(No Model.)

E. F. PEACOCK & H. C. REAGAN, Jr.

FEED WATER PURIFIER.

No. 428,131. Patented May 20, 1890.

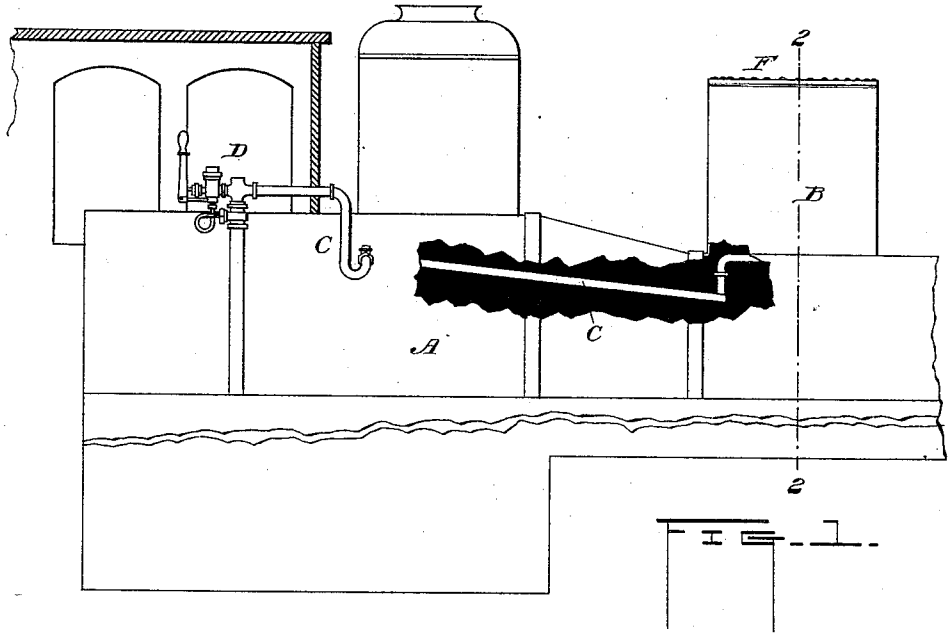


FIG. 1.

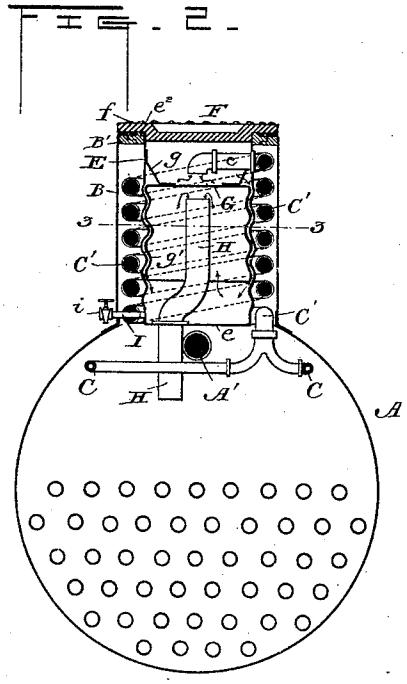


FIG. 2.

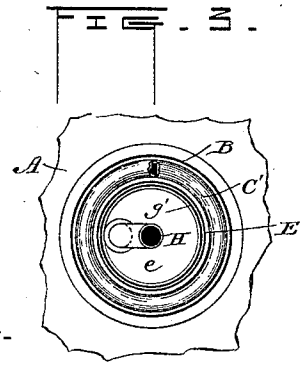
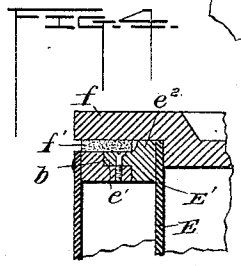


FIG. 3.



WITNESSES

L. A. Sommer, Jr.

Frankland Janney.

INVENTORS

Edward F. Peacock and
Harry C. Reagan, jr.
By their Attorney
Geo. P. Whittlesey

UNITED STATES PATENT OFFICE.

EDWARD F. PEACOCK AND HARRY C. REAGAN, JR., OF PHILADELPHIA, PENNSYLVANIA.

FEED-WATER PURIFIER.

SPECIFICATION forming part of Letters Patent No. 428,131, dated May 20, 1890.

Application filed March 3, 1890. Serial No. 342,485. (No model.)

