No. 645,419. Patented Mar. 13, 1900.

H. C. DAVIS & H. STRASBURGER.

SCALE DISSOLVER AND PREVENTER.

(Application filed June 26, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

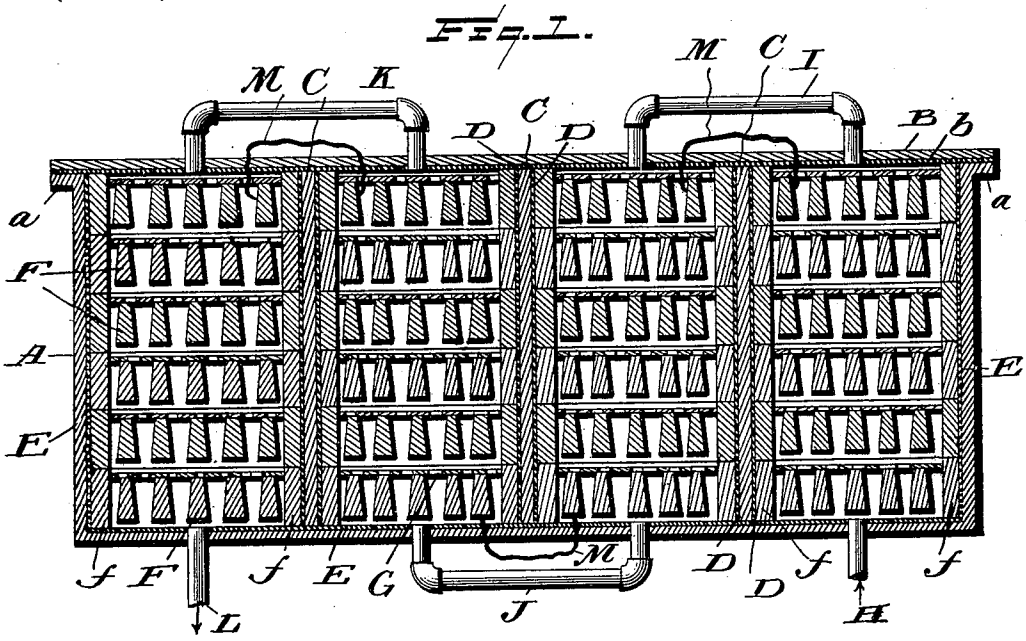
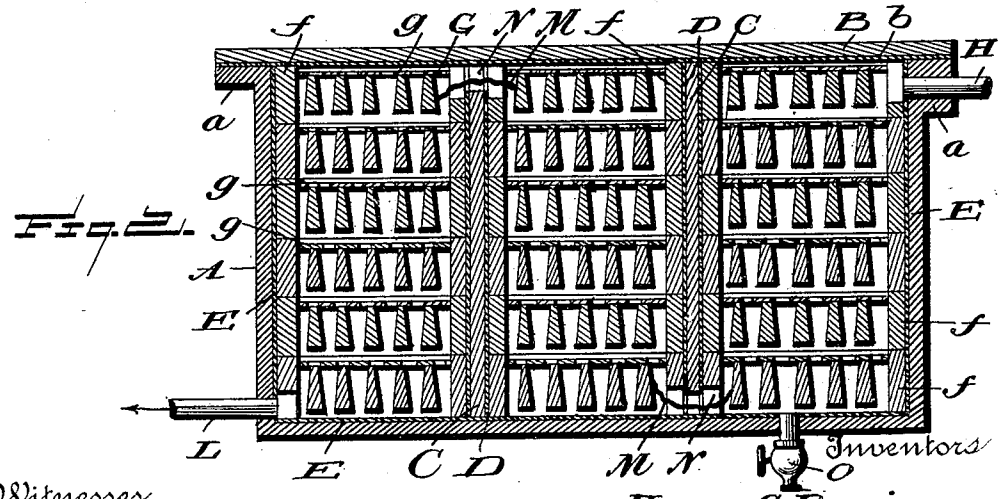


Fig. 2.



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Fig. 3.

