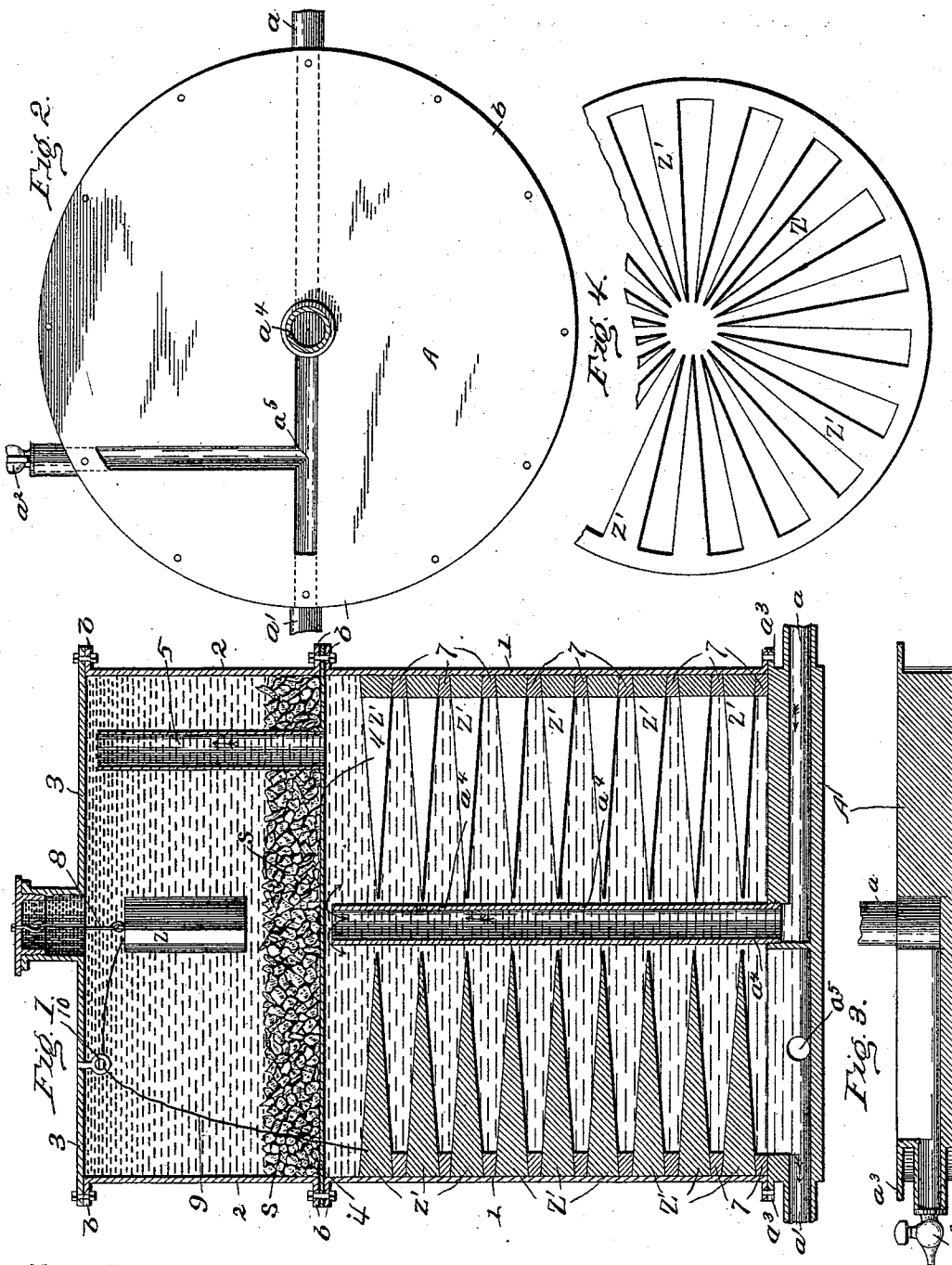


(No Model.)

S. G. CABELL.
APPARATUS FOR PURIFYING FEED WATER.

No. 552,412.

Patented Dec. 31, 1895.



Witnesses:

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UNITED STATES PATENT OFFICE.

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

APPARATUS FOR PURIFYING FEED-WATER.

SPECIFICATION forming part of Letters Patent No. 552,412, dated December 31, 1895.

Application filed May 26, 1894. Serial No. 512,540. (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, District of Columbia, have invented certain new and useful Improvements in Apparatus for Purifying Feed-Water; and I 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.

In my Patent No. 495,242, dated April 11, 1893, there is described and shown a feed-water passage or conduit for admitting feed-water to steam-boilers, having positive and negative galvanic elements so arranged therein that the feed-water in passing through said conduit in contact with said elements generates a current or currents of electricity by which the feed-water is electrically charged while on its way to the boiler. In some instances, in applying said invention to old boilers already incrustated with scale, it is desirable to increase the energy of the electric action on the feed-water until such old scale shall be removed, and in some cases it may be deemed advisable to continue such greater action even after the old scale shall have been removed, or, where an electric apparatus of small capacity is used with a large boiler or series of boilers, it may be deemed best to increase the current even although the boiler or boilers be not already incrustated.

