

(No Model.)

2 Sheets—Sheet 1.

S. G. CABELL.

APPARATUS FOR FREEING WATER FROM SCALE PRODUCING IMPURITIES.

No. 549,435.

Patented Nov. 5, 1895.

Fig. 1.

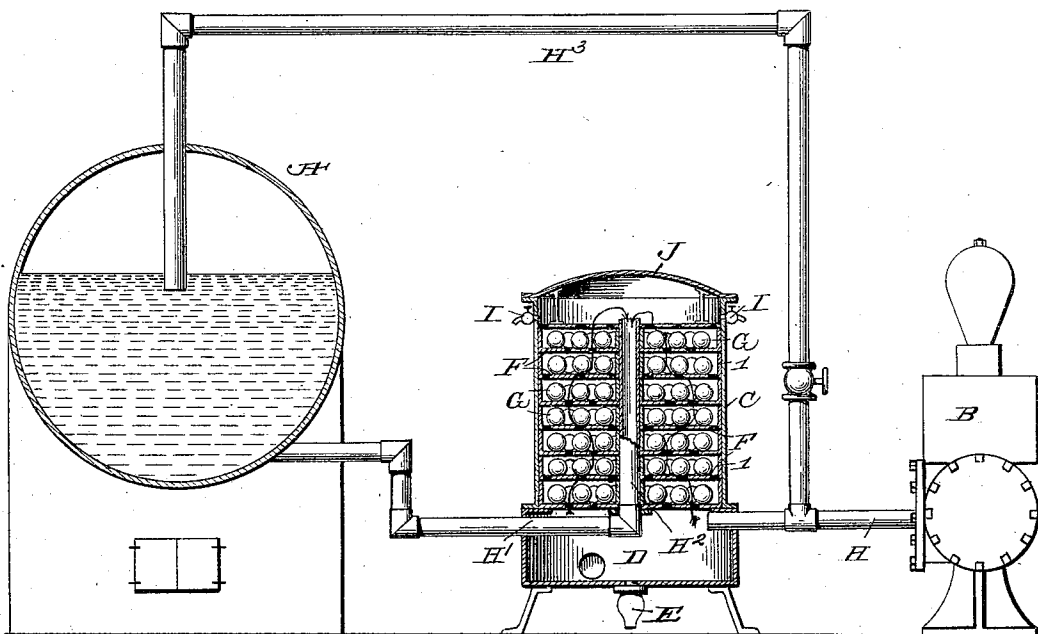
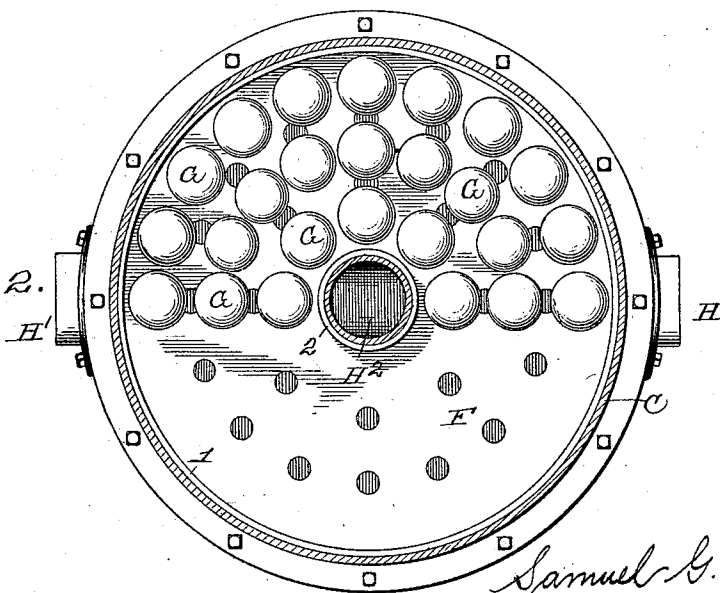


Fig. 2.



WITNESSES

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(No Model.)

