(No Model.)

E. HORTON & F. E. FITCH.

BOILER CLEANING APPARATUS.

No. 507,710. Patented Oct. 31, 1893.

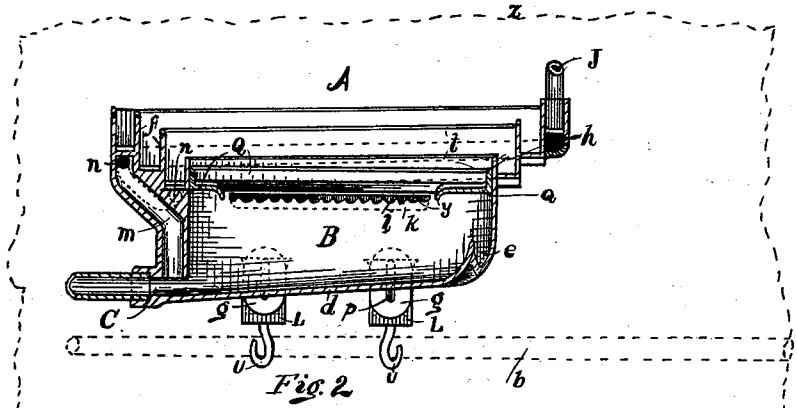

Fig. 2

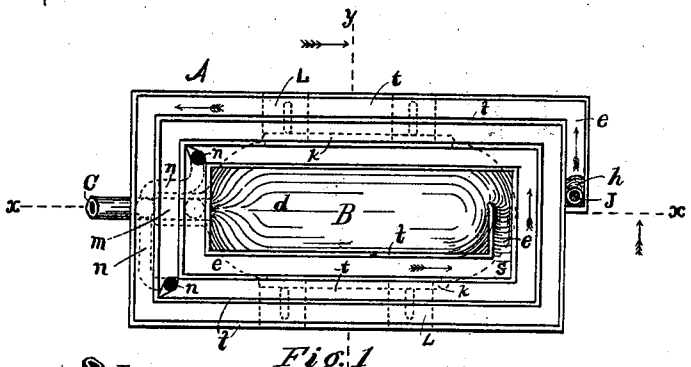

Fig. 1

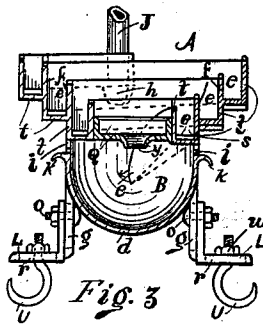

Fig. 3

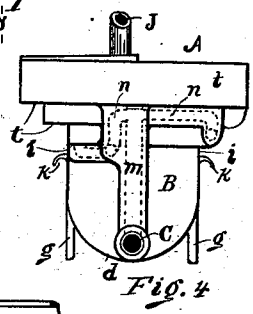

Fig. 4

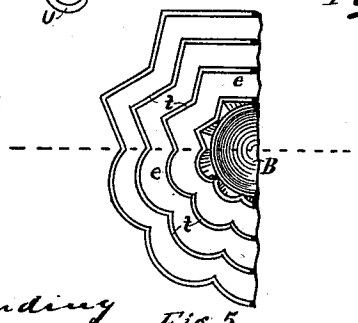

Fig. 5

Witnesses
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UNITED STATES PATENT OFFICE.

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BOILER-CLEANING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 507,710, dated October 31, 1893.

Application filed January 14, 1893. Serial No. 458,406. (No model.)

To all whom it may concern:

Be it known that we, EMMET HORTON, residing at Dundee, in the county of Yates, and FRANCIS ELLERY FITCH, residing at Elmira, in the county of Chemung, State of New York, citizens of the United States, have invented certain new and useful Improvements in Boiler-Cleaning Apparatus; and we do hereby 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.

This invention pertains to that class of precipitators used in connection with boilers and by which it has operation to extract from foul water all foreign and deleterious substances, which cause incrustation and scale in the boiler through the process of evaporation, the water being brought to a high temperature while in the steam space, and then into a precipitator reservoir where the foreign and heavier matters are left, and the purified water returned to the boiler.

