(No Model.)

P. J. GRAU.

FEED WATER PURIFIER.

No. 301,116. Patented July 1, 1884.

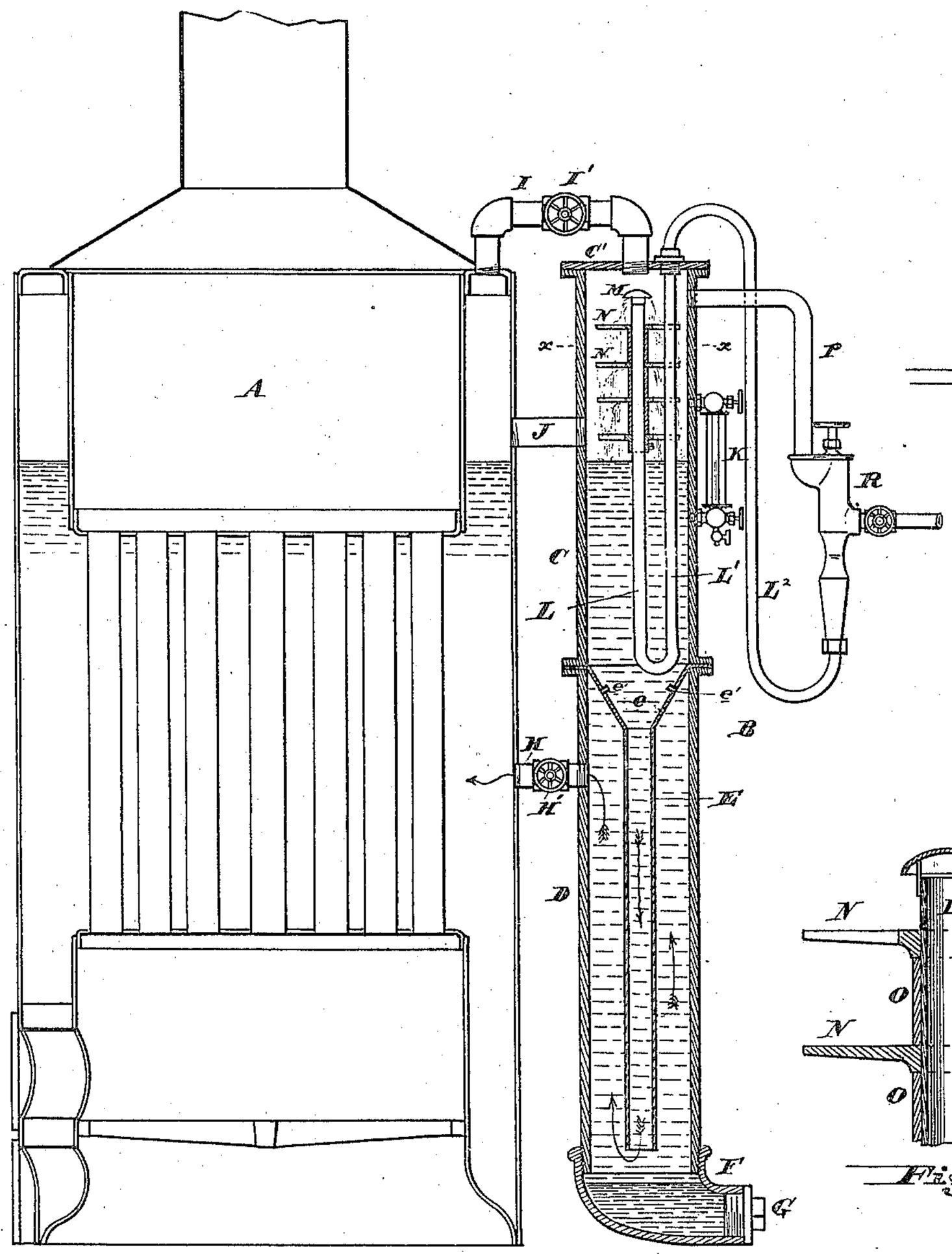
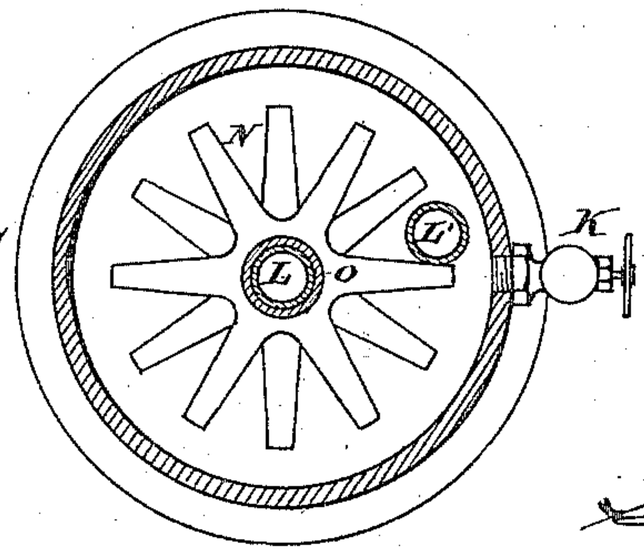