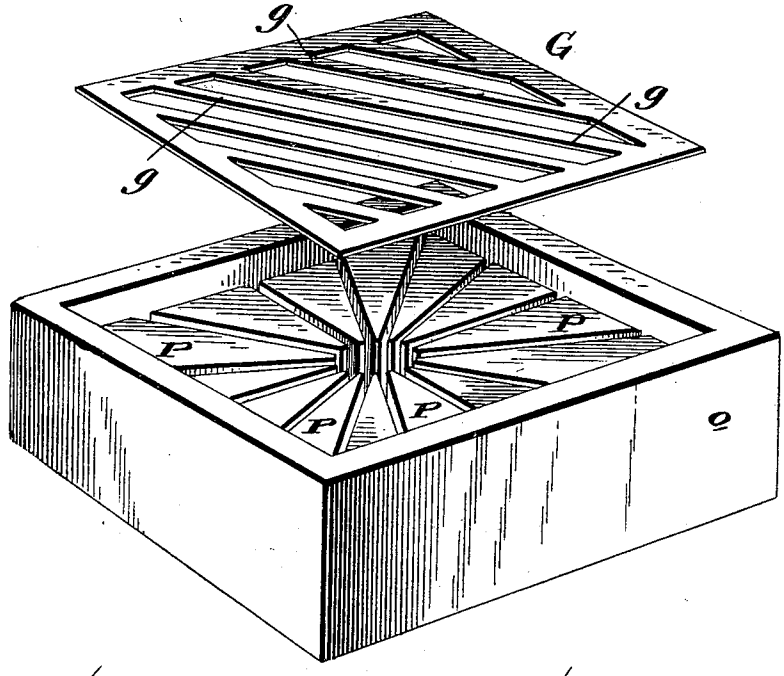


Fig. 4.

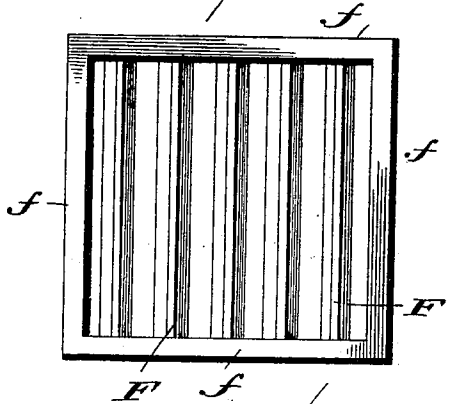


Fig. 5.

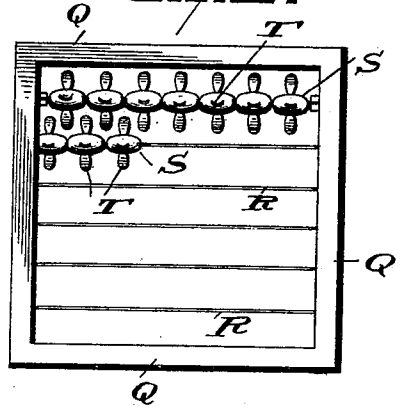
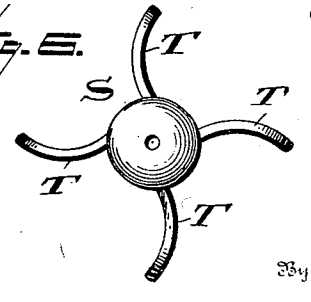


Fig. 6.



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UNITED STATES PATENT OFFICE.

HENRY C. DAVIS AND HENRY STRASBURGER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNORS OF ONE-THIRD TO ABRAHAM H. STRASBURGER, OF SAME PLACE.

SCALE DISSOLVER AND PREVENTER.

SPECIFICATION forming part of Letters Patent No. 645,419, dated March 13, 1900.

Application filed June 26, 1899. Serial No. 721,957. (No model.)

To all whom it may concern:

Be it known that we, HENRY C. DAVIS and HENRY STRASBURGER, citizens of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Scale Dissolvers and Preventers; 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.

This invention relates to certain new and useful improvements in devices for dissolving and removing scale, as well as preventing new incrustation from taking place.

The device is intended, primarily, for use in connection with steam-boilers, and is preferably so arranged that the water passes through the same before entering the boiler.

We provide a casing or vessel, which may be of any desired shape and capacity, divided into a plurality of compartments, in each of which is a series of negative and positive plates, with provision for causing the water to enter at one end of the casing or vessel and after passing successively through the various compartments and in contact with the plates therein finds its egress at the opposite end of the casing and flows on into the boiler. The positive plates are preferably of zinc and the negative plates of copper.

A battery may or may not be employed in connection with the device.

