

(No Model.)

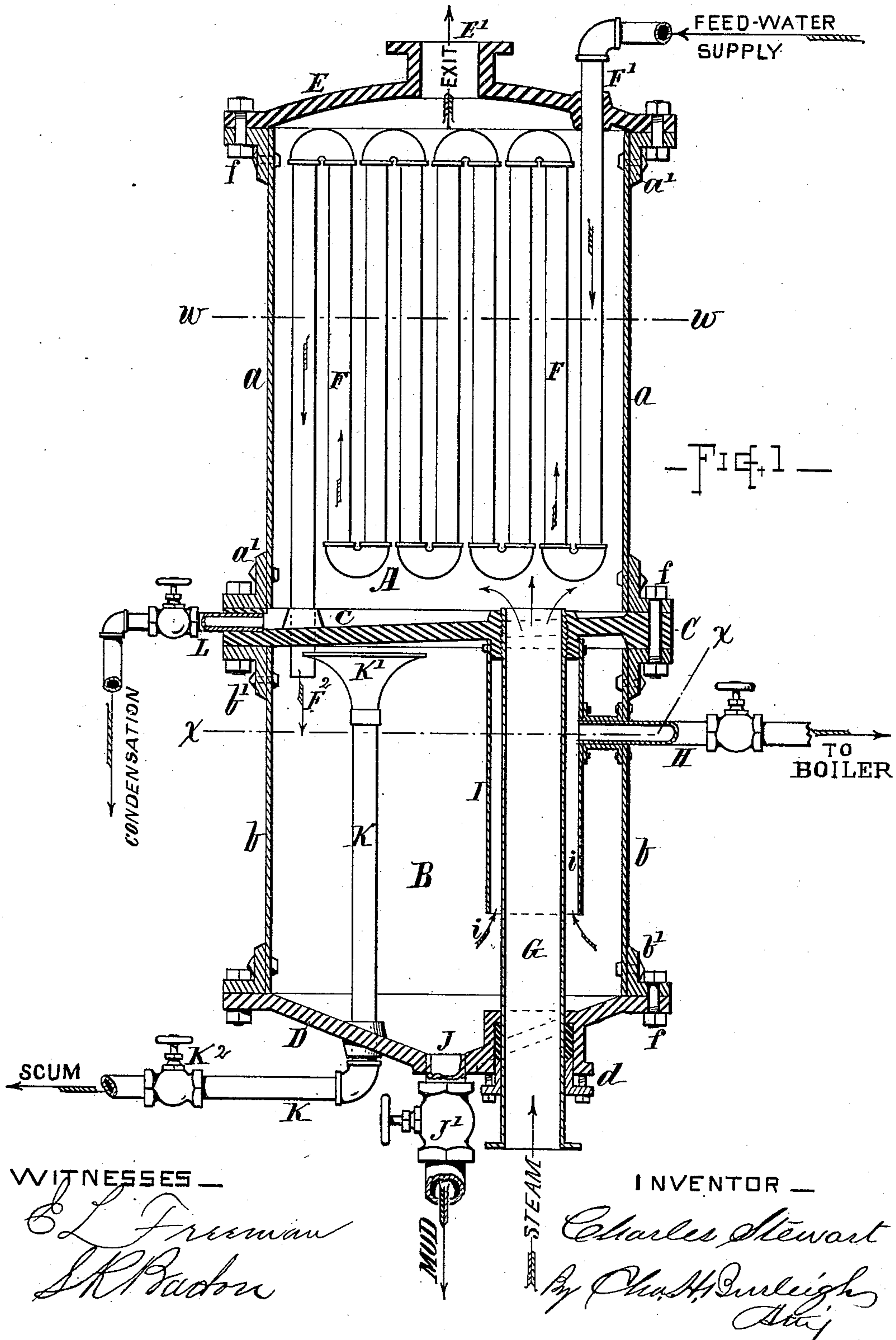
2 Sheets—Sheet 1.

C. STEWART.

FEED WATER HEATER AND PURIFIER.

No. 250,995.

Patented Dec. 13, 1881.



(No Model.)

