(No Model.)

C. J. BROWN.

APPARATUS FOR HEATING FEED WATER.

No. 575,207. Patented Jan. 12, 1897.

Fig. 1.

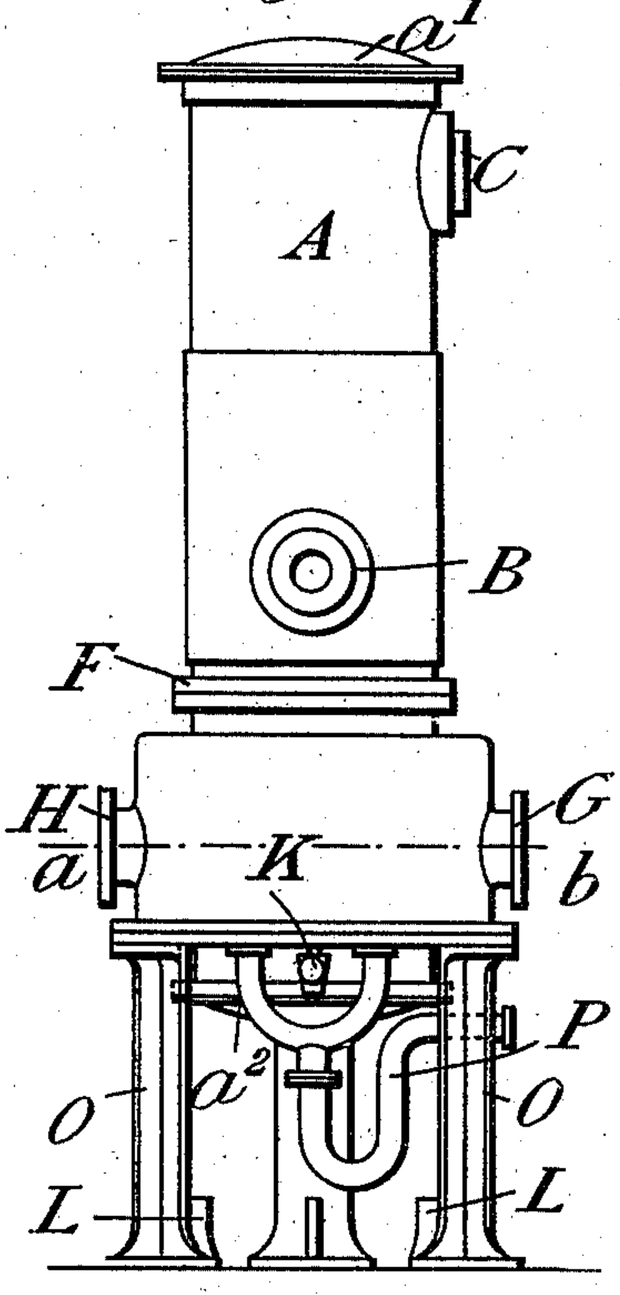


Fig. 2.

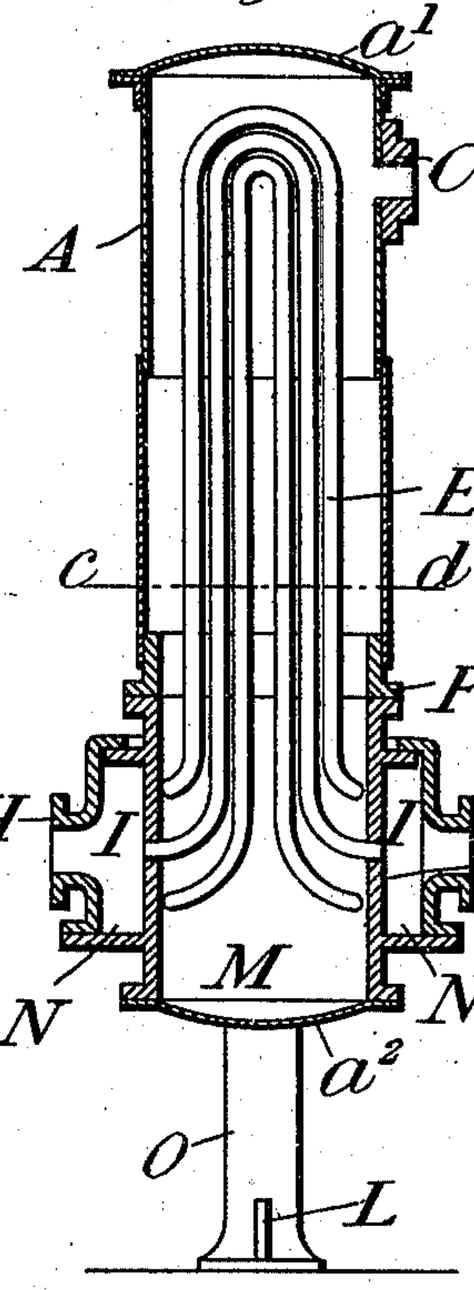


Fig. 3.

