No. 728,440. PATENTED MAY 19, 1903.

P. J. BOUCHER.

PURIFYING APPARATUS.

APPLICATION FILED OCT. 16, 1902.

NO MODEL.

Fig. 1.

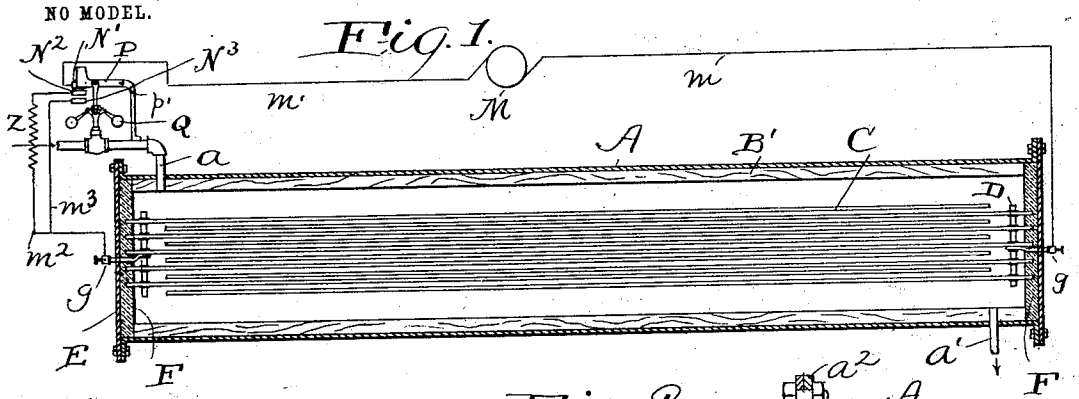
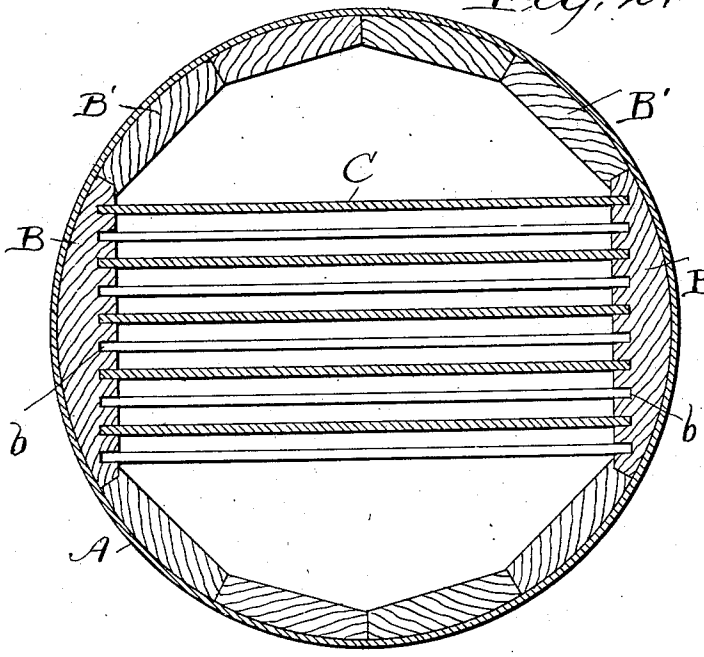


Fig. 2.



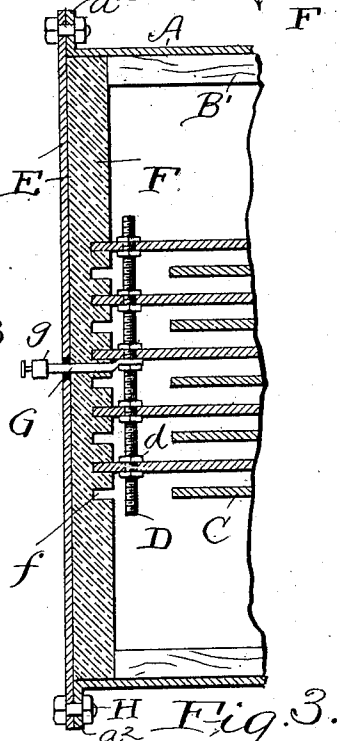


Fig. 3.

Fig. 4.