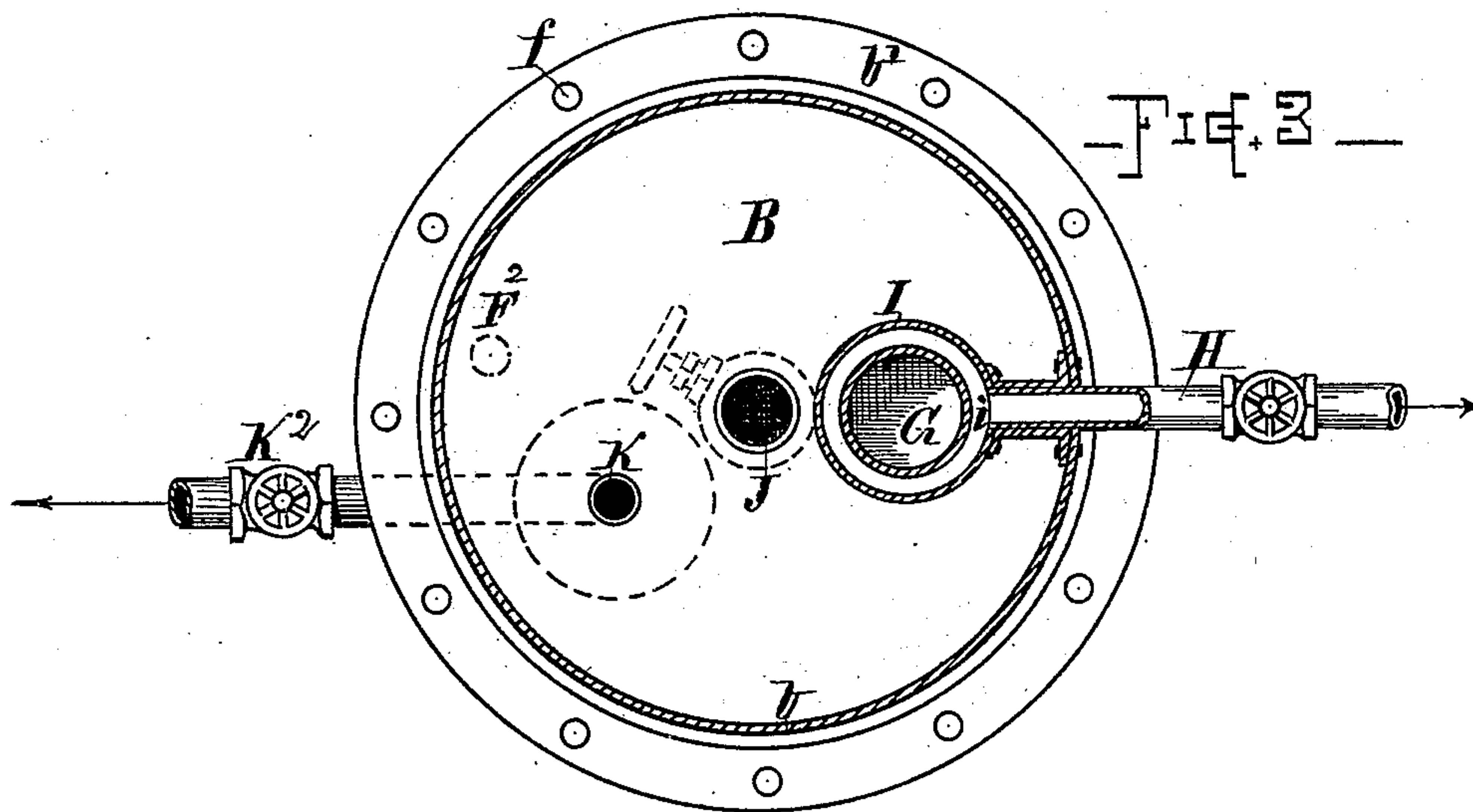
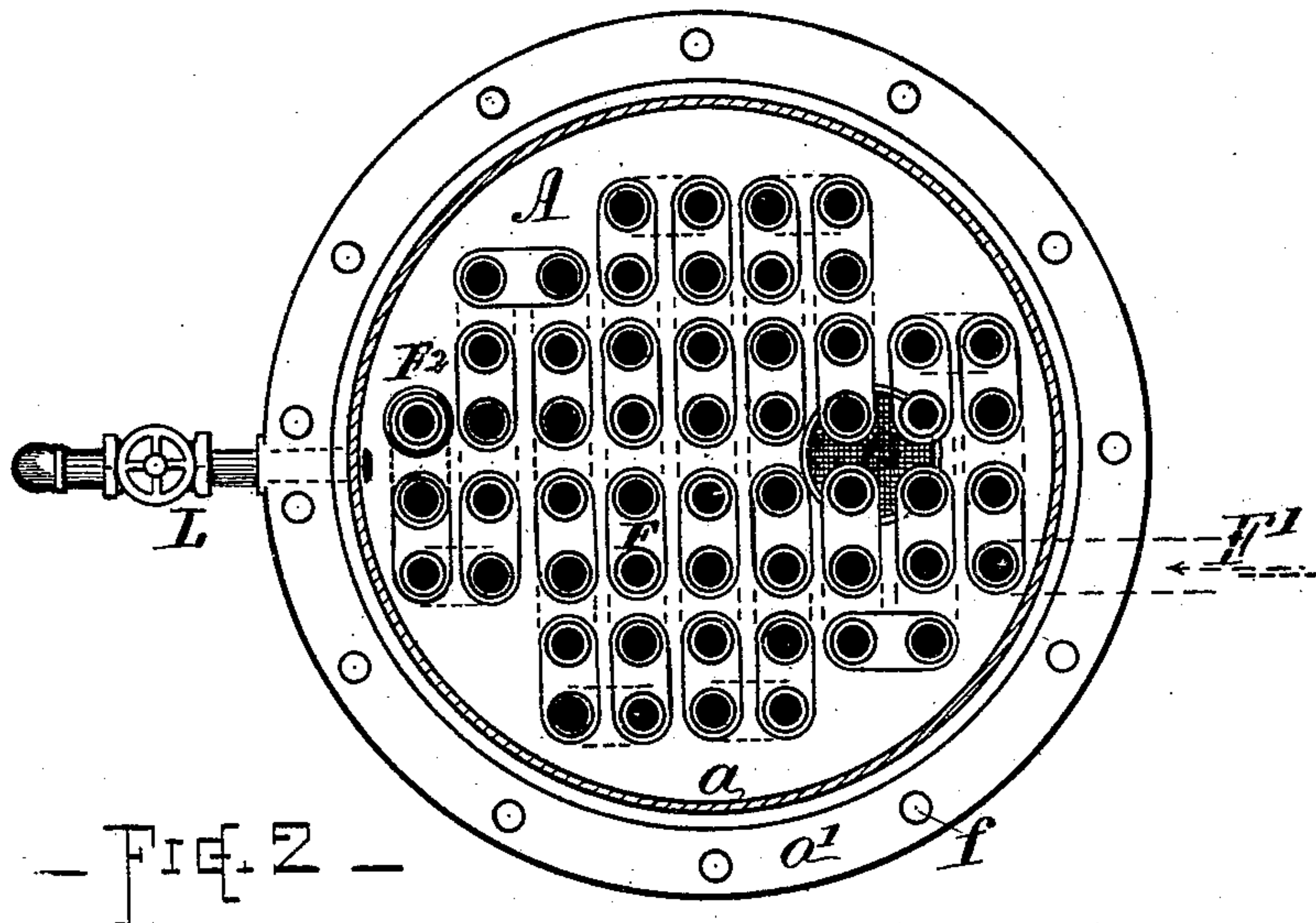
2 Sheets—Sheet 2.

