

(No Model.)

A. BERNEY.

FEED WATER HEATER AND PURIFIER.

No. 248,008.

Patented Oct. 11, 1881.

Fig. 1.

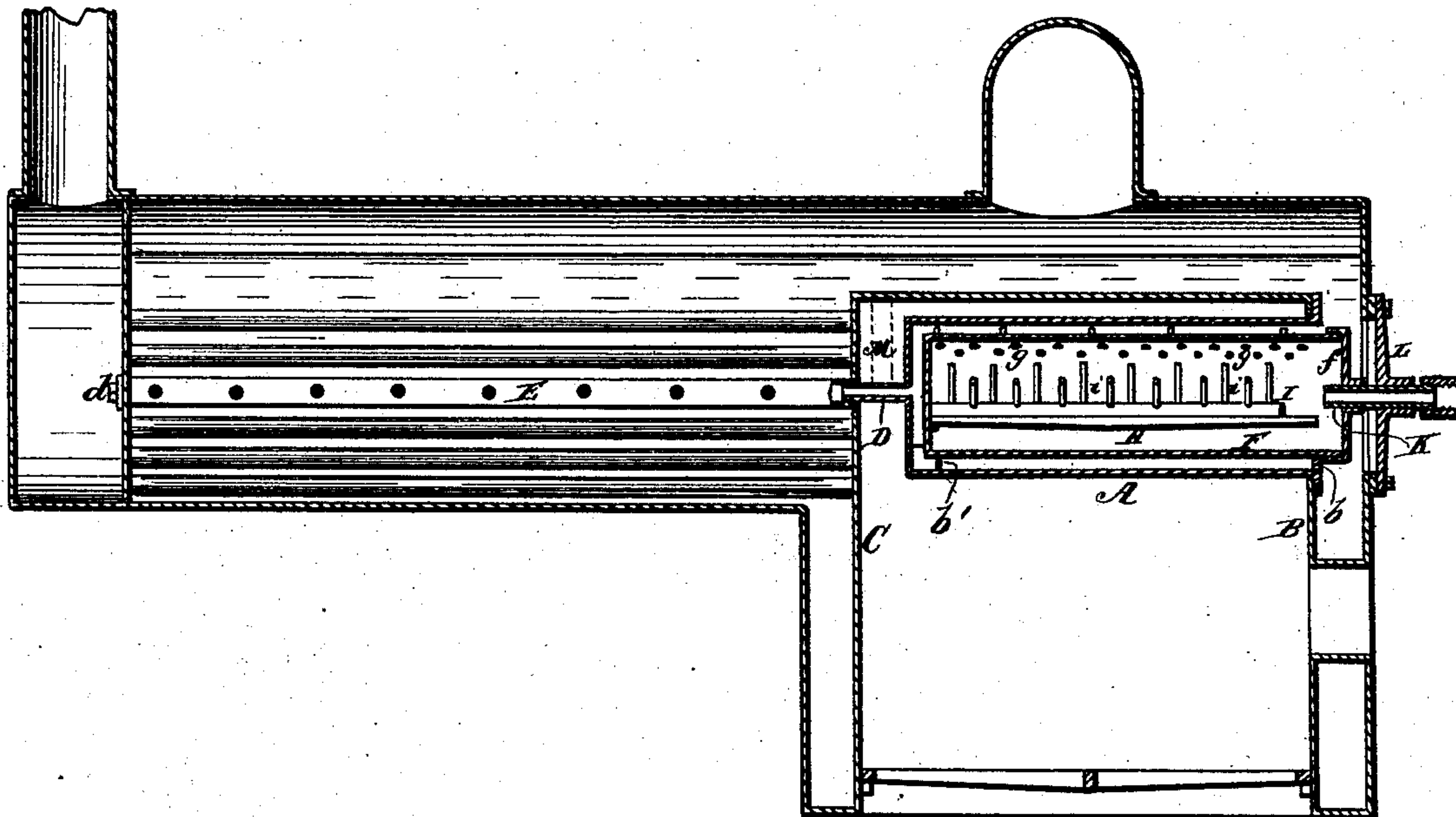
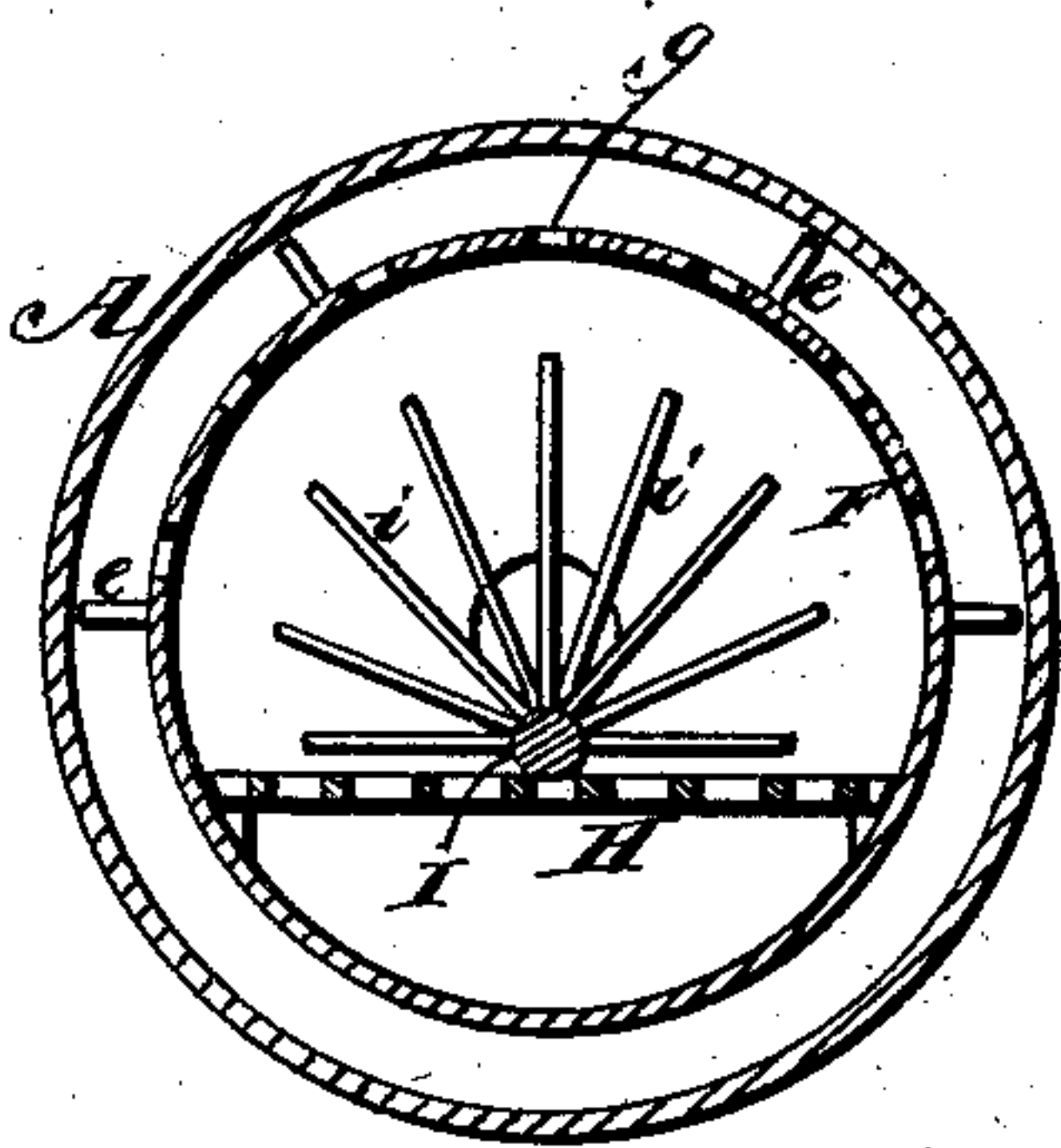


