J. L. GOUCHER.

APPARATUS FOR ELECTROLYTIC PURIFICATION OF LIQUIDS.

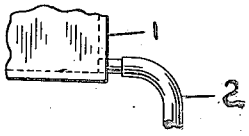
APPLICATION FILED MAR. 10, 1909.

1,145,862.

Patented July 6, 1915.

5 SHEETS—SHEET 1.

Fig. 1



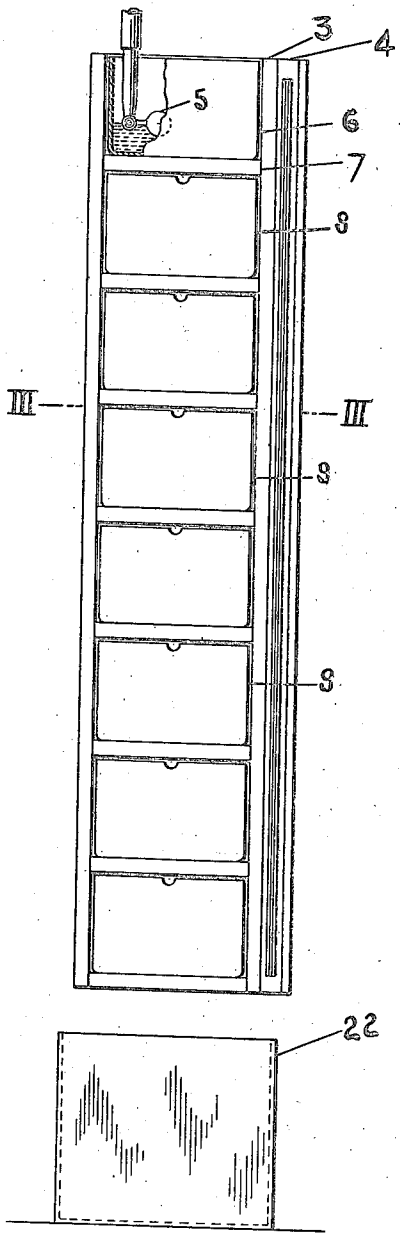
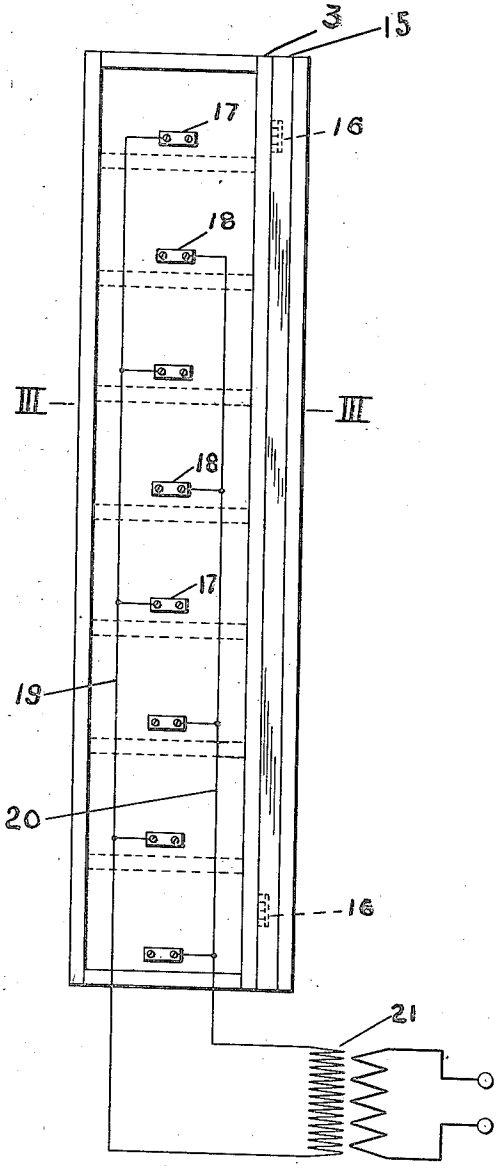


Fig. 2



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5 SHEETS—SHEET 2.