C. STEWART.

FEED WATER HEATER AND PURIFIER.

No. 250,995.

Patented Dec. 13, 1881.



WITNESSES —

E. L. Freeman
A. K. Barton

INVENTOR —

Charles Stewart
By Chas. H. Durlough
Att'y.

UNITED STATES PATENT OFFICE.

CHARLES STEWART, OF WORCESTER, MASSACHUSETTS.

FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 250,995, dated December 13, 1881.

Application filed October 15, 1881. (No model.)

To all whom it may concern:

Be it known that I, CHARLES STEWART, of Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Feed-Water Heaters and Purifiers; and I declare the following to be a description of my said invention sufficiently full, clear, and exact to enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

The object of my present invention is to provide a feed-water heater and purifier that is positive and efficient in its action, and that is adapted for thoroughly cleansing the water and for delivering it at a high degree of temperature, one that is also economical and durable in construction and conveniently accessible for repairs, also affording means for the ready discharge of impurities, both scum and sediment, and facilities for carrying off the water of condensation. I attain these objects by a heating and purifying apparatus constructed as shown in the drawings, and organized for operation substantially as hereinafter described, the particular features claimed being definitely specified.

In the drawings, Figure 1 is a vertical sectional view illustrating the construction of my improved heating and purifying apparatus. Fig. 2 is a horizontal sectional view of the same at the position indicated by line *w w*, and Fig. 3 is a horizontal section at the position indicated by line *x x*.

The heater is composed of two principal sections or chambers, A and B, located one above the other, and respectively adapted for containing steam in the one A and water in the other, B. The two sections are formed with the top or head plate, E, the center plate, C, and the base or bottom plate, D, of cast metal, connected by the wrought-metal shells or cylinders *a* and *b*, said cylinders being riveted to flanged end rings, *a'* *b'*, which are secured to the respective plates C D E by the screws or bolts *f*, the joints being properly packed or fitted to prevent leakage between the parts.

In the upper chamber, A, there is arranged a coil of pipe, F, through which the feed-water is supplied to the chamber B, said pipe enter-

ing through the top plate at F', and discharging just below the center plate, C, as at F², into the upper part of the chamber B.