My present improvement consists in combining, with said electric feed-water apparatus, a galvanic pile having positive and negative elements and an acid or alkaline electrolyte, such as sulphate of copper, so that the feed-water shall be charged with the current or currents generated by the action of the feed-water upon the positive and negative elements, as set forth in my former patent, and also with the additional current or currents generated by the action of the acid or alkaline solution upon the positive and negative elements of the additional galvanic pile, in order that the feed-water may be charged more energetically than with the first-mentioned apparatus alone.

It further consists in arranging both of said batteries within the shell or casing through which the feed-water passes to the boiler, so that the action of both batteries shall be

automatically excited by the feed-water itself and so that the combined apparatus may be conveniently constructed, applied and utilized.

It further consists in several minor combinations and constructions more specially pointed out in certain of the claims hereto appended.

In the drawings, Figure 1 is a central vertical section through the apparatus, showing the relative arrangement of its parts. Fig. 2 is a plan, and Fig. 3 is a section through the base, on the line *xx* of Fig. 2. Fig. 4 is a plan showing the form of the zinc or positive element.

A is the base of the gland, cast of suitable metal, having near its bottom an inlet-passage *a*, an outlet-passage *a'*, and a blow-off nipple *a²* connected with passage *a'* at *a¹*. The base is also provided with a circumferential flange *a³* to provide convenient connection therewith of the vessel or gland portion.

Centrally connected with the base is a copper tube *a⁴* for conducting the feed-water to the upper part of the vessel. The gland itself is conveniently made up of two sections of copper pipe 1 and 2, and a cover 3 of suitable material. These sections are provided with flanges *b b*, as shown, for convenience in coupling the sections together and for attaching the gland to its base and the cover to the gland. The upper section 2 has a copper bottom 4, which is provided with a filling pipe or nozzle 5 extending to the upper part of the cell.

Z is the zinc or positive element of the battery-cell, the copper vessel being the negative. The positive element is suspended by a non-conducting cord or hanger 8.

z' z' are the zinc or positive elements of the voltaic pile-section of the gland, the body of the gland being the negative. These elements *z' z'* are arranged in the lower section of the gland around the central passage *a⁴*, being separated from each other preferably by rings of asbestos 7 7. They are of such outside form as to fit inside the gland and they are cut away at the center and radially, as shown in Fig. 4, and the fingers or points are arranged in staggered order, so as to break up the water-current to bring it into close relation with the elements of the voltaic pile. The element

z of the cell-section 2 is coupled with the elements z' of the pile-section 1, by means of an insulated conductor 9, which may extend through an eye 10 depending from the cover

3. In this way I produce a battery consisting of the cell-section 2 and the pile-section 1 coupled in multiple arc, the copper of the two parts of the gland being in contact with each other.

10 In operation, the upper cell being charged with a proper salt or acid, as blue-stone or sulphate of copper s , water is fed through passage a and uptake a' , and being under boiler-pressure passes up through tube 5 and fills
15 the battery-cell or section 2. The water then passes downward through the voltaic elements and onward from outlet-passage a' to the boiler.

I do not wish to be understood as limiting
20 myself to the precise construction herein shown and described, as the details may be varied without departing from the spirit of my invention.

Having now described my invention, what
25 I claim as new, and desire to secure by Letters Patent, is—

1. In a feed water purifier, the combination of a gland for the feed-water pipes, consisting of two sections of copper pipe flanged at the
30 edges and having connected to said flanges a suitable base and top with a partition located between the upper and lower sections, the upper section containing the positive elements and constituting a chamber for electrolytic
35 material, the walls of the gland constituting the negative elements of an electric battery, and the two glands communicating with each other by a suitable pipe, the base of the gland being provided with inflow and outflow aper-
40 tures, and a pipe extending upward to near the top of the lower section of the gland for the introduction of the feed water.

2. A feed-water purifier involving the combination of a voltaic pile, having a water pas-
45 sage through it, and a voltaic battery element,

having a filling tube leading from said water passage, the pile and battery cell being electrically coupled, substantially as described.

3. In a feed-water purifier, the combination of the upper and lower gland sections, con-
50 nected by a suitable pipe, said lower section having inlet and outlet ports, and the positive element in the upper section, electrically connected to the negative element or walls of the gland, the two constituting a galvanic battery.
55

4. A feed-water purifier, comprising an upper and lower gland-section, a partition between them which divides the gland into two
60 chambers, the lower chamber constituting the negative element and having inflow and outflow passages and the upper one constituting a chamber for the electrolytic liquid, and the positive element suspended within said upper chamber, and electrically connected with the
65 lower chamber.

5. In a feed-water purifier, the combination with the gland, consisting of an upper and lower section, separated by a suitable partition, said partition having an opening for the
70 inflow of water from the lower section, and said lower section having suitable inlet and outlet ports; a pipe within the upper section communicating with the opening in said partition; said lower section constituting the
75 negative element; the positive element within the upper section; and the electrical connection between said negative and positive elements: the two elements of the respective sections of the gland constituting a galvanic battery for imparting a galvanic current to the
80 water flowing through the lower section and thereby purifying the same, substantially as described.

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

SAMUEL G. CABELL.

Witnesses:

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