Fig. 3

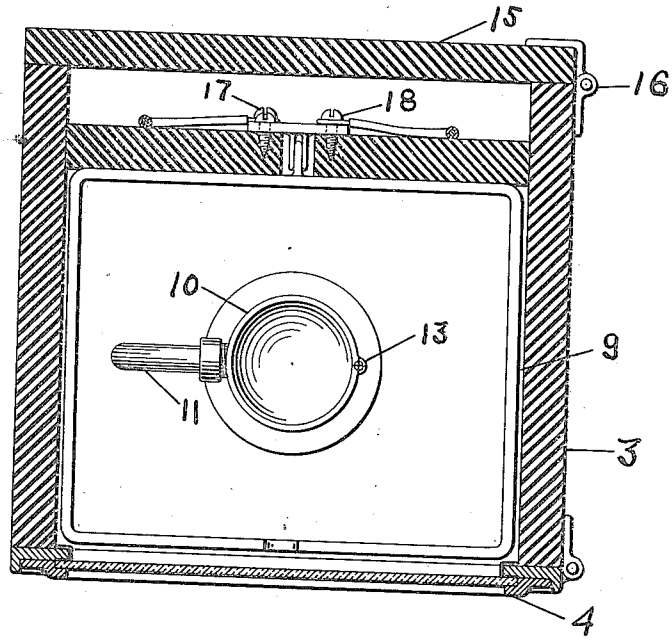


Fig. 4

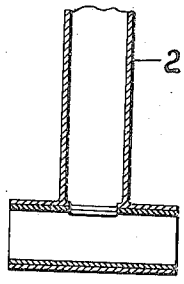
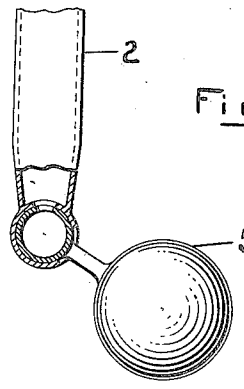


Fig. 5



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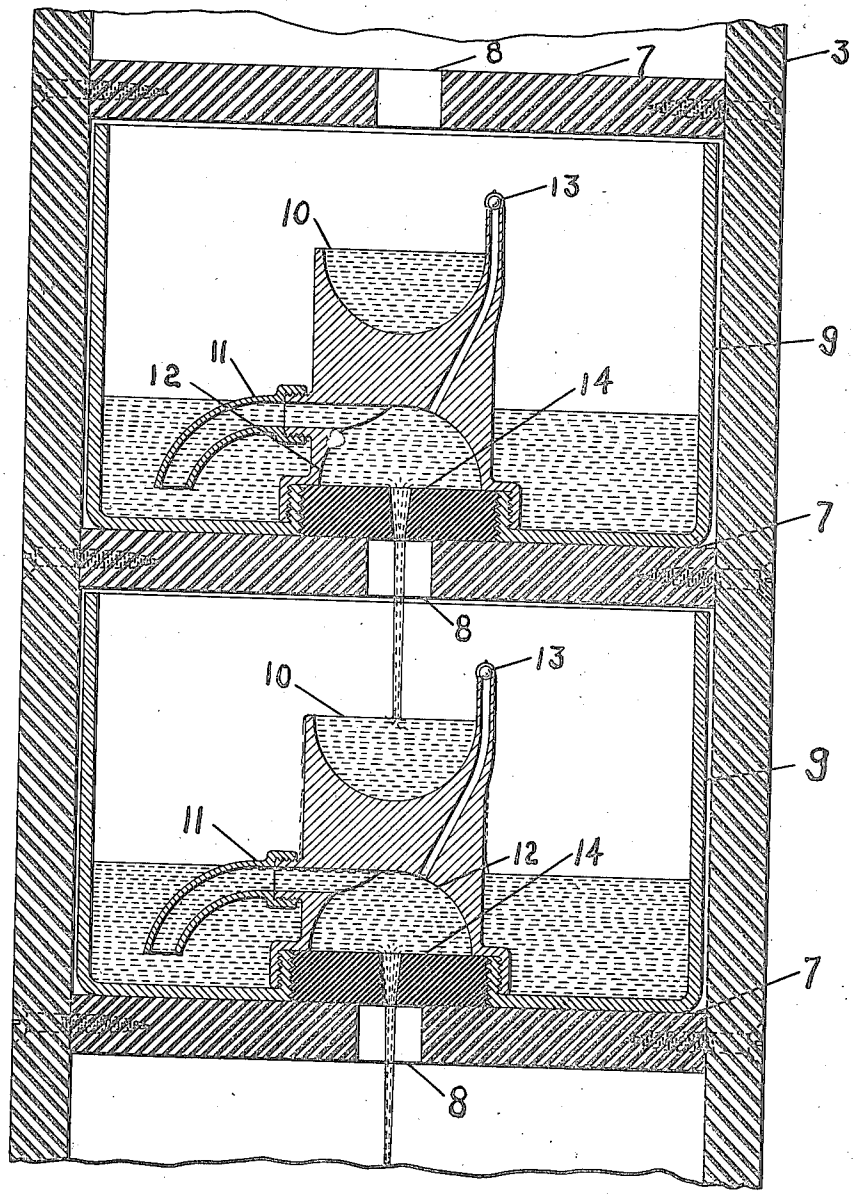
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5 SHEETS—SHEET 3.