To all whom it may concern:

Be it known that we, EDWARD F. PEACOCK and HARRY C. REAGAN, Jr., both citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Feed-Water Purifiers; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

One of the most expensive and frequent difficulties that steam-users have to contend with is the deposit and formation in the boiler of hard incrustations or scale, due to impurities held in solution in the water. The heat from the furnace not being carried off as rapidly as it otherwise would be by a fresh portion of water that is brought to it by circulation, its transmission being resisted by the thick scale, which is always a poor conductor, the plates and tubes are often overheated to such an extent that they become corrugated, blistered, burned, cracked, and often ruined. Scale also causes unequal expansion and unequal strain on all parts of the boiler, the sheets most affected being those exposed to the most intense heat of the fire and to obstructed circulation. It is estimated that at least seventy-five per cent. of the cost of repairs on locomotive-boilers is chargeable to bad water. Moreover, an immense item of expense that can be laid to this cause is the loss of heat and consequent waste of fuel. It has been estimated that one-sixteenth of an inch of incrustation on the tubes and parts of a boiler is equal to a loss of twenty per cent. of the fuel, and the loss increases in rapid ratio as the thickness of the scale increases.

About ninety-five per cent. of the scale-producing matter in water is made up of carbonates of lime, magnesia, and iron, and the sulphate of lime. These can be precipitated by heat, since their solubility diminishes as the temperature of the water increases. The carbonate of lime all precipitates at 390°. The sulphate of lime is completely insoluble at about 295°. It is therefore evident that these two substances, which constitute by far the larger part of the scale-producing matter, will be practically all precipitated when a boiler is worked at from one hundred to one hundred and fifty pounds pressure, the temperature of steam at these pressures being 332° and 363.40°, respectively. It is possible, therefore, to rid feed-water of a large percentage of its deleterious impurities by heating it to a sufficiently-high temperature. Many devices have been invented for accomplishing this result; but most of them have failed to come into any general use, owing either to their excessive cost or their impracticable construction, or their liability to choke up or get out of order, or other good reasons.

Our invention has for its object to provide a simple and efficient means for effecting the separation and removal of the sediment and scale-producing matter contained in the boiler feed-water through the agency of heat; and it consists in the novel and improved construction and arrangement of devices for this purpose hereinafter described, and particularly pointed out in the claims.

We have shown our invention applied to a locomotive-boiler, since it is especially designed for use in that connection, though applicable to other forms and styles.

In the drawings, Figure is an elevation of part of a locomotive-boiler provided with our improvements. Fig. 2 is a vertical cross-section on the line 2 2, Fig. 1. Fig. 3 is a horizontal cross-section on the line 3 3, Fig. 2; and Fig. 4 is a detail.

Attached to the shell of the boiler A, around the edge of a suitable opening therein, is a drum or casing B, preferably cylindrical and of about the relative size indicated in the drawings, though the shape and size may be varied to suit the circumstances. The feed-pipes C, after leaving the injectors D, pass into the boiler and run forward on each side to a point near the casing B, where they approach and unite in a large pipe C′, which extends up into the casing. To give a better heating effect the pipe is preferably coiled helically near the walls of the casing, ter-

minating near the top in a short radial section *c*, provided with a downwardly-turned mouth or nozzle. This radial section of pipe passes through the wall of an internal mud-drum or settling-chamber E, which has a closed bottom *e* and depends within the coil of pipe C′ down toward or to the dry pipe A′. The upper edges of the casing B and mud-drum E are united by a steam-tight joint, and the mud-drum has a cover F closing it tightly. We prefer to construct these parts as shown in the drawings, in which the rim of the casing B is riveted or bolted to an internal ring B′, having an annular rabbet *b*, to which is snugly fitted the shoulder *e′* of a ring E′, secured to the exterior of the rim of the mud-drum E, which is thus supported by and retained concentric to the casing B. The two rings B′ E′ are firmly, though separably, united by screws *b′*, and the joint may be packed, if necessary. The cover F is rabbeted to fit within the mud-drum E, and its flange *f* extends over or beyond the ring B′, being separated slightly therefrom by an annular rib e^2 on the upper face of the ring E′. Suitable packing *f′* between the flange *f* and the rings makes the joint steam-tight.