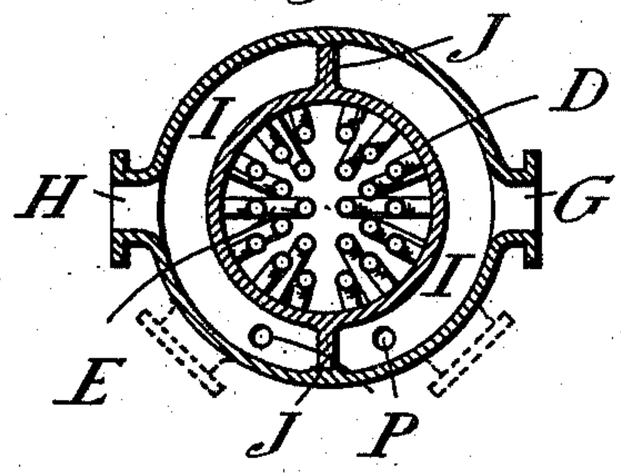
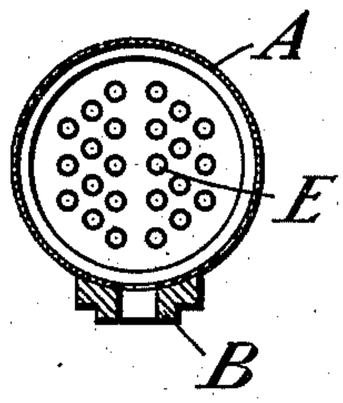


Fig. 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

CHARLES J. BROWN, OF LONDON, ENGLAND.

APPARATUS FOR HEATING FEED-WATER.

SPECIFICATION forming part of Letters Patent No. 575,207, dated January 12, 1897.

Application filed August 20, 1896. Serial No. 603,402. (No model.) Patented in England March 20, 1894, No. 5,766.

To all whom it may concern:

Be it known that I, CHARLES JAMES BROWN, a citizen of England, residing at No. 15 Victoria Street, Westminster, London, in the county of London, England, have invented certain new and useful Improvements in Apparatus for Heating Water or Steam, also applicable for condensing or refrigerating purposes, (for which I have obtained a patent in Great Britain, dated March 20, 1894, No. 5,766,) of which the following is a specification.

My invention relates to that kind of apparatus for heating feed-water or steam in which the heating fluid is made to pass through tubes of an inverted-U shape contained in a chamber through which the fluid to be heated passes.

My invention consists, mainly, of an improved form of tubes and tube-plate whereby an uninterrupted course is allowed for the precipitation and deposit of mud, saline, lime, and other impurities and free access is allowed to the exterior of the tubes from both ends of the heater. The internal tubes, through which the steam (which may or may not be the exhaust from an engine) passes, are mainly of the well-known inverted-U form, which, as is well known, has the advantage of allowing free expansion without strain.

In order that my invention may be better understood, I refer to the accompanying drawings.

Figure 1 is an outside elevation of a heater constructed in accordance with my invention. Fig. 2 is a cross-sectional elevation on the same plane as Fig. 1. Fig. 3 is a sectional plan taken through the line *a b*, Fig. 1. Fig. 4 is a sectional plan taken on the line *c d*, Fig. 2.

A is the usual external casing, having the water-inlet B and outlet C. It is closed by a top cover a', bolted on, and by a bottom cover a^2, also bolted on. The lower part of the casing is preferably constructed of thicker material, such as cast-iron, in order to form the annular tube-plate D, into which the ends of the tubes E are inserted and expanded, their lower ends being bent outward, as shown, for this purpose. This tube-plate or body is preferably constructed separate from the casing and attached thereto by bolts securing the ring F, to which the casing A is riveted.

G is the steam-inlet, and H the steam-outlet. They communicate with the annular steam-space I, which by means of the walls or division-plates J (see Fig. 3) is divided into two half-belts. It will be seen from Figs. 2 and 4 that the tubes are so disposed that the steam from the inlet G can only enter the ascending legs of the U-tubes, the descending legs all delivering into the outlet half-belt communicating with H.

A sludge-cock K is attached to the lower part of the body, by which means the sediment can be periodically blown out.

The main feature of my invention is the accessibility of the exterior of the tubes for cleaning. Thus when the bottom lid a^2 is detached and dropped onto the ledges L prepared for it a man can clean the tubes by means of a brush or hose-pipe from below, and by removing the top cover a' the upper pipes can be similarly cleaned.

Another important feature is the space M below the ends of the tubes, where sediment can collect without interfering with or scaling the tubes.

It will be observed that there is a space N in the half-belts I below the level of the lower tube ends. This is for the purpose of collecting the condensed-steam water, which is drained off through a pipe P and may be used for any desired purpose.

The legs O are provided to carry the whole apparatus and to allow access to the tubes and interior of body and casing when the bottom cover a^2 is removed.

It is obvious that I may place the inlet and outlet branches G and H in any desired position radially on their respective half-belts, as indicated by dotted lines in Fig. 3.

The above-described apparatus can also be employed for condensing or refrigerating purposes by passing the fluid to be condensed through the chamber A, while the refrigerating fluid is made to pass through the tubes E.

Having thus described the nature of my said invention and the best means I know of carrying the same into practical effect, I claim—

In an apparatus of the class herein described, the combination with the casing A, provided with an inlet and outlet opening, of the removable covers a', a^2, fitted to the top and bottom of said casing respectively, an

annular tube-plate D, forming the lower part of the casing, a series of inverted-U-shaped tubes E, having their ends fixed in said tube-plate, an enlarged belt I, entirely surrounding the said casing near its lower end, so as to provide an annular chamber which is divided with two compartments by the vertical partitions J, an inlet branch G, communicating with one compartment and an outlet H communicating with the other compartment, legs O, secured to the enlarged belt and serving as a support for the casing, and ledges L, fixed to said legs and adapted to support the bottom of the casing when detached, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 10th day of August, A. D. 1896.

CHARLES J. BROWN.

Witnesses:
OLIVER IMRAY,
JNO. P. M. MILLARD.