

(No Model.)

E. R. STILWELL.  
FEED WATER HEATER.

No. 476,089.

Patented May 31, 1892.

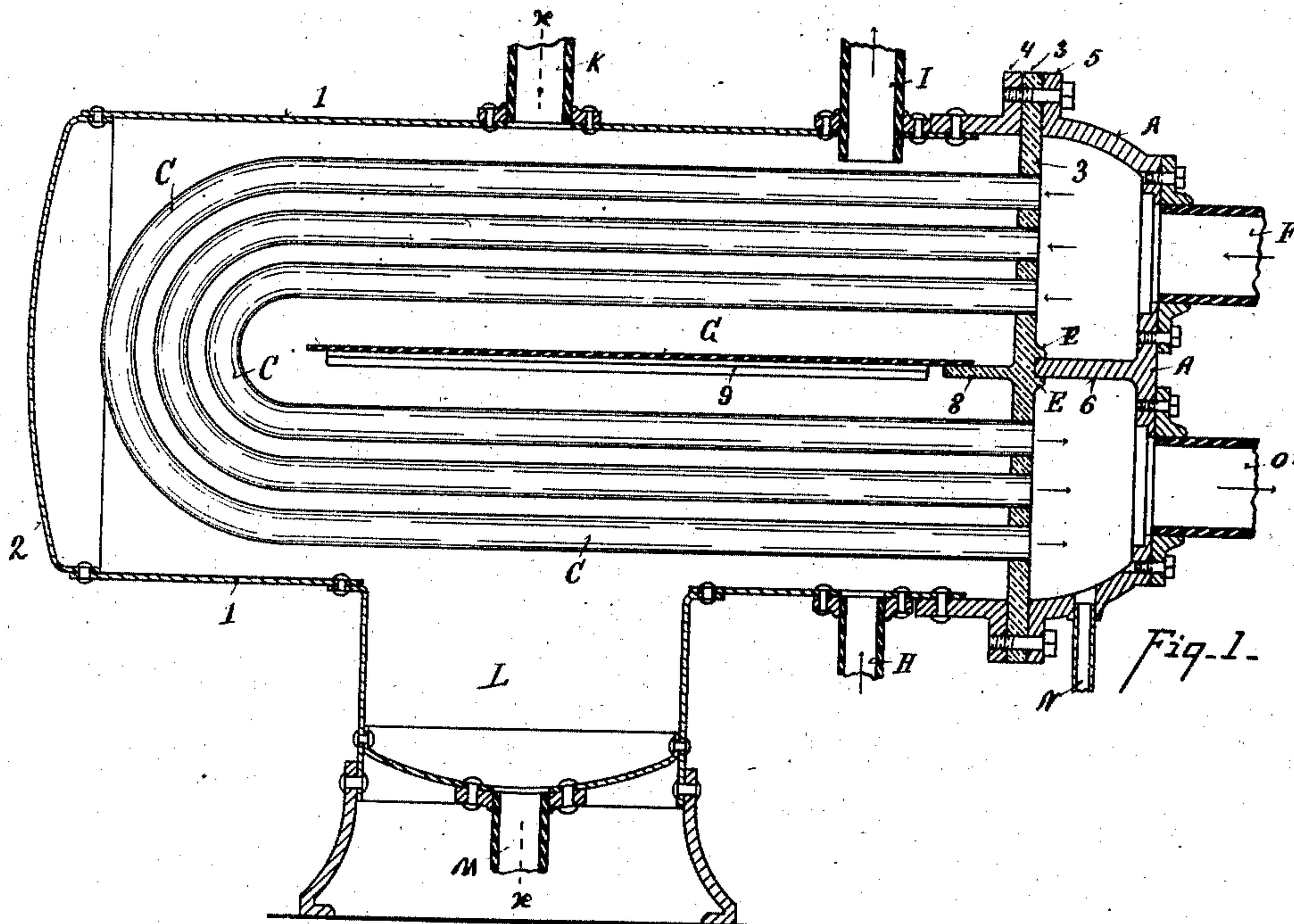


Fig. 1.