A dash-plate G is suspended concentrically within the mud-drum E by braces *g*, attached to the plate and to the drum. The plate is arranged below the mouth of the feed-pipe and serves to spread the stream of water toward the sides of the drum. A narrow annular space, preferably about one-sixteenth of an inch in width, is left between the drum and the periphery of the dash-plate, from which depends a deep flange *g′* parallel with the walls of the drum and reaching well down toward the bottom *e*. The feed-water falls through this narrow annular passage-way, being thus spread in a thin sheet against the shell of the drum E, the outside of which is surrounded by steam from the boiler, which fills the annular space in which the feed-pipe C is coiled. Escaping under the edge of the flange *g′*, the water rises in the water-chamber inside the same to or toward the under side of the dash-plate G until it reaches the upper end of the large drain-pipe H, which extends down through the bottom of the mud-drum into the boiler and delivers the feed-water thereto. The water is first warmed by the steam from the injector. It is further heated in its passage through the feed-pipes C C′ within the boiler and in the steam-spaces of the purifier. It is delivered upon the dash-plate, which spreads it in a thin sheet and conveys it to the annular passage-way between the depending flange of the dash-plate and the hot shell of the mud-drum. To insure a better heating effect and a larger heating surface, the flange and the shell of the drum may be corrugated, as shown, in such a manner, however, as to preserve their parallelism. In its descent through this narrow conduit the water becomes so highly heated as to precipitate all or nearly all of its soluble impurities, which fall to the bottom of the drum. The lower edge of the flange *g′* is far enough from the bottom *e* to give plenty of room for the water to enter the drum above the mass of sediment. The chamber inside the flange around the drain-pipe H is of so much greater area than the annular passage-way outside the flange that the current of water moves slowly, giving time for the solid matter to settle, so that only clean water will enter the drain-pipe.

The sediment can be blown out from time to time by opening the cock *i* in the blow-off pipe I, which extends from the bottom of the drum to the outside of the casing B, and thence to any convenient point of discharge.

By making the drain-pipe long enough to dip under the surface of the water in the boiler scum and other floating impurities will be carried out when the blow-off cock is opened.

When it is desired to clean the drum and pipes more thoroughly than is possible by blowing off, the cover F is removed, the blow-pipe I and the section of pipe *c* disconnected, and the screws *b′* taken out. The drum E, with its ring E′, dash-plate G, and drain-pipe H, can then be lifted out, leaving the coil C′ and the interior of the casing B readily accessible.

Our improved purifier can be used with any steam-boiler and at or near any convenient point thereof, the casing communicating therewith either directly, as shown in the drawings, or by means of a pipe-connection, as will be understood. We prefer, however, to mount it upon the boiler, as illustrated.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A feed-water purifier having a casing forming an exterior annular steam-space, a narrow annular water-passage within and adjacent to the steam-space, a chamber for clean water inside of and communicating with the annular water-passage, and pipes for delivering water to the upper end of the annular passage and for conveying it out of the water-chamber, substantially as described.

2. A feed-water purifier having a vertical mud-drum surrounded by steam and containing a narrow annular passage-way, through which the water descends, in contact with the shell of the drum, and a central chamber for clean water, a pipe delivering water to the upper end of the annular passage-way, and a pipe for conveying the clean water to the boiler, substantially as described.

3. A feed-water purifier having an exterior steam-space surrounding a mud-drum, a dash-plate within said drum having a depending flange parallel with and near to the shell of the drum, a feed-pipe passing through the steam-space and delivering water upon the dash-plate, and a drain-pipe extending from

a point below the dash-plate to the interior of the boiler, substantially as described.

4. The combination, with a boiler, of a casing, a mud-drum arranged within the same and leaving an annular space around it communicating with the steam-space of the boiler, a dash-plate concentrically arranged near the top of the drum and having a flange depending toward the bottom of the drum in close proximity to the shell of the drum, a feed-pipe coiled in the steam-space around the drum and having a short radial section entering the same and delivering water upon the dash-plate, a drain-pipe extending from the chamber within the depending flange to the steam-space of the boiler, and a blow-off pipe leading from the bottom of the drum, substantially as described.

5. The combination, with the boiler A, of the casing B, the feed-pipe extending up near to the top of the casing, the mud-drum E, having a corrugated shell arranged within the casing, the dash-plate G, concentric with the drum, supported by braces g, and having the depending corrugated flange g', parallel with and near to the shell of the drum, the drain-pipe H within the flange g', and the blow-off pipe I, extending from the drum out through the casing, substantially as described.

6. The combination, with the casing B, of the rabbeted ring B′, secured thereto, the mud-drum E, having the shouldered ring E′, fitting the ring B′, the cover F, extending over both the rings, and means for securing the parts together, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

EDWARD F. PEACOCK.
HARRY C. REAGAN, JR.

Witnesses:
CHAS. F. HALL,
JOSEPH THOMASSON.