The pipe G, which conveys the exhaust-steam into the heater, passes up through the chamber B, and discharges into the chamber A just above the center plate, C, to which its end is secured. The base D may be provided with a stuffing-box, *d*, around said pipe G, to avoid strains occasioned by unequal expansion and contraction between the different parts. Pipe G is preferably made from copper or composition metal, though iron or other suitable material may be used, if desired. The upper portion of the pipe G, for some two-thirds (more or less) of the depth of chamber B, is surrounded by a cylinder or pipe, I, of such size as to leave a narrow annular space, *i*, between the two, as illustrated, and from this annular space *i* is led the pipe H, that communicates with the boiler or steam-generator, wherein the heated feed-water is to be used. The top end of the cylinder I is closed, and is attached to the plate C, or otherwise supported. The lower end of said cylinder, or the space *i*, is open into the chamber B, so that the water can flow freely through said space *i* to the pipe H, which is located near its upper extremity.

A blow-off pipe, J, having a suitable valve or cock, J', is arranged in the bottom plate, D, for discharging the mud or sediment which settles to the bottom of the chamber B, and a second blow-off pipe, K, is provided for blowing off and discharging the impurities or scum that may rise to the surface of the water, or to the upper part of the chamber B. Said blow-off K is provided with a scum-collecting funnel or cap, K', near the under side of the middle plate, C, and with a suitable valve or cock, K², at a position convenient of access outside the heater.

A pipe or cock, L, is arranged at the side of the central plate, C, communicating with the chamber A at its lower extremity, for carrying off the water resulting from the condensation of the steam on the surface of the coil-pipes F. The plate C may be made inclined toward said pipe L, as indicated, to give thorough drainage of the chamber A.

An opening, E', is provided in the top plate, E, for the escape or exit of any steam not con-

densed within the chamber A. Said opening is furnished with a suitable flange or hub for the connection of the leader or escape pipe.

In the operation the steam enters by way of the pipe G to the chamber A, where it is rapidly condensed, and its heat transferred to the water, which enters by way of the pipe F to the chamber B. The water, having become heated in the coil F, readily parts with the impurities contained therein as soon as it reaches the chamber B, which impurities, according to the nature thereof, either rise in the form of scum or else deposit as a sediment or mud in the bottom of the heater. The water then passes, on its way to the delivery-pipe H, in contact with the hot-steam pipe G within the space *i*, and there becomes superheated or raised to a higher degree of temperature immediately before its delivery to the boiler or steam-generator.

The scum or floating matter can at any time be blown off or discharged without interfering with the working of the heater by opening the valve K², which may be done sufficiently often to prevent the formation of scale on the upper interior of the chamber B.

This heater creates no appreciable back-pressure on the engine, since it acts as a rapid condenser, besides being provided with a free exit for the surplus steam. By constructing the parts, in the manner shown, with the plates C D E and cylinders *a b*, secured to each other by bolts *f*, the heater can be readily put together and taken apart, if desired, and ready access may be had to the interior for inspection or repairs.

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

1. In a feed-water heater, a water-pipe coil inclosed within a steam-chamber, in combination with a purifier or water-chamber receiving water from said coil, and surrounding the steam-pipe leading into said steam-chamber, substantially as herein set forth.

2. The combination of a water-pipe coil inclosed within a steam-chamber, a water-purifying chamber surrounding the steam-pipe leading to said steam-chamber for receiving water from said coil, a jacket or cylinder surrounding said steam-pipe within the upper portion of said water-chamber, and a delivery-pipe leading from the space between said steam-pipe and cylinder to the boiler, substantially as hereinbefore set forth.

3. The combination of the steam section or chamber A, containing the water-pipe coil F, the water section or chamber B, receiving the feed-water from said coil, the steam-pipe G, passing through said water-chamber, the cylinder I, surrounding said steam-pipe, the delivery-pipe H, leading from said cylinder to the boiler, the mud-discharge pipe J in the bottom of said water-chamber, and the scum-discharge pipe K, leading from the upper part of said water-chamber, substantially as and for the purposes set forth.

4. The combination of the wrought-metal shells or cylinders *a b*, provided with bolting-flanges *a' b'*, and the cast-metal top plate, E, center plate, C, and bottom plate, D, constructed and arranged in connection therewith as shown and described.

5. The combination, with the plate C, steam-pipe G, and delivery-pipe H, of the pipe or cylinder I, substantially as shown and described.

6. In a feed-water heater and purifier, the inclined center plate, C, and pipe L, in combination with the sections A and B, substantially as and for the purpose set forth.

Witness my hand this 11th day of October, A. D. 1881.

CHARLES STEWART.

Witnesses:

CHAS. H. BURLEIGH,
W. A. WHEELER.