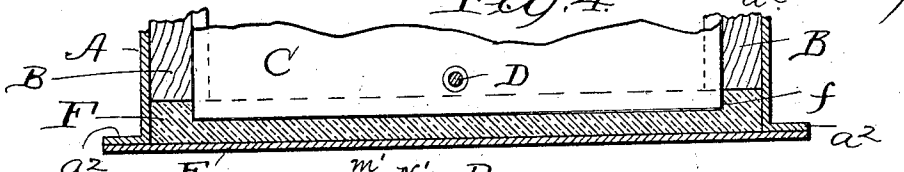
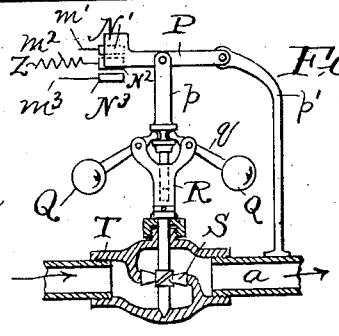


Fig. 5.



Witnesses.
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By his Attorneys,
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 728,440. Patented May 19, 1903.

UNITED STATES PATENT OFFICE.

PIERRE J. BOUCHER, OF CLEVELAND, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE STANDARD WATER PURIFYING COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF WEST VIRGINIA.

PURIFYING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 728,440, dated May 19, 1903.

Application filed October 16, 1902. Serial No. 127,483. (No model.)

To all whom it may concern:

Be it known that I, PIERRE J. BOUCHER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Purifying Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide an apparatus for use in the purification of water or other liquid by electrolysis which shall be very simple and cheap in construction, durable and efficient in service, and easily separable for purposes of cleaning.

One of the great difficulties heretofore attendant upon purification of liquids by electrolysis has been the inconvenience of cleaning the electrodes when rendered ineffective by being enveloped by gas-bubbles or by the deposition or collection of substances upon them.

To prevent the waste of current and unnecessary deterioration of the parts, I have provided an automatic switch adapted to open the electric circuit whenever the supply of liquid ceases and regulate the electric current according to the flow of liquid. This is also one of the features of the present invention.

My invention may be conveniently summarized as consisting of the combination of parts to the above ends or some of them, as hereinafter more fully explained and as clearly set out in the claims.

The drawings clearly disclose my invention, Figure 1 being a vertical central section through the tank in which my apparatus is embodied and showing diagrammatically the arrangement of the electric circuit. Fig. 2 is an enlarged transverse section of such tank. Fig. 3 is a vertical section of the same near one end. Fig. 4 is a plan near the end, and Fig. 5 is a view in sectional elevation of the automatic switch.

Referring to the construction shown in the drawings by letters, A represents a metal pipe or tank, preferably a piece of steam-piping. This is lined with wood arranged with two longitudinal slabs B and intermediate staves B′, these parts having radial meeting edges and being shoved endwise into the pipe, and thus holding themselves in place. The slabs B have grooves *b* extending along them longitudinally, which grooves are occupied by metal plates C, of aluminium or other suitable material, which constitute the terminals of the electric circuit. The liquid to be purified—as water, for example—enters the tank through the pipe *a* and leaves it through the pipe *a*′, becoming purified in the passage by the electrolysis of the anode aluminium plate which forms a flocculent insoluble aluminium compound operating to coagulate the impurities suspended in the liquid and cause their deposit. As the plates C extend across the tank, the liquid must circulate longitudinally back and forth over them from the upper end of the tank to the lower, and in this travel the coagulated impurities become deposited on the plates, so that the removal and cleaning of the plates allow the entire removal of the foreign substances in the liquid. Thus my apparatus may be simply connected in a pipe of water under pressure, the impure water entering the tank and the pure water leaving it, and all that is necessary to do is to remove the plates with the impurities on them at periodic times according to the impurity in the water. By using one or more of my tanks alternately the operation may be continuous. For the convenient accomplishment of the removal of the plates for cleaning I have devised the following arrangement of apparatus: Alternate members of the plate C overlap the others at either end of the tank, and these overlapped portions are secured together at each end by bus-bars D, these bars being threaded throughout and having nuts *d* on opposite sides of the plates which serve to clamp them.