2 Sheets—Sheet 2.

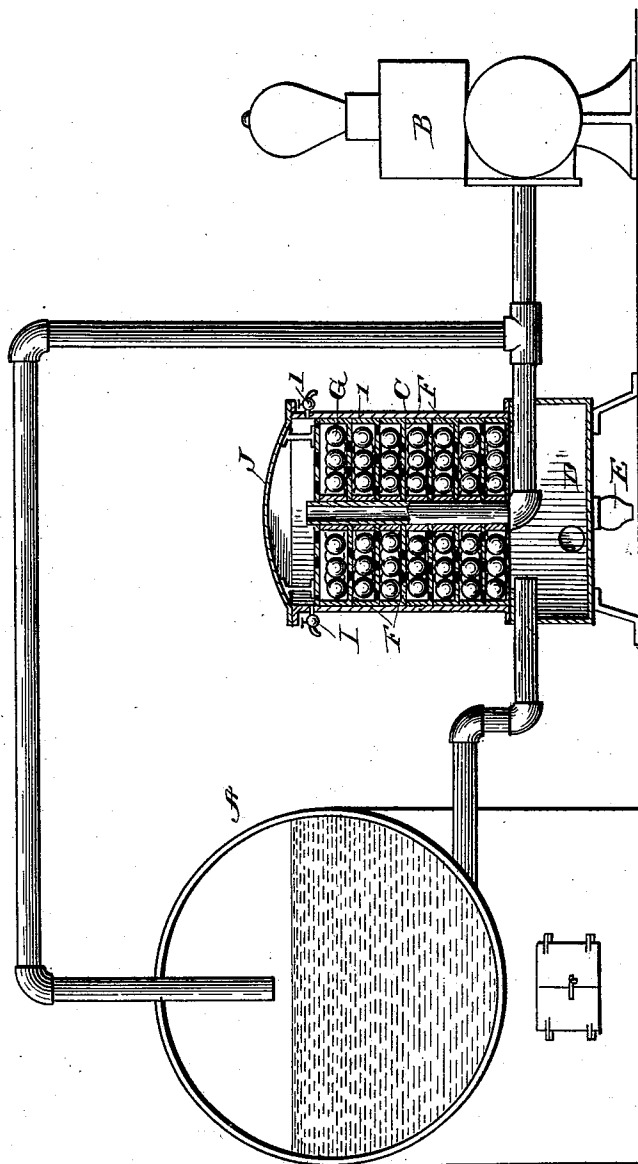
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Fig. 3.
H³



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UNITED STATES PATENT OFFICE.

SAMUEL G. CABELL, OF WASHINGTON, DISTRICT OF COLUMBIA.

APPARATUS FOR FREEING WATER FROM SCALE-PRODUCING IMPURITIES.

SPECIFICATION forming part of Letters Patent No. 549,435, dated November 5, 1895.

Application filed November 30, 1894. Serial No. 530,410. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL G. CABELL, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Freeing Water from Scale-Producing Impurities; and I 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.

This invention has relation to that class of means for preventing the formation of scale in steam-boilers in which the scale-producing elements are eliminated from the water by galvanic action, but particularly to that type thereof in which the galvanic action is produced by zinc balls or cylinders movable upon copper.

The object of my invention is to provide an apparatus for the purpose stated which will have a maximum efficiency, and this object is accomplished by so constructing the apparatus that, first, the strength of the action produced is materially increased and more efficiently maintained; second, the corrosive action upon the balls is more efficiently retarded; third, the impurities of the water will be collected into a chamber before the water reaches the boiler and may be easily and quickly discharged from said chamber to the atmosphere whenever desired, and by otherwise improving the construction of the apparatus.

In the accompanying drawings, illustrating the invention, Figure 1 is a sectional elevation showing my improved apparatus applied to a boiler and pump and connected with both of the same, said apparatus being drawn to a larger scale than the boiler and pump. Fig. 2 is an enlarged sectional plan view of the apparatus with one-half of the balls upon the plate removed to more clearly disclose the position of the water-passages through the plate; and Fig. 3 is a sectional elevation of the purifier connected with a pump and boiler and shows the arrangement of pipes when the water is to flow downward through the pile, and also shows the return-pipe termi-

nating at a place in the boiler higher than is shown in Fig. 1.

The same letters of reference designate the same parts in all the figures.

