No. 767,964. PATENTED AUG. 16, 1904.

W. J. SCHWEITZER.

ELECTROLYTIC APPARATUS.

APPLICATION FILED JULY 31, 1903.

NO MODEL.

Fig. 1.

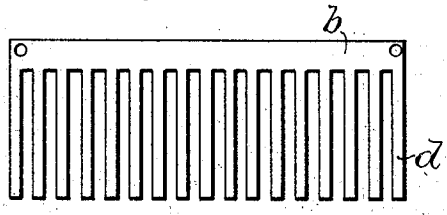


Fig. 2.

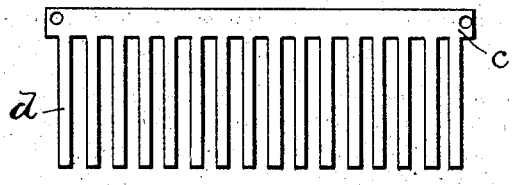
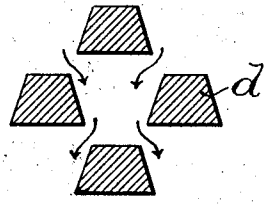


Fig. 3.



WITNESSES:

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No. 767,964. Patented August 16, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM J. SCHWEITZER, OF WHITEPLAINS, NEW YORK.

ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 767,964, dated August 16, 1904.

Application filed July 31, 1903. Serial No. 167,695. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM J. SCHWEITZER, a citizen of the United States, residing at Whiteplains, Westchester county, State of New York, have invented certain new and useful Improvements in Electrolytic Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electrolytic apparatus applicable to the sterilization and purification of water and other fluids, and particularly those containing organic matter, such as sewage, for the purpose of oxidizing and precipitating the organic constituent and rendering it and the liquid constituent inodorous and innocuous.

To these ends my invention consists of certain novel features in such an apparatus and in their combination and arrangement to effect the purposes stated, as will be fully described hereinafter, and particularly pointed out in the claims.

In the drawings illustrating my invention, Figure 1 is a side elevation of one of the end electrodes embodying a unit element of my invention, these being arranged transversely in the electrolyzing-chamber. Fig. 2 is a side elevation of one of the intermediate electrodes; and Fig. 3 is a partial sectional plan view taken through the electrolyzing-chamber, showing the shape of the teeth of the combs of the electrodes and showing also the arrangement of said teeth for the circulation of the liquid.

The fundamental principles of construction involved in the electrode element of my invention are, first, its construction in the form of a comb—that is to say, with a series of prongs extending from a common connecting and electrically-integral cross-bar—and, second, shaping these teeth as to longitudinal outline in such manner as to provide in cross-section a series of faces terminating in angular edges between the adjacent faces.

My invention further comprises arranging these angular-edged teeth of my comb electrodes in staggered relation, so as to provide tortuous passages for the flow of the liquid to be purified without appreciably retarding its flow, and finally for electrolysis of semiliquids, such as sewage, I have devised a special form of this angular-edged tooth—namely, as a trapezoid in cross-section—in order while thus providing increased contact-surface I am enabled to make a specially effective arrangement of the electrodes—namely, with the narrow faces of the trapezoidal comb-teeth facing in the direction from which the liquid to be treated is flowing.

In the construction of the electrolyzer the electrode-plates *b* and *c* are as illustrated in detail in Figs. 1 and 2. These plates are shown as rectangular in planular outline and constructed somewhat like a comb—that is to say, having a series of prongs or teeth extending from a common cross-bar with which they are electrically integral—and the teeth are shaped in longitudinal contour with a plurality of faces, which thus provide sharply-defined angular edges between the adjacent faces. In the drawings these teeth are shown as trapezoidal in cross-section, which is a form of angular-edged electrode-teeth especially desirable for electrolysis of sewage, as hereinafter explained, but not necessarily so for purification of water and other absolute liquids. Practice has shown that a flat plate electrode gives contact practically only at the edges of the plate, which is proven by the fact that plates when taken from the electrolyte in which they have been used are seen to be worn away mostly at the edges and but slightly at the center. Hence I make my electrode not only in comb-like form to give a series of teeth instead of a single plate, but I subdivide each tooth into a number of electrodes by giving it a plurality of contact-faces with angular connecting edges between the adjacent faces. Hence the comparatively large "contact-surface" of my electrode enables it to do the work of several ordinary flat or corrugated electrodes, and hence by using the same number of mine as would ordinarily be required of the latter kind the required work can be done in a much shorter time. In the preferred form of angular-edged teeth, especially for semiliquids containing much organic matter, I make the teeth *d* of trape-

