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A. STEWART.

DEVICE FOR PREVENTING THE FORMATION OF SCALE IN BOILERS.

APPLICATION FILED FEB. 12, 1904.

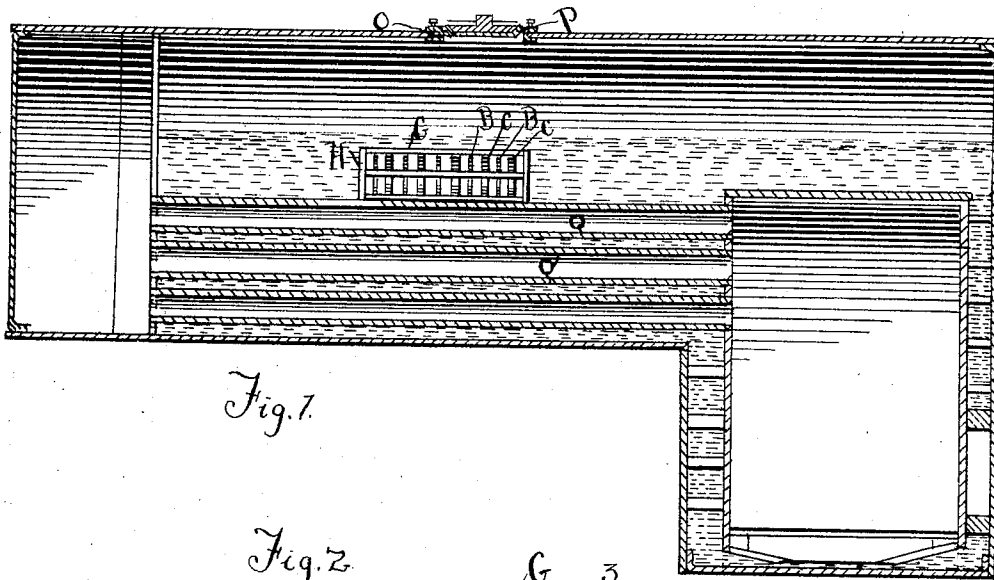


Fig. 1.

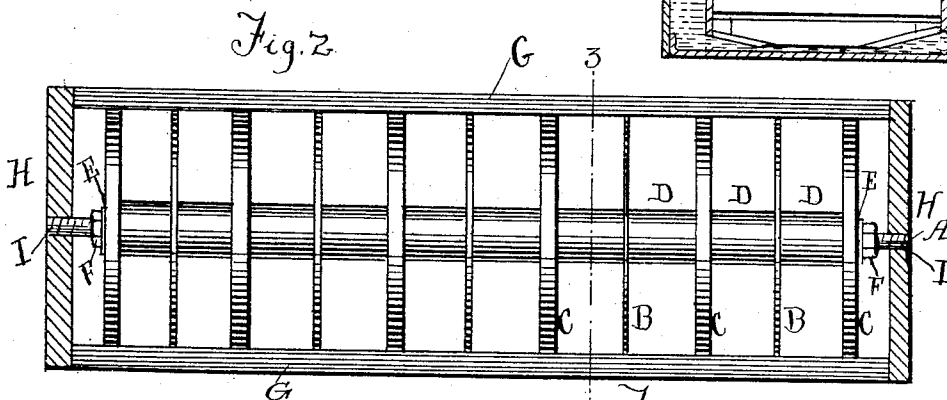


Fig. 2.

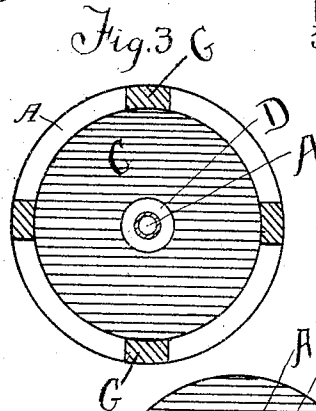


Fig. 3.