E represents a blind metal head for the tank, secured by bolts H to a flange a^2 on the tank-body. On the inner side of this blind head is an insulating-head F, made preferably of slate. This insulating-head fits within the metal body of the tank and abuts against the

wood lining. It has grooves *f* for the reception of the ends of the plates C and an opening through which passes a conductor G, connected at its inner end with the bus-bar and carrying at its outer end a binding-post *g*. This construction is duplicated at the other end of the tank. Now when it is desired to clean the plates it is only necessary to remove the binding posts *g* and the bolts H, which hold the blind head to the tank, and then take out the slate head and draw out half of the plates. The other half may be similarly removed from the other end. The wood lining and the slate head effectually insulate the interior of the tank from the outside and prevent on the one hand any contamination of the liquid and on the other any electrolyzing of the metal tank. It is to be observed that by extending the plates alternately to one head and the other the maximum travel is given to the liquid, while preserving the minimum space occupied. The liquid traveling back and forth over the long plates has ample time to deposit its impurities. In order to automatically regulate the current to the electrodes according to the flow of the liquid, I provide in the supply-pipe *a* a water-motor which operates a speed-governor which controls an electric switch. This is shown in Figs. 1 and 5. In Fig. 1, M represents a dynamo supplying the current. From this dynamo the conductor *m* leads to one of the binding-posts *g* and the other conductor *m'* to a contact-point N'. From the adjacent contact-point N^2 a conductor m^2 leads through the resistance *z* to the other binding-post *g*, while from a third contact-point N^3 the conductor m^3 leads directly to said binding-post. Therefore if the two contact-points N' and N^2 are bridged the circuit from one set of electrodes to the other through the dynamo is completed through the resistance R. If all three points are bridged, the resistance is cut out. If none are bridged, the circuit is broken. The one resistance-coil and corresponding contact-point shown are to be taken as illustrative of any convenient number. P represents a lever adapted to bridge these contact-points. This lever is shown as pivoted to a standard *p'* and operated by a link *p*, which is raised or lowered by the levers *q*, which carry centrifugal balls Q, these levers *q* being pivoted in a rotatable yoke R, which is adapted to be revolved by the diagonal blades S, journaled within the water-motor casing T and rigid with the shaft of the yoke. Thus when the water is flowing the rotation of the wheel S causes the centrifugal balls Q to fly out, moving downward the lever P to bridge first the contact-points N' and N^2 and close the circuit through the resistance and then as the flow increases to bridge the points N', N^2, and N^3 and cut out the resistance. If for any reason the liquid ceases to flow, the motor-wheel ceases revolving, the balls Q drop, the lever P is moved upward thereby, and the circuit is broken at the contact-points.

Having described my invention, I claim—

1. In a purifying apparatus, the combination of a tank having on opposite sides of its interior insulating substance forming a permanent portion of the tank in which are formed grooves, metal plates removably occupying said grooves, removable heads at opposite ends of said tanks whereby the plates may be slid out when the heads are removed, and means for conducting the electric current to said metal plates.

2. In a purifying apparatus, the combination of a pipe having on opposite sides of its interior insulating-pieces constituting a permanent portion of the pipe and having formed in them grooves, metal plates occupying said grooves, the insulating-pieces making a substantially tight connection with the edges of the plates so that the liquid to be purified cannot escape around those edges, means for holding said insulating-pieces in place in the pipe, removable heads on opposite ends of the pipe, and means for conducting an electric current to the plates.

3. In a purifying apparatus, in combination, a metal cylinder, an insulating-lining therefor made of staves and provided with grooves, plates removably held by said lining in said grooves, removable heads at opposite ends of the cylinder, whereby the plates as a whole may be withdrawn, and means for conducting electricity to said plates.

4. In a purifying apparatus, the combination of a casing, a series of plates removably held therein, alternate members of said plates overlapping the others at opposite ends, bars connecting said overlapped ends of the plate, and removable heads at the two ends of the casing, whereby each set of plates may be drawn out of the casing through the corresponding end.

5. In a purifying apparatus, the combination of a casing, a series of plates removably held therein, alternate members of said plates overlapping the others at opposite ends, bars connecting said overlapped ends of the plates, an inner head having grooves for the reception of the ends of said plates, and an outer head secured to the tank, substantially as described.

6. In a purifying apparatus, the combination of a metal pipe, a lining of wooden staves therefor, opposite sides of said lining being grooved, metal plates occupying said grooves, alternate members of said plates overlapping the rest at their ends, bars connecting said alternate ends together, a pair of removable heads for said pipe at the ends thereof within the body of the pipe and abutting against the lining, and blind heads outside of the removable heads and removably secured to the pipe, substantially as described.

7. A purifying apparatus comprising a wa-

ter-tank and electrodes therein, combined with a speed-governor operated by the flow of water through the tank, an electric switch governed by said motor, electric connections to said electrodes, and resistance which said switch is adapted to cut out as the speed increases, substantially as described.

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

PIERRE J. BOUCHER.

Witnesses:
ALBERT H. BATES,
H. M. WISE.