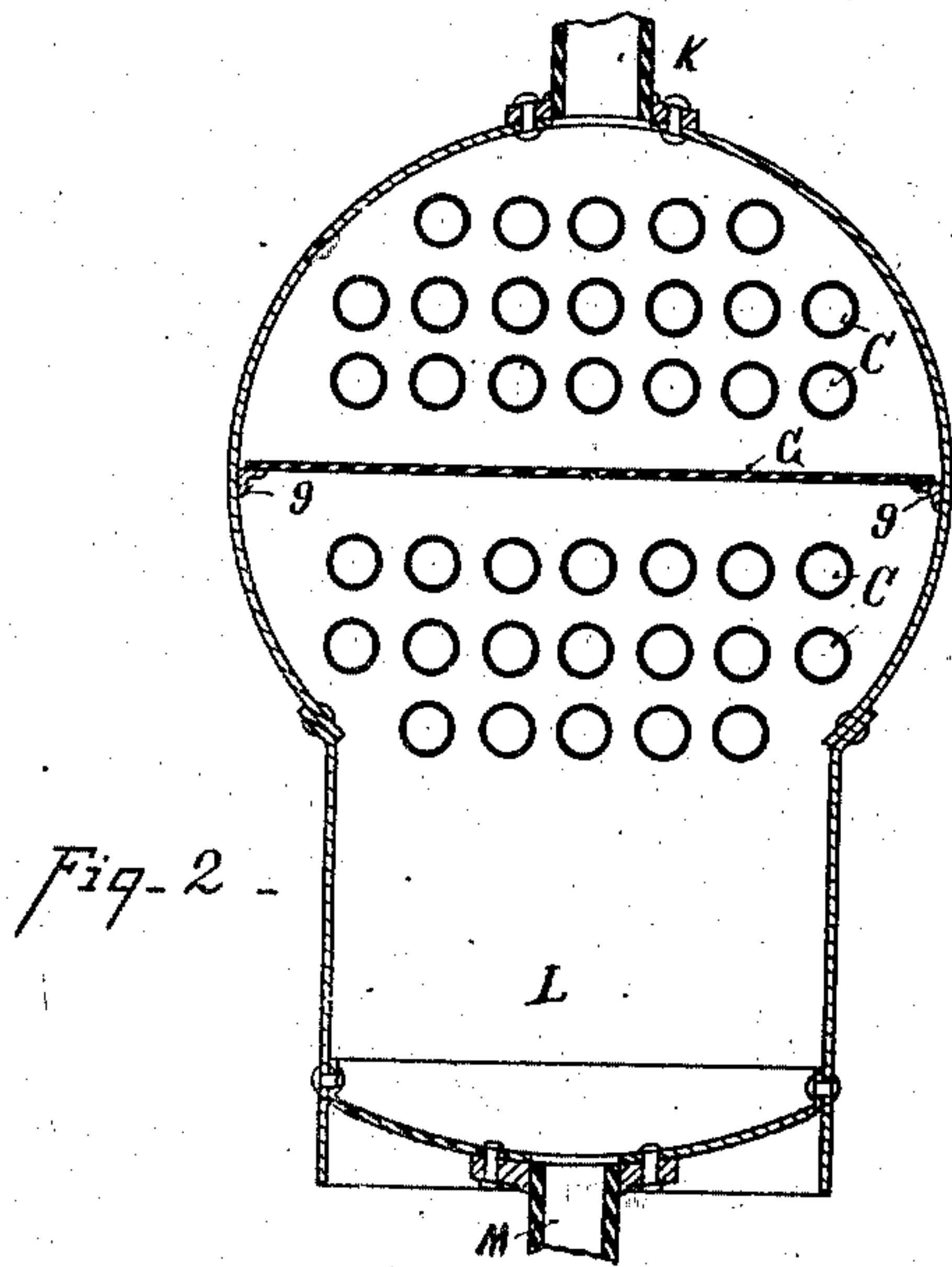


Fig. 2.