Fig. 1

Fig. 2

Fig. 3



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PHILIP J. GRAU, OF PHILADELPHIA, PENNSYLVANIA.

FEED-WATER PURIFIER.

SPECIFICATION forming part of Letters Patent No. 301,116, dated July 1, 1884.

Application filed March 4, 1884. (No model.)

To all whom it may concern:

Be it known that I, PHILIP J. GRAU, of the city and county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Feed-Water Purifiers for Boilers, of which the following is a specification.

My invention has reference to feed-water purifiers for steam-boilers; and it consists in certain improvements in settling-chambers and their connections, whereby the feed-water may be heated and then allowed to settle to eliminate mud and other impurities prior to its passage into the boiler, all of which improvements are fully set forth in the following specification, and shown in the accompanying drawings, which form part thereof.

In locations where the water is impure and carries large quantities of sediment it becomes necessary to provide some means to separate said impurities from the water to a great extent before forcing it into the boiler; hence the object of my invention is to provide a boiler with suitable apparatus to perform the said separation of impurities from the water prior to its passage into the boiler, thereby overcoming the necessity of cleaning the boiler so frequently as is now the general practice.

In the drawings, Figure 1 is a sectional elevation of a boiler and my improved feed-water purifier and heater attached thereto. Fig. 2 is a cross-section of the latter on line *x x* and Fig. 3 is a sectional elevation of the top or nozzle of the feed-water pipe.

A is the boiler, which may be of any construction, either vertical, horizontal, tubular, cylindrical, or of any other design.

B is my improved purifier and heater, and consists of a vertical cylinder of small diameter, and preferably formed of two sections, C and D. The lower section, D, is provided with a central tube, E, of small diameter, extending almost to the bottom and opening into a funnel, *e*, at the top, the upper and larger diameter of which is clamped between the sections C and D to retain it in position. The bottom of the section D is provided with a receptacle, F, made curved, and having an outlet stopped by a plug, G, whereby the collected sediment may be blown off. If desired, the plug G may be removed and a pipe with a valve in it may be substituted. The upper end of this section D is connected with the boiler by a pipe, H, provided with a valve, H′. The upper section, C, is closed on the top by a cap, C′, through the center of which a steam-pipe, I, enters, which pipe I is provided with a valve, I′, and communicates with the boiler. The water-level will be practically the same in the purifier and boiler, and to indicate any obstructed passages and the height of the water in said purifier B, I provide it with a water-gage, K. To enable a free circulation of steam between the boiler and purifier B a pipe, J, may be inserted, opening into each a little above the water-line, and, if desired, provided with a valve. Pipes L L′ pass down and up in the section C, and connect by a pipe, L^2, with the injector or pump R, which preferably receives its steam by a pipe, P, connecting with the purifier, as shown, to increase the circulation of steam. The central pipe, L, is arranged, preferably, directly under the pipe I, and its top and open end is covered with a curved cap, M, against the under side of which the water is forced, and by which it is sprayed around the outside of pipe L and allowed to fall upon the spiders N, which are supported by said pipe L, and separated from each other by tubular sections O, the said spiders N being so supported that their arms or legs are not set one above the other, but are so arranged that the arms of one correspond to the spaces of the next, and so on, whereby the water is divided and subdivided to enable it to absorb heat and bring it nearly to the temperature of the water in the boiler.

The operation is as follows: As the cold water is fed by the injector or pump into the pipe L′, it is caused to circulate in said pipe and up the central pipe, L, through hot water, thereby causing it to become greatly heated. It is next sprayed from the end of pipe L, and in falling is subdivided, as above set forth, and is highly heated. It then mixes with the water in the section C. This water slowly passes down through pipe E, and then rises from the bottom of pipe E to the top of section D, where it passes into boiler A by pipe H. As the water is passing through pipe E and section D, the impurities are allowed to settle, being received in the elbow F. By the construction shown there is no possibility of agitating the water sufficiently in its passage through pipe E and section D to prevent the

settling and elimination of the impurities. To blow off the sediment, valve H′ is closed and plug G removed, allowing the pressure of steam to force the water out of the purifier to cleanse it, and to prevent a partial vacuum being formed in lower section, D, between the cone *e* and the bottom of pipe E, as the water is drawn off.

