

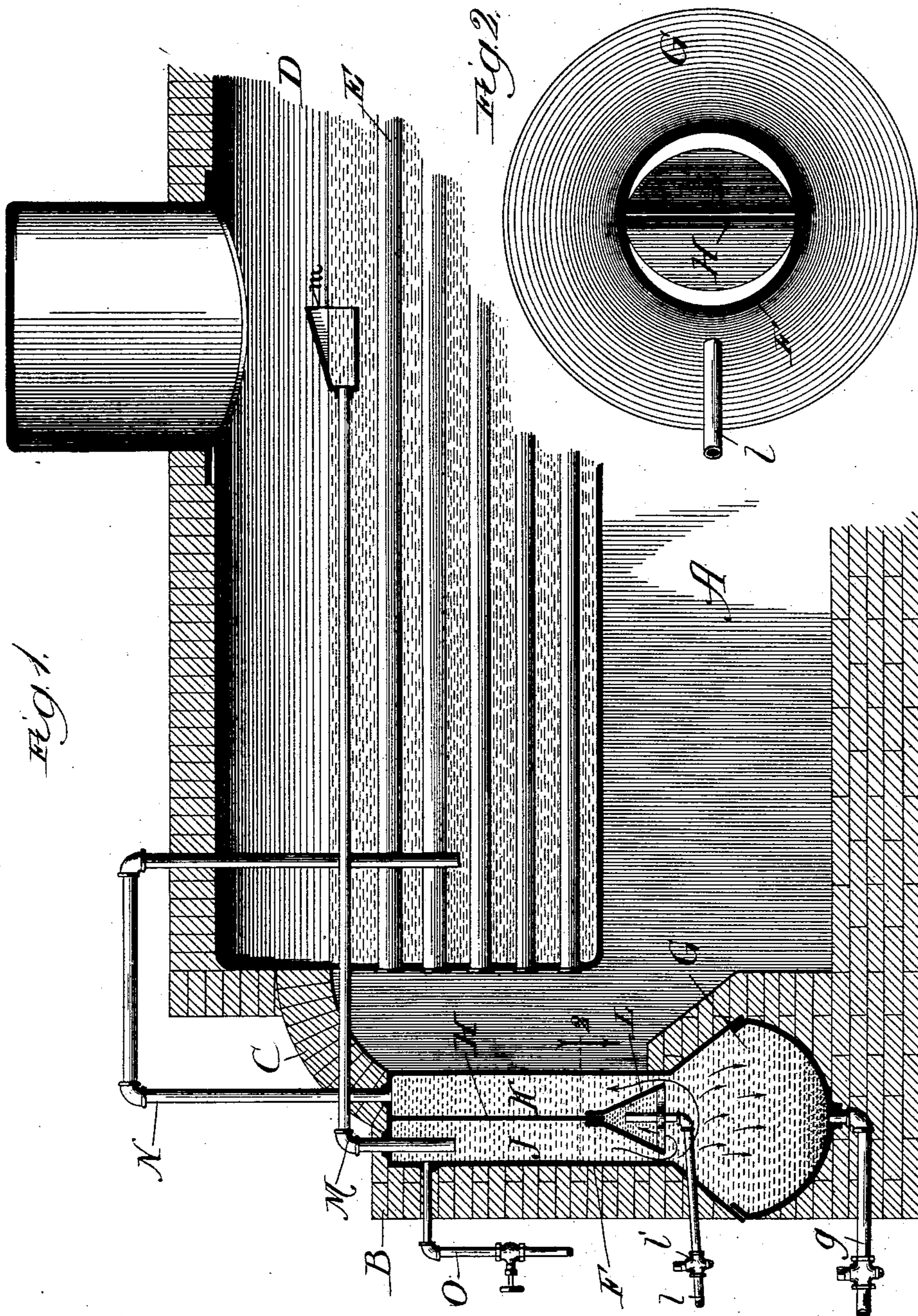
(No Model.)

J. J. LONG.

AUTOMATIC BOILER CLEANER AND FEED WATER HEATER.

No. 591,856.

Patented Oct. 19, 1897.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

JEREMIAH J. LONG, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO  
GEORGE HIBBEN, OF SAME PLACE.

## AUTOMATIC BOILER-CLEANER AND FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 591,856, dated October 19, 1897.

Application filed July 9, 1894. Renewed March 19, 1897. Serial No. 628,361. (No model.)

*To all whom it may concern:*

Be it known that I, JEREMIAH J. LONG, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented  
5 new and useful Improvements in Automatic Boiler-Cleaners and Feed-Water Heaters, of which the following is a specification.