zoidal form in cross-section and arrange these with the shorter sides facing in the direction from which the liquid is flowing, and I have found that for such purpose this form and this arrangement of the electrode in the electrolyzing-chamber gives very large "contact" and produces most excellent results, as well as avoiding any perceptible retarding of the flow of semiliquid acted on. In arranging these positive and negative electrodes in series in the electrolyzer the outside plates *b* are each to be provided with one more tooth than are the intermediate plates *c*, so that when so arranged in series the teeth of one plate will be staggered relatively to the teeth of the contiguous plate, as represented in sectional plan view in Fig. 3, the function and result of this construction and arrangement being that a greatly-increased contact-surface is presented to the liquid, which has a tortuous path to follow between the teeth of the plates, without appreciably retarding the passage of the liquid through the chamber, and these are the functions which my new electrode is designed to accomplish in the electrolysis of liquids and semiliquids, a function and result due primarily to the comb-like form of the electrode with a plurality of angular-edged contact-faces increased by arranging these electrodes in staggered series and still further increased by making the angular-edged teeth of trapezoidal form and so arranging them in series with the narrower faces of the teeth facing in the direction from which the liquid is flowing through the chamber. In connecting the electrodes to the source of electrical supply the connections should be made by means of switches which will permit the cutting out of any one individual electrode or series of electrodes, as desired.

The electrodes are preferably made of soft cast-iron, galvanized or otherwise plated. Plain cast-iron or any other metal or combination of metals the oxid of which has color other than white or gray should not be used, as the electrochemical action with the aforesaid plain iron or metals with color oxid neutralizes the effect of the generated chlorin gas, if not entirely, to a large extent. This effect is produced especially by the use of plain cast-iron electrodes, same giving the reaction in the effluent similar to chlorid of iron. With plain copper electrodes the deodorizing effect of chlorin gas is retained; but the reaction in the effluent is similar to that of cupric hydrate, $Cu(HO)_2$, light blue, and in the effluent where a large percentage of ammonia is present the blue solution of ammonia salt of copper is experienced. In either of the aforesaid instances or where electrodes with metals which give a colored oxid are used the color imparted to the effluent make it extremely difficult to obtain a clarified effluent.

My experience has taught me that sewage is generally sufficiently saline to contain sodium chlorid in quantity sufficient to produce when treated electrically enough chlorin gas to disinfect the mass; but if in any given case a deficiency may be suggested it may be supplied by adding common salt in the electrolyzing-chamber, in which case the amperage will be increased to about five and one-half amperes per gallon with the same electrodes, this being the commonly-required amperage; but of course it varies according to the amount of chlorin-producing elements contained in the liquid to be treated. Hence with a given-sized electrode the greater amount of chlorin-producing elements present the larger will be the amount of current drawn from the generator and passed through the electrolyzer. I have found in my tests of the apparatus that ordinary sewage containing the average amount of saline property can be successfully treated with a current of five volts, drawing from the generator an amperage of three amperes per gallon in the electrolyzer, the filtered effluent resulting containing no noticeable saline taste.

Although I have described hereinabove the broad invention exemplified in an electrode which is comb-like in structural outline, the prongs or teeth thereof having a plurality of faces terminating in angular edges between the adjacent faces, for electrolysis of absolute and semi liquids, I have not claimed the same herein, as it forms the subject-matter of another and pending application, Serial No. 186,475, filed by me December 24, 1903, for Letters Patent therefor.

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

1. An electrolyzing apparatus, comprising positive and negative comb-like electrodes, alternately arranged in series, the teeth of said alternating combs in the series being relatively staggered, thereby affording tortuous passages for the material to be electrolyzed without appreciably retarding the flow thereof; substantially as set forth.

2. An electrolyzing apparatus, comprising positive and negative comb-like electrodes having teeth formed like truncated pyramids in lateral cross-section, said electrodes being arranged alternately in series and with the narrower faces of the teeth in the direction from which the material flows; substantially as set forth.

In testimony whereof I have hereunto affixed my signature this 28th day of July, A. D. 1903.

WILLIAM J. SCHWEITZER.

Witnesses:

A. M. BIDDLE,

J. IRVING COHN.