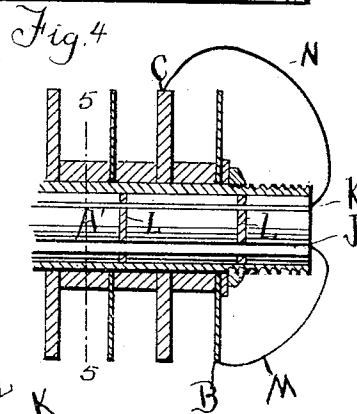
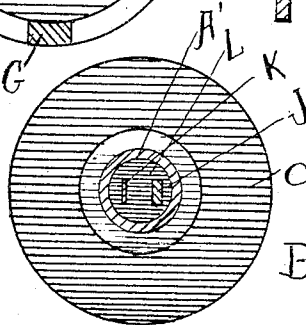


Fig. 4.

Fig. 5.



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# UNITED STATES PATENT OFFICE.

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## DEVICE FOR PREVENTING THE FORMATION OF SCALE IN BOILERS.

SPECIFICATION forming part of Letters Patent No. 779,326, dated January 3, 1905.

Application filed February 12, 1904. Serial No. 193,331.

*To all whom it may concern:*

Be it known that I, ALEXANDER STEWART, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Devices for Preventing the Formation of Scale in Boilers, of which the following is a specification.

The object of the present invention is to construct a device which is complete in itself and may be quickly and easily introduced into and removed from steam-boilers for the purpose of precipitating the calcareous matter in the water and preventing the same from forming on the tubes or linings of the boiler in the shape of scales, thereby necessitating frequent cleaning and impairing the usefulness of the boiler. The precipitation is effected by the action of an electrical current generated by the device of the present invention, with which the heated water in the boiler serves as the fluid of a battery of which the present device of this invention constitutes the electrodes; and the invention more particularly relates to the means of assembling the various parts, so that an electrical action can be generated to accomplish the end in view.

The invention further consists in the means employed for assembling the parts so that the electrodes can be quickly and easily removed for the substitution of new ones or the cleaning of old ones without the necessity for renewing the entire device or disturbing the remaining electrodes.

The invention consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings illustrating the invention, Figure 1 is a longitudinal sectional view of a boiler having the cleaning device of the present invention inserted into place; Fig. 2, an enlarged side elevation of the cleaner; Fig. 3, a cross-section of the device of Fig. 2, taken on line 3 3 of said figure; Fig. 4, a longitudinal sectional view in slightly-modified form; and Fig. 5, a cross-section of the same, taken on line 5 5 of Fig. 4.

The device of the present invention consists of a central supporting-rod A, which is pref-

erably of tubular form and constructed of metal pipe, and at suitable intervals along said supporting-rod are a series of alternating copper and zinc disks B and C, which are slipped onto the central supporting-rod, and between each of the disks is a metal collar D, composed of conducting material, such as copper or iron, which collars serve as connections or contacts for the disks, which when so arranged form the electrodes of a battery of which the heated water in the boiler forms the electric fluid and the metal supporting-rod an electrical connection, so that when the device is inserted into the boiler an electric action will be generated between the electrodes, which serves to precipitate the calcareous matter contained in the water and prevent the formation of scale. The disks are tightly assembled and held in place by means of washers E and nuts F, screw-threaded onto the ends of the central supporting rod or tube, which washers and nuts serve to tightly clamp the disks in place and hold them in rigid transverse relation to the central supporting-rod and to hold the contacting collars into tight contact with the alternating copper and zinc disks, thereby forming a perfect series of electrodes adapted for insertion into a boiler.