The object of my invention is to provide  
10 suitable and efficient mechanism for heating feed-water and for simultaneously removing the impurities and sediment from a boiler. A continuous positive current is maintained to and from the boiler through my device without the use of an injector or the forma-  
15 tion of a siphon by the manipulation of valves, or otherwise, so that the impurities from the boiler are drawn off and precipitated while the feed-water passes through the precipita-  
20 tion-chamber and becomes heated in its pas- sage through a heating-chamber before entering the boiler.

Heretofore it has been found necessary to start a siphon in order to maintain a constant and positive current, or to employ a steam-  
25 injector, but I dispense with such agencies to accomplish the desired result and obtain a device which is truly automatic. Furthermore, I secure other advantages and benefits not heretofore attained in this art; and my  
30 invention consists in the features and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a sectional view of a boiler with my device in  
35 position; and Fig. 2, a sectional plan view taken on line 2 of Fig. 1, looking in the direction of the arrow.

The boiler is provided with the ordinary combustion-chamber A, back wall B, arch C,  
40 boiler proper, D, flues E, &c., which parts are made in the usual and well-known manner and do not require, and therefore will not receive, any detailed description.

In making my heater and purifier, I first  
45 construct a chamber F of suitable material and of the proper size and proportions. For the sake of clearness and brevity of description in the specification and claims, I will hereinafter term this chamber a "heater,"  
50 although it possesses other functions than those of a heater. This heater is preferably,

though not necessarily, cylindrical in form and enlarged at its lower end, as shown in the drawings, in order to form a settling or sedi-  
ment chamber G. The heater is adapted to  
55 be built directly into the brickwork or shell, preferably in the back wall of the boiler, and a portion thereof is exposed to and forms a portion of the walls of the combustion-chamber within, as shown particularly in Fig. 1. 60

Depending from the head of the heater is a diaphragm H, which divides the same into two chambers J and K, communicating only at their lower ends. The chamber J forms a precipitation-chamber, while the chamber K  
65 is a heating-chamber having its face exposed to the heat of the combustion-chamber and providing for the heating of water before its entrance to the boiler. Upon the lower free end of this diaphragm I secure an inverted,  
70 closed funnel K, elliptical in cross-section, forming crescent-shaped contracted throats at the lower ends of the precipitation and heating chambers J and K, as illustrated particularly in Fig. 2. Extending into the fun- 75  
nel and communicating with the exterior of the boiler is a drain-pipe *l*, provided with a cock *l'* for the purpose of drawing off the contents. The sediment-chamber is like-  
80 wise provided with a drain-pipe or blow-off *g* for blowing out the sediment therein collected.

Leading from the boiler at or near the wa-  
ter-line is a pipe M, entering the head of the heater and communicating with the precipi- 85  
tation-chamber J. The free end of this pipe is provided with an ordinary skimmer *m*, having a flaring mouth. Leading from the head of the heater is a pipe N, which enters the boiler proper, preferably beneath the water- 90  
level, and completes the circuit through the heater. At a suitable point in the side of the precipitation-chamber the usual feed-water-supply pipe O enters the chamber J.

My device, being constructed as hereinbe- 95  
fore set forth, operates as follows: The flames, &c., from the combustion-chamber strike against the exposed face of the heating-chamber and heat the water therein, causing a rapid upward movement and circulation of 100  
the water in the heating-chamber through pipe N and thence into the boiler. Water is

consequently drawn or sucked into pipe M through the skimmer and enters the precipitation-chamber J. It then passes through the contracted throat at the lower end into the upper portion of the sediment-chamber, where it makes a slight sweep, and then passes upward through the similar contracted throat at the end of the heating-chamber K. The movement of the water holding the scale, &c., in suspension being rapidly accelerated, then lessened, and finally accelerated, causes a precipitation of the particles of greater specific gravity than the water. This precipitation will fall in the dead-water space or globular pocket of the sediment-chamber, from whence it may be blown off at intervals, as desired, through the blow-off pipe arranged therein.

As is well known, oil and other impurities of less specific gravity than water find entrance to boilers to their detriment. These light impurities floating at the water-line are drawn rapidly into the precipitation-chamber, and after the speed of circulation is decreased, after passing through the first contracted throat, they rise upward and are caught by the inverted funnel and held therein until drawn off by any suitable means. Furthermore, the cool feed-water entering the precipitation-chamber in the line of travel of the impure water cools the latter and tends to cause a precipitation of scale, &c. Before entering the boiler the mixed feed-water and the water freed of its impurities are necessarily highly heated in their passage through the heating-chamber K, absorbing heat which would to a great extent be otherwise wasted. The water is consequently delivered to the boiler at a high temperature.