Fig. 2.



Witnesses.

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FEED-WATER HEATER AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 248,008, dated October 11, 1881.

Application filed March 24, 1881. (No model.)

To all whom it may concern:

Be it known that I, ALFRED BERNEY, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Circulating Feed-Water Heaters and Purifiers, of which the following is a specification.

My invention relates to a device for promoting circulation of water in steam-boilers, heating the feed-water, and preventing incrustation of the boiler-sheets. Its object is, first, to prevent decrease of the steam in the boiler at the time of introducing feed-water. The decrease of steam is a very common annoyance, especially to locomotive-engineers, and results from the fact that most all boiler-feeders introduce the feed-water at a temperature considerably below that of the water and steam in the boiler, thus reducing the temperature of the whole volume, checking the making of steam, and frequently causing condensation of a portion of the steam already formed. Its second object is to cause strong currents of hot water to enter the boiler directly from the feeder and branch in various directions, thus causing currents in the whole volume within the boiler, which result in a general circulation. Its third object is to intercept sedimentary matter in the feed-water before it reaches the boiler, and thus prevent incrustation of the boiler-sheets. The incrustation of boilers being known as a prime cause of their deterioration and a prolific source of danger, especially when salt and lime waters are used, many inventions have been made looking to its prevention, and among such inventions are various improvements in feed-water heaters, some forms of which have been intended to purify the water as well as heat it by the use of a series of shelves or shallow basins, upon or in which the solid material will be deposited as the temperature of the water is increased. In others the water is filtered; but prior to my invention, so far as I am aware, no filtering feed-water heater has yet been devised which is adequate to furnish a proper supply of water, and none has been produced with devices for satisfactorily intercepting the calcareous deposits which attend the use of limestone-water.

In the accomplishment of its several objects my invention consists, generally, in the combination, with a steam-boiler and its furnace or fire-box, of a tubular chamber located within said fire-box or furnace, and connected with the water-space of the boiler by a perforated pipe extending through a portion of said water-space, an inner cylinder arranged within and separated by an intervening space from the wall of said chamber, and having a sediment-chamber in its lower portion and perforations through its upper portion, and provided with means for connection with a feed-water supply, and a series of spikes, studs, or projections arranged above said sediment-chamber and within said inner cylinder, substantially as hereinafter described; and it consists, also, in certain sub-combinations for the performance of the several objects separately.

In the accompanying drawings, Figure 1 is a longitudinal central section of a steam-boiler and fire-box of the locomotive pattern with my improved device applied thereto, and shown, also, in longitudinal central section. Fig. 2 is a cross-section of my feed-water heater and purifier detached.

The letter A designates a strong rolled-iron tube or tubular chamber arranged in the upper part of the fire-box or furnace above the furnace-door, and extending from the front wall, B, to near the back wall, C. The front end of said tube or chamber is open through the front wall, B, and firmly secured thereto all around, and a narrow flange, b, projects inward on the lower semicircle of the mouth of said tube. From the center of rear end of said tube A a pipe, D, leads through the rear wall, C, of the fire-box or furnace, entering, and preferably connected by screw-thread with, a perforated tube, E, which extends from the wall C to the rear head of the boiler, a little below its center. The end of said perforated tube is screwed through a threaded hole in the head of the boiler, and is closed by a screw-plug, d.

The letter F indicates a hollow cylinder of heavy sheet-iron of less diameter than the tubular chamber A—say four inches less in diameter and four inches shorter—so that when the cylinder F is supported about centrally within the chamber A there will be a space two inches

wide between the longitudinal walls and four inches wide between the end walls of the two cylinders.

The cylinder F is permanently closed at its rear end, and is closed by a screw-cap, *f*, at its front end, which extends somewhat in front of the mouth of the chamber A. The front end of the cylinder F rests upon the narrow flange *b* at the mouth of chamber. Its rear end rests upon a seat, *b'*, formed for it in the tube A, and its upper surface is provided with studs or pins *e*, which keep it at a proper distance from the surface of the said tube A.

The upper portion of the wall of the hollow cylinder F is thickly perforated, as shown at *g*, and within said cylinder, somewhat below the line of its horizontal diameter, is arranged a longitudinal perforated partition or grating, H, upon the top of which is secured an iron bar, I, from which a great number of iron spikes or studs, *i*, radiate horizontally and upwardly at various inclinations. The space below the partition H forms a sediment-chamber.