It is necessary in order to obtain a proper electrical action that the parts of the device be thoroughly insulated from the metallic portions of the boiler, and in order to provide suitable insulation a crate of wood or other suitable insulating material is fastened around the plates or disks, and said crate, as shown, consists of a series of longitudinally-extending wooden strips G, which extend from end to end of the device and exterior of the plates or disks and are held in place at their ends by means of end sections or disks H, likewise of wood or other suitable insulating material, which end sections are provided with holes or sockets I for securing the ends of the central supporting rod or tube. By arranging the parts in this manner the device will be simple and compact and adapted to be introduced into any ordinary boiler, and when so introduced the parts will be insulated from the metallic portions of the boiler at all points, thereby enabling an electrical action to be gener-

ated which serves to precipitate the calcareous matter contained in the water. It is plain, however, that the parts may be insulated from the boiler in any other suitable manner, and the invention is not limited to the particular form herein shown and described.

In Figs. 4 and 5 is shown a slightly-modified form of the device in which in addition to the parts heretofore described are a pair of longitudinally-extending plates arranged on the interior of the supporting-tube, which in this case is made of sufficient diameter to contain said plates, and, as shown said arrangement consists of a zinc plate J and a copper plate K, arranged within the central supporting-tube A' and suitably insulated from said tube and from each other by means of insulated blocks L, through which the longitudinally-extending plates J and K pass and by which they are held in place. The openings for the plates should be of sufficient size to allow of the ingress of water into the interior of the tube, so that said arrangement serves to provide an additional electrical action owing to the presence of a pair of additional plates, and said plates are connected by means of wires M and N, the former leading from the zinc plate J to one of the copper disks and the latter leading from the copper plate K to one of the zinc disks. In other respects the device of Figs. 4 and 5 is similar to that hitherto described.

In use the parts are assembled, as above described, and the device introduced into a boiler O through a manhole P or otherwise to rest upon the flues Q of the boiler and within the steam and water space above the flue. The water in the boiler surrounding the cleaning device will have the matter therein contained precipitated by the electrical action generated by the electrodes of the device, and such matter will be precipitated and prevented from forming in the shape of scale around the sides and flues of the boiler.

After the device has been in operation for a considerable period of time it may be necessary to renew some of the zinc plates, owing to the corrosive action, and said renewal may be easily effected by unscrewing one of the nuts at the end of the supporting rod or tube to remove the impaired disks and substitute others, after which the parts may be assembled and introduced into the boiler, as before.

It will be seen that the device is simple and

compact and complete in itself, which adapts it for use with boilers of all constructions, and that it is so arranged that it can be instantly introduced into and removed from a boiler and so arranged that the parts composing the cleaner may be readily assembled and removed to allow for the corrosion incidental to its use.

Although the invention has been described as adapted for the prevention of scale in boilers, it is also adapted to eradicate scale already formed thereon, since the electrical action caused by the device is efficacious in dissolving scale from a boiler, as well as precipitate the calcareous matter in the water previous to the formation of scale.

What I regard as new, and desire to secure by Letters Patent, is—

1. In a device of the class described, in combination with a boiler, a frame adapted to be inserted into the boiler, a supporting-rod carried by the frame and insulated thereby from the boiler, a series of alternate electropositive and electronegative plates removably mounted on the rod, a series of collars removably located on the rod between the plates, and means for holding the plates and collars firmly thereon and allowing of their removal therefrom, substantially as described.

2. In a device of the class described, the combination of a hollow supporting-rod, a series of electropositive and electronegative plates carried by the hollow rod, an electropositive and an electronegative plate passing through the interior of the rod and insulated therefrom, electrical connections for the interior and exterior plates, and insulating means for insulating the parts from the metallic portions of the boiler, substantially as described.

3. In a device of the class described, the combination of a central supporting-rod screw-threaded at its ends, a series of copper and zinc plates removably mounted on the rod, a series of continuous metallic collars mounted on the rod between adjacent plates, nuts screw-threaded on the ends of the central supporting-rod, and a crate formed of insulating material surrounding the plates and adapted to insulate the same from the metallic portions of a boiler, substantially as described.

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