed-pump from the discharge *d*, said pump standing on a plane below the heater. The exhaust-steam may be taken in and out by means of the pipes *e f g*, or it may be taken in and out at any other desirable point. I however prefer in most cases to introduce and take out the steam above the plates.

It will be seen that the plates present a large amount of surface to be heated by the steam, and the water being spread equably over the same, and caused to flow down in small circuitous streams, will be thoroughly mingled with the steam and be heated by it and the plates to the temperature due to the steam. In this way a very small vessel will answer the purpose, and very little water will have to be carried.

By examining the drawings it will be observed that the outlet and discharge of my heater is located below the bottom of the chamber A. This arrangement or its equivalent, with such engines as use small boilers relatively to the amount of heating-surface, is very essential, as it has been found that when the exhaust-steam and feed-water have been brought in contact the oil from the engine was fed to the boiler to such an extent as to cause the water in the boiler to foam in such a degree that such mode of heating feed-water was impracticable. To avoid this, I have provided a bent tube, *d'*, with a vent-hole, *h*, in the highest portion of the curve. This tube has its curved perforated portion *h* always above

the level of the water, and its receiving end *c* below the surface of the water in the heater, this being insured either by a waste-pipe of the heater or by having the capacity of the feed-pump equal to or in excess of the quantity supplied. The curved pipe might be arranged directly on the cylindric heater by making it (the heater) somewhat higher in proportion to what it is shown in the drawings, and thus making more room below the bottom plate of the series of plates; but I prefer, in order to avoid this increase in size of the heater, to attach a well, *H*, to one end of the cylinder *A*, as represented, and to have the curved pipe located in it. This well communicates with the chamber of the cylinder *A*, and it may be of any depth and level below the bottom of the same.

It will be observed that the curve of the pipe in this arrangement is somewhat above the bottom of the cylinder, and as the depth of water at any time in the cylinder is not to be above the dotted line *xx*, the water will flow out at *c*, circulate by reason of pressure of head of water around in the pipe *d'*, and escape at *d*, passing therefrom to the feed-pump of the boiler, and by reason of thus passing out the oil will remain behind on the surface of the water in the heater. So long

as the water maintains a height such as indicated by the dotted line *xx*, it will continue to flow; but when it falls below the bottom of the curved part of the pipe the pressure due to the head of water will be exhausted, and the air rushing in at *h* will balance the pressure on the water, and the flow will cease. The oil and surplus water are removed through the pipe *m* when necessary.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of plates, perforated to a greater or less extent over their surface, with the shell or case of feed-water heaters of steam generators or boilers, for the purpose set forth.

2. The combination of the bent tube, or its equivalent, with a feed-water heater of steam generators or boilers, for the purpose set forth.

3. The combination of the well, bent tube, and a feed-water heater of a steam-generator or steam-boiler, substantially as and for the purpose set forth.

R. C. BRISTOL.

Witnesses:

GUSTAVE DIETERICH,
D. C. LAWRENCE.