We are aware of devices gone before ours claiming to effectually purify the water, and thus clean the boiler, which as before said we also contemplate doing in these improvements. But in none of these former devices do we find a structure so compact, that it may be readily entered through the man hole of the boiler when used to intersect the feed water therein, or to have any special provisions in their general structure to prevent slopping over, by the end thrust, or rolling motion if applied to the locomotive boiler. Again in blowing off the accumulated foreign substances from time to time, which may gather in the precipitator reservoir, we find no provision heretofore made for blowing off like matter from the inlet or feed water way at the same time, which ofttimes fills up at retarding points, and causes the water to overflow the inlet before reaching the reservoir, and especially, is it so where the construction is such as to permit the water to back up the inlet for any considerable distance, before it can reach the point designed for overflow in the settling pan.

The object of our invention is to overcome these troubles, and to otherwise improve in the general construction, as will be more fully described hereinafter, and pointed out in the claims.

In the accompanying drawings, in which similar letters of reference are employed to designate like parts, Figure 1 is a plan view of our invention minus the reservoir cover. Fig. 2 is a vertical sectional view of same, (but showing said cover,) on the dotted line *x x* of Fig. 1. Fig. 3 is a vertical sectional view on the line *y y* Fig. 1. Fig. 4 is an elevational view showing the blow-off end of the device. Fig. 5 is a plan view in part of modified forms for the inlet channel walls, which will permit a rounded or circular construction for the precipitator, and at the same time, by reason of the angles or corrugations in the channel walls, retard the water sufficiently in its course.

In the drawings, A represents our precipitator or settling apparatus which is adapted to be applied to any kind of boiler and intersect the feed water in the steam space, causing the removal of the sediment therefrom, thus saving fuel and labor in cleaning the boiler, and proportionately increasing the quantity of steam, the boiler being indicated by the dotted lines *z z* Fig. 2.

B represents the precipitator reservoir, being preferably made oblong, with its ends and bottom rounded in cross section, one end of said reservoir being rounded to a blow-off opening C low down, and toward which the bottom *d* and said inwall end of the reservoir diverge, and the other end rounded to an inlet trough *e* entering tangentially therein. Said trough from this point of its entrance to the reservoir leads upward and outwardly by the provision of a vertically raised wall *f*, in rectangular spiral form around about the top of the reservoir. In other words said inlet trough may be described, as a plate *t* having a step arranged in it, of spirally rectangular configuration, such step conforming with the outline of the trough by the vertical wall *f* being an extension of the rising part in the

steps of said plate. The higher and outer end of this trough is provided with a receiver, or smaller reservoir *h*, which receives water as it flows from the feed pipe J entering therein and the boiler, and from which entrance reservoir it flows on in its revolution to the larger reservoir, but meeting retardation from each abrupt or angular turn in the trough.

Below the inlet trough and at the top of the reservoir B are made overflow apertures *i* opening therefrom, and below these apertures are extended drip plates *k* projecting outwardly along the opposite sides of said reservoir. The lowest grade point of the regular pitch given the inlet trough *e*, is reached at the last angular turn *s* practically terminating said trough, and is level with or slightly higher than the overflow apertures *i* of the reservoir. Now from the point or turn *s* above described the trough descends rapidly and tangentially into the reservoir, which construction it will be seen not only aids the precipitation of foreign matter entering the reservoir, but prevents the water backing up the inlet beyond affectation by the body of water which the reservoir contains.