A designates a steam-boiler, B a pump, and C a cylinder that contains the electro-positive and the electronegative metals, which when immersed in water produce the galvanic action by which the water is freed from scale-producing elements previous to entering the boiler. This cylinder is between the pump and boiler, and receives its supply of water from the former and supplies the latter. It has in its bottom a chamber D, into which the mud and other impurities of the water are collected and from which said impurities may be blown out by the steam from the boiler by a proper manipulation of cocks or valves with which the pipes connecting said chamber or the cylinder with the boiler may be provided and by opening the cock E in the bottom of said chamber.

Within the cylinder and above the collecting-chamber D are horizontal copper partitions or plates F, and upon each of said plates is a series of zinc balls G, which balls and plates when immersed in water produce a galvanic action, the effect of which is to free the water from scale-producing impurities, as is well known.

The copper plates are of greater diameter than what may be termed the "tread" of the balls, so that in whatever direction the balls turn a constant contact, and that throughout a maximum amount of surface, is maintained, and a constant galvanic action of maximum strength is thereby produced.

While the plates are described as being of copper and the balls of zinc, it is obvious that an equivalent construction is produced by forming the plates of zinc and the balls of copper and that this change may be made without departing from the spirit of my invention.

It will be observed that the plates or partitions are arranged horizontally one above another and that they are formed with perforations, through which the water passes, so arranged in the respective partitions that an opening of one partition will register with a closed part of the partition or partitions immediately adjacent to it. By this arrange-

ment of perforations the water is caused to flow in a circuitous path from one end of the cylinder to the other and is subjected to galvanic action of maximum strength constantly maintained during its travel through the cylinder. This maximum strength of the galvanic action is produced and maintained not merely by duplicating the zinc and copper elements and by constructing the former so that they will rotate upon the latter, but is due to the use of copper partitions arranged one above another in a cylinder into which the water is first fed and of substantially the same diameter as the inner diameter of said cylinder and having perforations through them arranged to cause the water to traverse a circuitous course from end to end of the cylinder.

By the construction and arrangement described the body of water is subjected to a series of successive galvanic actions and very effectually and rapidly freed from scale-producing elements, as is obvious, and by causing the water to traverse a circuitous path it causes the balls to roll in every direction upon the copper partitions without breaking complete engagement of the balls with the copper, as hereinbefore stated, and by thus causing them to roll in various directions against the partitions and themselves they are more effectually kept clean and bright than in the construction heretofore proposed, whereby weakening of their action by the formation of a scale upon them is very efficiently retarded. Furthermore, by providing the cylinder within which the water is purified with an impurity-collecting chamber all of the impurities of the water are prevented from entering the boiler, which is of manifest advantage.

Having thus described the main features of my invention, I will proceed to describe the detailed construction preferred by me; but I do not wish to be understood as limiting myself to the details of construction herein described, as many of them may be varied without departing from the spirit of the invention.

Entering opposite sides of the collecting-chamber are pipes II and II', which respectively connect the cylinder with the pump and boiler, and said pipe II' is provided with a vertical extension II², which extends centrally of the cylinder through openings in the partitions F. The water is fed to the cylinder through pipe II and takes the circuitous upward course, above described, to the top of the cylinder, and thence through pipes II² and II' to the boiler. If desired, however, the arrangement may be changed so that the water will flow downward through the cylinder instead of upward, as shown in Fig. 3, in which the pipe extending vertically within the casing is connected with the pipe leading from the pump instead of with the pipe leading to the boiler; but I prefer the first-named arrangement. The upper part of the boiler is connected with the cylinder by a pipe II³.

When the water in the boiler is at its normal level, (indicated in Fig. 1,) heated water is conveyed from the boiler to the cylinder to raise the temperature of the water in the latter through pipe II³, and when desired or necessary quickly and yet efficiently to free the cylinder from the impurities collected said impurities may be blown out by steam taken from the boiler through pipe II³, when the water in the boiler is at the level indicated in Fig. 3 relative to the receiving end of the pipe. It will be understood that the same pipe will answer to convey either water or steam to the cylinder by regulating the depth of water in the boiler or that the end of the return-pipe may terminate always in the steam-space of the boiler or always in the water of the boiler, so as to convey only steam or water, respectively, to the cylinder, whichever is desired.

The upper end of the cylinder may be provided with cocks or valves I I, through which oil or other matter lighter than the water may be drawn or forced out of the cylinder.