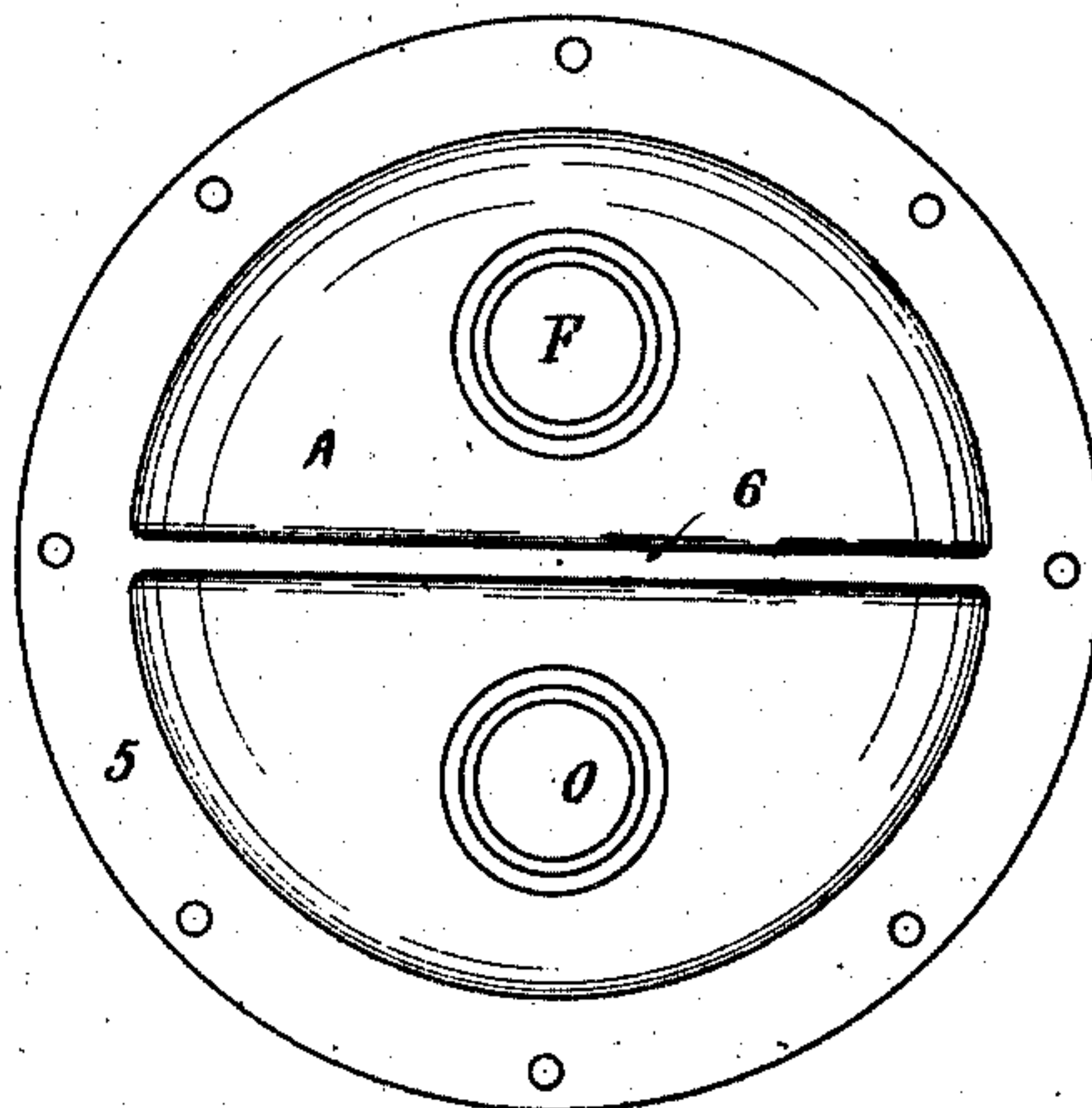


Fig. 3.

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By his Attorneys, Wood & Boyd



# UNITED STATES PATENT OFFICE.

EDWIN R. STILWELL, OF DAYTON, OHIO, ASSIGNOR TO THE STILWELL & BIERCE MANUFACTURING COMPANY, OF SAME PLACE.

## FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 476,089, dated May 31, 1892.

Application filed January 19, 1892. Serial No. 418,581. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN R. STILWELL, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

My invention relates to a feed-water heater and purifier.

10 The object of the invention is, first, to provide a series of U-shaped tubes, one arm of the tubes receiving the heated steam, which is more or less condensed in practice and voided after it has heated the feed-water surrounding the U-shaped tubes, the construction and arrangement being such that the feed-water enters and meets the coldest portion of the tube and travels round parallel with the tubes and discharges opposite the end 15 of the tubes which receive the hot steam.

20 Another object of my invention is to provide a mud-well, over which the feed-water is compelled to pass after it has been partially heated, where the matters held in suspension 25 are deposited.

The various features of my invention are fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

30 Figure 1 is a central vertical longitudinal section of my improvement. Fig. 2 is a section on line *x x*, Fig. 1. Fig. 3 is an inside elevation of the cap.

1 represents the shell of the heater; 2, a cap closing the rear end thereof; 3, a diaphragm supporting the tubes, which is clamped between the flanges 4 of the shell and the flanges 5 of the conical cylindrical head A in the preferred form of construction.