The present invention has for its objects, among others, to provide a simple and cheap device of this character readily applied to the feed-pipe of the boiler, not liable to get out of order, and positive and reliable in its action.

Other objects and advantages of the invention will hereinafter appear, and the novel features thereof will be specifically defined by the appended claims.

The invention is clearly illustrated in the accompanying drawings, which, with the letters of reference marked thereon, form a part of this specification, and in which—

Figure 1 is a substantially central vertical longitudinal section through the device. Fig. 2 is a substantially central vertical longitudinal section through a different form of the device. Fig. 3 shows in perspective one form of each of the plates. Fig. 4 is a detail view of one of the forms of positive plates shown in Figs. 1 and 2. Fig. 5 is a detail in plan showing another form of arrangement of the positive and negative portions. Fig. 6 is an enlarged detail view of one of the rotary parts of Fig. 5 removed.

Like letters of reference indicate like parts throughout the several views.

Referring now to the details of the drawings by letter, A designates a box, vessel, or casing of any suitable material, preferably of metal, and it may be of any desired shape and capacity. It is here shown as provided with a flange *a* at its upper edge, upon which is designed to be supported the removable cover B, which may be secured by any suitable means, a packing *b* preferably being provided, as indicated in Figs. 1 and 2, to insure a watertight joint.

The casing or vessel A is divided into a plurality of compartments of any desired number by the vertical partitions C, which are by preference of metal, and in some instances these partitions may be covered with sheet-rubber, as seen at D, in Figs. 1 and 2, in which views the vessel is also shown as lined with sheet-rubber E, as are also the various compartments; but this rubber lining may be dispensed with, as it is not always necessary. In each compartment are disposed a number of negative and positive plates, alternating as shown, and these plates may assume a variety of forms. In Figs. 1 and 2 the positive plates, of zinc, are of the form shown in detail in Fig. 4, consisting of a surrounding frame *f*, in this instance rectangular, (but it will be understood that its shape will vary with the shape of the casing,) and a plurality of bars F, which are herein shown as tapered, but not necessarily so, and upon each of these is placed the negative plate G, which consists of a correspondingly-shaped frame and bars *g*, which may extend either parallel with the opposite side bars, as in Figs. 1 and 2, or diagonally therewith,

as indicated in Fig. 3. These plates rest on the bars F, as shown, and within the frame *f*, so as not to interfere with the next one of the plates in the series when it is placed in position, as will be readily understood from Figs. 1 and 2.

In the form shown in Fig. 1, H is a water-inlet pipe, shown as entering the vessel or casing at the bottom, so that the water is forced to pass upward through the interstices in the several plates and thence through the pipe I into the next compartment and thence downward through the spaces between the bars of the plates and in contact therewith, and then through the pipe J into the next compartment, up through the same and through the pipe K into the next compartment, down through the materials therein, and out at the outlet-pipe L to the boiler. It will be noticed that in passing through the device from one end to the other the water must necessarily take a circuitous course and come in contact with all of the positive and negative plates in the various compartments. The plates of the various compartments are joined, as by the wires M, as shown in Fig. 1, so that each compartment is connected with the adjacent one and electrical communication established between the various compartments.

In Fig. 2 is shown an arrangement the same in principle, but instead of employing the outside pipes I, J, and K, and in the partitions C we provide openings N, through which the water passes from one compartment to the next, these openings being arranged at alternately-opposite ends in adjacent compartments or partitions, so that the water must take a circuitous route in passing from the inlet to the outlet. In this form the connections M are disposed within the casing instead of exteriorly thereof, as in Fig. 1. In the form shown in Fig. 2 also the inlet-pipe enters at the end at the top and the outlet-pipe L is disposed at the opposite end and at the bottom of the compartment from which it conducts the water. The operation, however, is substantially the same.

In Fig. 2 there is provided a drain-cock O, by means of which all of the contents of the casing may be withdrawn when desired or necessary. If the casing is placed in position where it must rest upon the bottom, the drip-cock should be arranged upon the side, so as not to be injured, as will be readily understood.

Instead of making the zinc plates of the form shown in Fig. 4 they may be of other forms that will serve the purpose equally as well. In Fig. 3 we have shown one of such forms. Here the bars P instead of extending from side to side of the frame *o* extend from the four sides inward toward the center, with an opening at the center, as shown clearly in said Fig. 3. There is space between each two adjacent bars for the passage of the water, which latter in passing through the compartment is brought into contact with the zinc, as well as in contact with the copper plate which rests thereon, the same as in the other form seen in Figs. 1 and 2.