The feed water pipe J in entering the boiler and precipitator, may be vertically or horizontally arranged to accommodate the select position of the precipitator in the boiler, and the blow-off pipe C in its connection thereto.

m represents a main supplementary blow-off channel arranged vertically along outside the reservoir over its blow-off pipe C and into which it opens and has connection. From the upper end of this main channel is extended one or more other channels *n* of like nature, opening to the inlet trough *e*. Provision for these channels is made by coring and casting them with the rest of the apparatus of cast iron. The secret of operation is in connecting the inlet channels *n* to the main channel *m*, at a point higher than the highest of their respective mouths. They thus at once, on letting water into the inlet trough, fill only to a level or short way of their distance from the mouth opening to each. By this arrangement it will be seen, the water will rise in the main channel *m* only to a level with that in the reservoir B, and in the inlet channel or channels to a level with the inlet opening to each, and at all times when the water is flowing through the precipitator the higher and remaining portions of these channels contain steam, and the water is thus prevented from flowing through them into the precipitator reservoir by reason of steam pressure. These upper supplementary channels *n* have connection to the inlet at retarding points and containing still water, gather sediment, more or less, from the water flowing over them. Their number may be increased or diminished, and the steam having passage through them all as well as the precipitator reservoir in blowing-off, the whole device is at once and readily cleaned of sediment gathered by it. In this manner a long lineal distance of inlet can be compactly arranged taking up but little room in the steam space of the boiler.

For a support to the precipitator, and one having special features for use in the locomotive boiler, is cast to the sides of the reservoir downward extending lugs *g* which are slotted vertically, and to which is secured, by means of the bolts *o* angle irons L which rest upon the upper boiler tubes *b* (indicated by dotted lines) and are also provided with slots *p* for vertical adjustment, and slots *r* in their horizontal parts for lateral adjustment. The said bolts *o* passing through the vertical slots of the lug and angle iron, furnish an efficient means for adjustment vertically, and the hooked tube gripping bolts *u* passing through the lateral slots to hook upon the tubes under pressure of the nuts *w* thereof, furnish such adjustment laterally.

Q represents a rectangular cap or crown casting, fitted between the inner walls of the inlet, and to partially cover the reservoir B, its under and inner edge having a downwardly curved surface *y* which in case of turbulence, in use with the locomotive boiler, serves to direct and return the water to the reservoir and prevent its slopping over.

The pitch of the inlet may vary with analytic tests of water used, and in cases of small boiler entrance openings, the precipitator may be entered in longitudinal halves or sections and bolted together after being entered.

It is evident that numerous slight changes might be resorted to in effecting the results herein claimed. Therefore we do not wish to be confined to the exact construction shown, but consider ourselves entitled to all changes which may fall within the spirit and scope of our invention.

Having thus fully described our invention, what we claim, and wish to secure by Letters Patent of the United States, is—

1. A boiler cleaner consisting of a precipitating reservoir having a rectangular flanged plate projecting laterally therefrom said plate being provided with a single vertically raised rib or wall extending continuously from the outer edge or periphery of the plate in direction of a rectangular scroll, inwardly to the mouth of the reservoir, substantially as described.

2. The combination with the boiler, of the precipitator reservoir B provided with the overflow apertures *i*, and having its bottom rounded and diverging to a blow-off, a rectangular plate connecting and extending laterally from the top of said reservoir, a receiving reservoir *h* arranged in the outer edge of the plate, and a single vertically raised wall extending on the plate continuously from one reservoir to the other, in the manner substantially as shown and described.

3. In a precipitator, the combination of the reservoir provided with a blow-off channel, the winding water inlet discharging into the reservoir, and one or more supplementary

blow-off channels connecting said inlet and the blow-off channel of the reservoir, substantially as described.

4. In a precipitator, the combination of the reservoir having a vertically arranged blow-off channel, a winding water way discharging into the reservoir, and one or more blow-off channels opening to the water way and connecting the vertical channel at a point higher than their inlet openings, substantially as described.

5. The combination, with the boiler and the boiler flues, of the precipitator reservoir having downwardly projecting lugs *g*, the winding water way discharging into the reservoir B and the angle irons L bolted to the lugs *g*, and provided with hooks *u* for gripping the boiler flues, substantially as described.

6. In a precipitator, the combination with the rectangular spiral water inlet and reservoir below it, of the cover Q having inward and downwardly curved water returning edges *y* to the reservoir, substantially as described.

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