40 C represents a series of U-shaped tubes, the free ends of which are rigidly secured to the diaphragm 3.

45 G represents a partition preferably made integral with the head A and supported in the lugs E of the diaphragm 3. This partition causes the steam to enter one end of the U-shaped tubes and pass out the other.

H represents a partition extending centrally through the heater from the diaphragm 3 for-

ward approximately near the bend of the tubes and is supported upon lugs 8 and 9.

I represents the inlet-pipe for supplying feed-water; J, the outlet-pipe; K, a scum-blow-off pipe; L, a mud-well located under the tubes and between the point of entrance and exit 55 and preferably but a short distance from the inlet-orifice.

M represents a blow-off pipe for voiding the matter deposited in the mud-well.

The outlet-pipe I projects down a considerable distance below the shell of the boiler, so as to be below the surface of the water. This prevents the scum or light substances floating on the top of the water being taken off. This scum may be blown off from time to time 65 through the pipe K. The feed-water is supplied through pipe J and rises up and passes round the partition G on its way to the outlet-pipe. The mechanical impurities held in suspension commence to deposit as soon as 70 the water commences to heat, and the partition G holds the water back in the lower portion of the heater and prevents it rising vertically upward toward the outlet, but causes it to pass round the partition. In this movement the particles held in suspension are separated and gathered in the mud-well L, as also are portions of the mineral salts which are set free in the heating of the water; but these are largely freed by the higher heating of the 80 water and deposited upon the shelf or partition G, which is shown as readily detachable when the heater is taken apart, so that this shelf may be cleaned.

It is important to prevent the scum or lighter 85 impurities which float on the top of the water from being carried to the boiler. Hence the outlet I projects a sufficient distance below the shell of the heater to prevent the scum from being drawn off with the feed-water. 90 Thus the feed-water is freed of the three following impurities: mud or matters held in mechanical suspension, minerals held in solution, and the scum or lighter portion floating on top of the water.

95 I have provided an escape-pipe N to carry off the condensation of the steam, which is pure distilled water. This may be connected



up so as to be used for feed-water or for other purposes.

O represents the steam-exit pipe, and F the steam-supply pipe.

5 This heater is constructed so as to be readily taken apart for cleaning purposes. The bent tubes may be removed with the diaphragm 3 and the shelf G readily taken out and cleaned. Blow-off pipe M is supplied  
10 with a suitable valve, and blow-off pipe K is likewise supplied with a valve. These valves may be opened from time to time to blow off the impurities.

It will be seen that by the construction of  
15 this heater the cold water is received opposite the steam-exit end of the tubes. This more thoroughly condenses or robs the steam of heat. It is compelled to travel round the shelf and follow up the tubes, gradually being heated, and it is taken out at the point where it  
20 is the hottest, thus always bringing the hottest water in contact with the hottest steam.

Another advantage arising in making the large settling-chamber is that it serves as a  
25 leg to attach the supporting-base. For this reason the mud-well is located centrally under the heater.

Having described my invention, what I claim is—

30 1. In a feed-water heater, the combination, with the bent tubes C, supported in the shell of the heater, of the horizontally-arranged partition G, located in the body of the heater and separating the heater into two compartments  
35 between the forks of the pipe, and the lower

compartment terminating in the mud-well L, located under the partition, substantially as specified.

2. In a feed-water heater, in combination with the bent tubes C, the horizontally-ar- 40 ranged partition G, separating the heating-chamber into two compartments, the inlet-pipe H near the steam-exit, the mud-well L, located beneath the partition, and the outlet water-pipe I, located near the steam-entrance and  
45 projecting below the surface of the water in the heater, substantially as specified.

3. In a feed-water heater, in combination with the bent pipes C, the horizontally-ar- 50 ranged partition G, separating the heating-chamber into two compartments, the inlet water-pipe H near the steam-exit, the outlet-pipe I, located near the steam-entrance and projecting below the surface of the water in the heater, and the scum-blow-off pipe K, sub- 55 stantially as specified.

4. In a feed-water heater, the combination, with the heater-shell supporting the bent pipes C, of the horizontally-arranged partition G and the mud-well formed of the shell of the 60 heater-shell, located vertically under the shelf and projecting downward centrally, so as to constitute a heater-supporting leg, substantially as specified.

In testimony whereof I have hereunto set 65 my hand.

EDWIN R. STILWELL.

Witnesses:

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