In lieu of the forms of plates shown in Figs. 1, 2, and 3 we propose to sometimes employ such, for instance, as is seen in Fig. 5, wherein the frame Q is provided with a number of copper rods R, upon which are strung to revolve the zinc bodies S, provided with the blades or wings T of like material which may assume any desired shape, in this instance being illustrated as somewhat curved, so that the water in flowing through the compartments will act upon these wings or blades and rotate the bodies and agitate the water, which has been found to produce more satisfactory results. These bodies are elongated in the direction of the length of their axis upon which they rotate, so that the wings or blades cannot come in contact with each other.

Describing the operation and action of the device without the battery shown in Fig. 1, the water enters the inlet-pipe with considerable force and passes through the several compartments, up one, down the other, and so on successively, and flows out through the outlet-pipe into the boiler. In the form shown in Fig. 1 this passage is through the pipes I, J, and K, while in the form illustrated in Fig. 2 it is through the openings in the partitions. In passing through the several compartments as described the water comes in contact with the positive and negative plates or bodies and a change takes place in the character of the water which we are unable to satisfactorily explain by formulæ, but which we know from experience and tests to be of such a nature as to dissolve the scale from the boiler after passing through the same for a time and prevents new incrustation from taking place.

Modifications in the details of construction, form, and size of the plates and shape of the casing may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages. For instance, in the form shown in Fig. 5 the rods might be made of a material to constitute the positive element and the bodies to form the negative element and rotatable upon the rods.

What is claimed as new is—

1. A scale-dissolving device consisting of a vessel having a plurality of compartments, a communication between the compartments, a plurality of frames in each compartment embodying a positive plate, a plurality of negative plates supported upon the positive plates and within said frames, a wire connecting the plates of each compartment with those of the next, an inlet at one end and an outlet at the other, substantially as specified.

2. A device of the character described, consisting of a vessel having a plurality of compartments, a series of negative and positive elements in each compartment, partitions between the compartments provided at alternately-opposite ends with openings, a wire

connecting the plates of each compartment with those of the next through said openings, an inlet at one end and an outlet at the other, substantially as and for the purpose specified.

3. An element for a device of the character described, the same comprising a fixed support and a rotatable body mounted axially upon said support and having a portion adapted to be acted upon and rotated by the action of the water thereupon, as set forth.

4. An element for a device of the character described, consisting of a fixed support, and a body of zinc loosely mounted upon said support which passes entirely therethrough and having projecting portions whereby the action of the water will rotate said body, as and for the purpose specified.

5. An element for a device of the character described, consisting of a fixed support, and a plurality of bodies sleeved loosely thereupon and having projecting portions whereby said bodies are adapted to be revolved by the action of the water thereagainst, as set forth.

6. The combination with a frame, of a plurality of copper rods supported therein, and a plurality of independent zinc bodies loosely sleeved upon each of said rods, substantially as and for the purpose specified.

7. An element for a device of the character described, the same consisting of a frame, copper rods supported therein, and zinc bodies rotatably mounted on said rods and provided with wings, substantially as and for the purpose specified.

8. A device for the purposes specified, consisting of a vessel with a rubber lining, and divided into a plurality of compartments, a plurality of positive and negative elements one of which is rotatably mounted upon the other in each of said compartments, an inlet and an outlet pipe and means for causing the water to flow in a circuitous path from one end of the vessel to the other, alternately in opposite directions, substantially as specified.

9. A device of the character described, consisting of a rubber-lined vessel divided into a series of compartments provided with a rubber lining, a series of positive and negative elements one of which is rotatably mounted upon the other in each compartment, a connection between the elements of each two adjacent compartments, an inlet at one end, an outlet at the other, and means for causing the water to flow in a circuitous and alternately-opposite passage through the device, as set forth.

10. An element for the purposes specified, comprising a rod of copper and a zinc body through which said rod passes, the zinc body having portions projecting beyond its surface, of like material, and adapted to be acted upon by the water to rotate the said body, as set forth.

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

HENRY C. DAVIS.
HENRY STRASBURGER.

Witnesses:
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ADOLPH G. WOLF.