From the center of the screw-cap *f*, which closes the cylinder F, a pipe, K, leads through a movable cover, L, which closes a man-hole in the front boiler head or sheet, the boiler being constructed, as usual, with a water-space between the outer sheets and the walls of the fire-box. The pipe K is to make connection with a feed-pump or injector.

A pipe, M, may lead from the pipe D up through the top wall of the fire-box and into the water-space of the boiler, to assist in the circulation. The circulation is also assisted by the space left open at the mouth of the chamber A, between it and the upper portion of cylinder F.

The operation of the invention is as follows:
 40 The furnace keeps the tube A and cylinder F heated to a high degree, and when feed-water passing through the pipe K enters said cylinder it becomes highly heated, even before passing to the chamber A, and a large portion of its carbonate of lime, in the case of limestone-water, is deposited upon the spikes or studs *i*, while its mud and sand settle through the perforated partition or grating H to the sediment-chamber, where it rests comparatively undisturbed. The water leaves the cylinder F pretty well purified, and passes through the perforations *g* to the space between said cylinder and the wall of tube A, where it is still more intensely heated, and from whence it is forcibly ejected through the pipe D to pipe E, from the perforations in the top of which it escapes in strong currents at various inclinations, causing currents in the surrounding volume of water and contributing to the production of a thorough circulation, being aided by the injection of water from the mouth of the tube A around the upper part of cylinder F, and also by the current through the pipe M, when such a pipe is used. The impurities of the water are deposited to such an extent in the cylinder F, upon its spikes and other iron surfaces, and in

its sediment-chamber, that it is capable of depositing but very little crust upon the boiler-sheets.

By removing the cover L of the man-hole, which is a little larger than the cylinder, said cylinder can be drawn out, its screw-cap and partition or grating and spikes removed, the sediment-chamber cleaned out, and the deposit upon the spikes and other surfaces removed in any well-known or convenient manner. The parts may be then again placed together and the cylinder returned to its position for further use.

I do not limit myself, of course, to the precise form or arrangement of the various parts above described, as it is obvious that they may be varied greatly without departing from the principle of my invention.

What I claim is—

1. The combination, with a steam-boiler and its furnace or fire box, of an outer chamber located within said fire box or furnace and connected with the water-space of the boiler, and a removable inner chamber arranged within said chamber and provided with means for connection with a feed-pump or injector, said inner chamber being separated from the outer chamber by an intervening space and provided with water-passages leading to said outer chamber, substantially as described, whereby the feed-water will be heated and caused to deposit its impurities in said inner chamber and then pass to the outer chamber, where it will be further heated and forced into the boiler.

2. The combination, with the boiler and furnace, of the chamber A, located in the furnace or fire box and connected with the water-space of the boiler, and the inner centrally-supported cylinder, F, having its upper portion perforated and provided with a perforated horizontal partition or grating, below which is a sediment-chamber, said inner cylinder being provided with means for connection with a feed-water supply, substantially as described.

3. The combination, with the furnace and boiler, of the chamber A, located within the fire-box and provided with means for intermediate connection with a feed-water supply, and a perforated pipe connected with said chamber and extending through a portion of the water-space of the boiler, substantially as described, whereby when the feed-water is heated in said chamber it will be forced into the boiler in currents of various directions.

4. The feed-water heater and purifier composed of the chamber provided with means for connection with the water-space of a steam-boiler, and the inner cylinder separated from the walls of said outer chamber by an intervening space, and provided with a perforated horizontal partition or grating, and a number of surfaces for intercepting sediment and attracting deposit from the feed-water arranged above said partition, substantially as described.

5. The combination, in a feed-water heater

and purifier, of the outer chamber provided with means for connection with the water-space of a steam-boiler, the inner cylinder separated therefrom by an intervening space and
5 provided with a sediment-chamber in its lower portion and perforations through its upper portion, and with means for connection with a feed-water supply, and the spikes or studs ar-

ranged above the said sediment-chamber, substantially as and for the purpose set forth. 10

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

Witnesses: ALFRED BERNEY.

JAS. L. NORRIS,

J. A. RUTHERFORD.