It will, of course, be understood that it is within the ability of the mechanic skilled in this art to provide various arrangements of feed-pipes and to provide said pipes with all necessary valves, if there be any required, to cause the water to circulate properly and produce the results sought, and for this reason I do not consider it necessary to more particularly describe this part of the system; nor do I wish to be understood as limiting myself to this or any particular arrangement of pipes.

The bottom partition is supported upon flanges surrounding openings in the top of the collecting-chamber, and each succeeding partition is supported from the one immediately beneath it upon vertical rims 1, projecting from the circumferences of the partitions, and upon rings 2, encircling the pipe II² and resting upon the pan beneath. By means of this construction the partitions may be readily inserted and removed and their number varied to adapt the device to the size of the boiler to be fed or to the character of water to be purified. The openings in the partitions, through which the water flows, are so arranged as to not register with each other for the purpose above stated.

To afford easy access to the interior of the cylinder for insertion or removal of the partitions and balls or for any other purpose, the cylinder is provided with a removable cap J, bolted or otherwise suitably secured to it. The bottom of the cylinder rests upon the top of the collecting-chamber, and is fastened thereto by any proper means.

I do not wish to be understood as limiting myself to the use of copper and zinc as the metals for producing galvanic action, as any other relatively electropositive and electro-negative metals may be employed in lieu thereof without departing from the spirit of my invention.

From the above it will be seen that I have provided an apparatus having many advan-

tages over those heretofore proposed and which will purify water to a maximum extent in a minimum time. The collecting-chamber is also provided with suitably arranged hand-
5 holes having proper means for covering the same in order that the sediment collected therein and not discharged by "blowing out" may be removed by a proper instrument.

10 Having now described my invention, what I believe to be new, and desire to secure by Letters Patent, is—

15 1. In an apparatus for freeing water from scale-producing impurities, the combination with the cylinder having inlet and outlet ports, of perforated partitions, arranged one above another in said cylinder, and balls upon said partitions, said partitions and balls being of electro-negative and electro-positive metals, substantially as described.

20 2. In an apparatus for freeing water from scale-producing impurities, the combination of the cylinder, having means for the ingress and egress of water, perforated copper partitions in said cylinder, said partitions being
25 arranged one above another, and zinc balls upon said partitions, substantially as described.

30 3. In an apparatus for freeing water from scale-producing impurities, the combination of the cylinder, having means for the ingress and egress of water, copper partitions in said cylinder, said partitions being located one above another and having perforations ar-
35 ranged to give the water a circuitous course, and zinc balls upon said partitions, substantially as described.

40 4. In an apparatus for freeing water from scale-producing impurities, the combination with the cylinder provided with means for the ingress and egress of water, and having an impurity-collecting chamber in its base, of a series of copper partitions arranged one above another in said chamber, said partitions hav-
45 ing perforations for the passage of the water, and zinc balls upon said partitions, substantially as described.

5. In an apparatus for freeing water from scale-producing impurities, the combination with the cylinder, having means for the in-
gress and egress of water, and a removable 50 cap for said cylinder, of a series of partitions in said cylinder, arranged one above another and perforated to permit the water to pass through them, said partitions having verti-
cally-projecting rims, whereby one is sup- 55 ported by another, and balls upon said partitions, said balls and partitions being respectively of electro-positive and electro-negative metals, substantially as described.

6. In an apparatus for freeing water from 60 scale-producing impurities, the combination with the cylinder, having means for the ingress and egress of water, and a removable cap for said cylinder, of a series of partitions in said cylinder, arranged horizontally one
65 above another and perforated to permit the water to pass through them, said partitions having vertical rims, a vertical water tube extending through said partitions, rings encir-
cling said tube and engaging the partitions, 70 and balls upon the partitions, said partitions and balls being respectively of electro-negative and electro-positive metals, substantially as described.

7. The combination with the steam boiler 75 and a pump, of a purifier between the same, said purifier embodying a casing having purifying means therein, a mud collecting chamber in the base of said casing, a pipe connecting said casing with the pump, an egress
80 pipe extending from the casing to the water chamber of the boiler, a return pipe extending from the upper part of the boiler to said casing, and a blow-off cock in said chamber, substantially as described. 85

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL G. CABELL.

Witnesses:

EMILY E. PARISH,
CHAS. J. STOCKMAN.