By the arrangement of the heating-chamber adjacent to the combustion-chamber I obtain a rapid and positive circulation of water without the starting of a siphon through the manipulation of valves and without the employment of an injector. Furthermore, my device will always be in operation as long as the combustion-chamber supplies heat to the boiler, or as long as the water in the boiler is warm—that is to say, it is entirely automatic in its operation.

It will be understood that the device may be placed outside of the boiler, when designed to be used simply as a boiler-cleaner, in which case the pipe returning to the boiler would be arranged to enter at a lower level in order to insure a circulation of water. I prefer, however, for the purpose of accomplishing the best results to use my device as a combined feed-water heater and boiler-cleaner, as shown, thereby attaining simultaneously a twofold result.

Although I have shown my device as applied to an ordinary stationary boiler, it will be understood that it may be applied to other types of boilers and that the exact location of the heater may be varied to adapt it to circumstances without departing from the spirit

of my invention—as, for instance, it may be located in the smoke-box of a locomotive.

Although I have described more or less precise forms and details of construction, I do not intend to be understood as limiting myself thereto, as I contemplate changes in form, proportion of parts, the substitution of equivalents, as circumstances may suggest or render expedient.

I claim—

1. The combination with a boiler, of a heater, a diaphragm arranged therein and dividing its upper portion into two chambers, only one of such chambers being exposed to heat, an educt-pipe communicating between the boiler and such exposed chamber and an induct-pipe communicating between the boiler and the other chamber.

2. The combination with a boiler, of a heater supported in the shell thereof and forming a portion of the inner walls of the combustion-chamber, a diaphragm within the heater and arranged substantially parallel with the plane of the inner furnace-wall whereby the upper portion of the heater is divided into two chambers only one of which is exposed to the combustion-chamber, and induct and educt pipes communicating with the interior of the boiler and with their respective chambers at the head of the heater.

3. In a feed-water heater and purifier, the combination with a boiler, of a heater supported in the outer shell and forming a portion of the inner walls of the combustion-chamber, a diaphragm within the said chamber dividing its upper portion into two chambers J and K, a pipe leading from the boiler and entering chamber J and a pure-water pipe leading from chamber K to the boiler, whereby a constant and positive circulation is maintained from the heat of the combustion-chamber, substantially as described.

4. In a feed-water heater and purifier, the combination with a boiler, of a heater supported in the outer shell of the boiler forming a portion of the walls of the combustion-chamber, a depending diaphragm arranged within the heater and dividing it into two compartments J and K, a funnel elliptical in cross-section and secured to the lower end of the diaphragm a pipe leading from the boiler to the upper end of the compartment J and a pure-water pipe leading from the upper end of the compartment K back into the boiler, whereby a positive constant circulation of water is maintained through the heater and the water simultaneously heated, substantially as described.

5. In a boiler-cleaner, the combination with a boiler, of a chamber, a diaphragm arranged therein and dividing its upper portion into two compartments J and K, an inverted closed funnel arranged upon the free end of the diaphragm, means communicating with the exterior of the chamber and the interior of the funnel for drawing off its contents, and induct and educt pipes leading to and from

the boiler and chamber, substantially as described.

5 6. In a boiler-cleaner, the combination with a boiler, of a chamber, a diaphragm therein provided at its free end with an inverted closed funnel thereby dividing the upper portion of the heater into two compartments, and induct and educt pipes communicating between the boiler and heater, substantially as described.

10 7. In a boiler-cleaner, the combination with a boiler, of a heater, a diaphragm therein provided at its free end with an inverted closed funnel elliptical in cross-section, thereby dividing the upper portion of the heater into two chambers with contracted throats at their lower ends and induct and educt pipes communicating between the boiler and heater, substantially as described.

20 8. The combination with a boiler, of a chamber, a flat vertically - depending diaphragm

extending from side to side of the chamber and dividing its upper portion into two compartments and an induct and educt pipe communicating with the boiler and with its respective compartment substantially at the top.

9. The combination with a boiler, of a chamber, a depending diaphragm arranged therein and provided at its free end with an inverted closed funnel whereby the upper portion of the said chamber is divided into two compartments, induct and educt pipes communicating with the boiler and with the top of said compartment and an enlarged settling or precipitation chamber arranged below said funnel.

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