I may have one or more small tubes or apertures, *e′*, opening through the cone *e*, or constructed in any other way so as to allow a passage for water or steam from section C to section D without having to pass down by pipe E; but these small tubes do not interfere with the ordinary working of the purifier.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A steam-boiler, in combination with a feed-water purifier consisting of two compartments, located one above the other, the upper of said compartments opening into the bottom of the lower compartment by means of a pipe, and being on a level with the water in the boiler, whereby said chamber is partly full of water, a feed-water pipe and a steam-pipe to feed water and steam into the upper compartment, and an exit water-pipe opening from said lower chamber near its top, substantially as and for the purpose specified.

2. A feed-water purifier consisting of two compartments, located one above the other, the upper of said compartments opening into the bottom of the lower compartment by means of a pipe opening from the upper compartment below the level of the water therein, a feed-water pipe and a steam-pipe to feed water and steam into the upper compartment, and an exit water-pipe opening from said lower chamber near its top, substantially as and for the purpose specified.

3. A feed-water purifier consisting of two compartments, located one above the other, the upper of said compartments opening into the bottom of the lower compartment by means of a pipe, a feed-water pipe and a steam-pipe to feed water and steam into the upper compartment, and an exit water-pipe opening from said lower chamber near its top, the said feed-water pipe passing down and up through the hot water in said upper compartment, substantially as and for the purpose specified.

4. A feed-water purifier consisting of two compartments, located one above the other, the upper of said compartments opening into the bottom of the lower compartment by means of a pipe opening from the upper compartment below the level of the water therein, a feed-water pipe and a steam-pipe opening from the boiler to feed water and steam into the upper compartment, and an exit water-pipe opening from said lower chamber near its top, said feed-water pipe being provided with means to spray or subdivide the water, substantially as and for the purpose specified.

5. A feed-water purifier consisting of two compartments, located one above the other, the upper of said compartments opening into the bottom of the lower compartment by means of a pipe opening from the upper compartment below the level of the hot water therein, a feed-water pipe and a steam-pipe to feed water and steam into the upper compartment, and an exit water pipe opening from said lower chamber near its top, the said feed-water pipe passing down and up through the hot water in said upper compartment, and provided with means to spray said water, substantially as and for the purpose specified.

6. A feed-water purifier consisting of two compartments, located one above the other, the upper of said compartments opening into the bottom of the lower compartment by means of a pipe, a feed-water pipe and a steam-pipe to feed water and steam into the upper compartment, an exit water-pipe opening from said lower chamber near its top, and a blow-off exit from its bottom, substantially as and for the purpose specified.

7. The combination of sections C D, pipe E, wholly submerged in the feed-water, steam-pipe I, water-pipe H, and a feed-water pipe to section C, substantially as and for the purpose specified.

8. The combination of sections C D, pipe E, steam-pipe I, water-pipe H, and a feed-water pipe to section C, consisting of pipes L L′, substantially as and for the purpose specified.

9. The combination of sections C D, pipe E, steam-pipe I, water-pipe H, and a feed-water pipe to section C, consisting of pipes L L′, cap M, and spiders N, substantially as and for the purpose specified.

10. The combination of sections C D, pipe E, wholly submerged in the feed-water, steam-pipe I, water-pipe H, blow-off F G, and a feed-water pipe to section C, substantially as and for the purpose specified.

11. The combination of sections C D, pipe E, wholly submerged in the feed-water, steam-pipe I, water-pipe H, steam-pipe P, injector or pump R, pipe L^2, and a feed-water pipe to section C, substantially as and for the purpose specified.

12. The combination of sections C D, pipe E, wholly submerged in the feed-water, steam-pipes I and J, water-pipe H, and a feed-water pipe to section C, substantially as and for the purpose specified.

13. The combination of sections C D, pipe E, steam-pipe I, water-pipe H, and a feed-water pipe to section C, consisting of pipes L L′, and water-gage K, substantially as and for the purpose specified.

14. The combination of sections C D, pipe E, tubes or apertures *e*, steam-pipe I, water-pipe H, and a feed-water pipe to section C, substantially as and for the purpose specified.

In testimony of which invention I hereunto set my hand.

PHILIP J. GRAU.

Witnesses:
R. M. HUNTER,
FRANCIS S. BROWN.