Fig. 6



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APPARATUS FOR ELECTROLYTIC PURIFICATION OF LIQUIDS.

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5 SHEETS—SHEET 4

Fig. 7

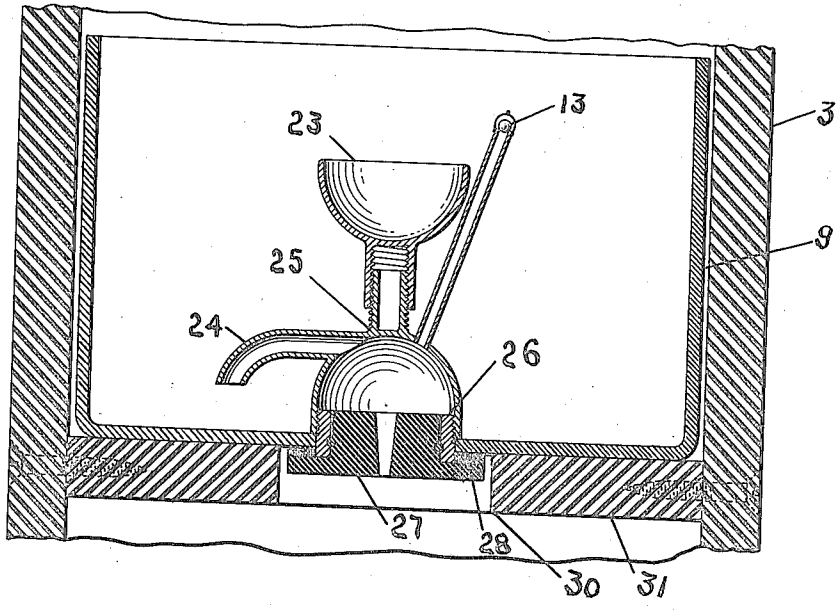


Fig. 8

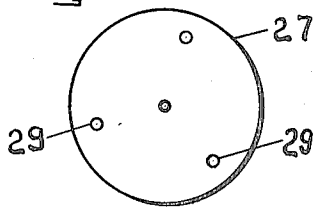
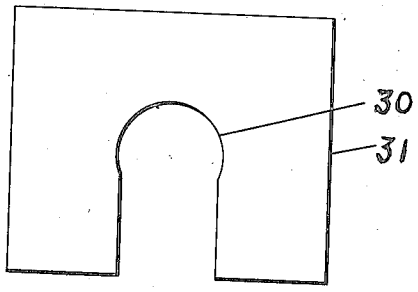


Fig. 9



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Patented July 6, 1915.

5 SHEETS—SHEET 5.

Fig. 10

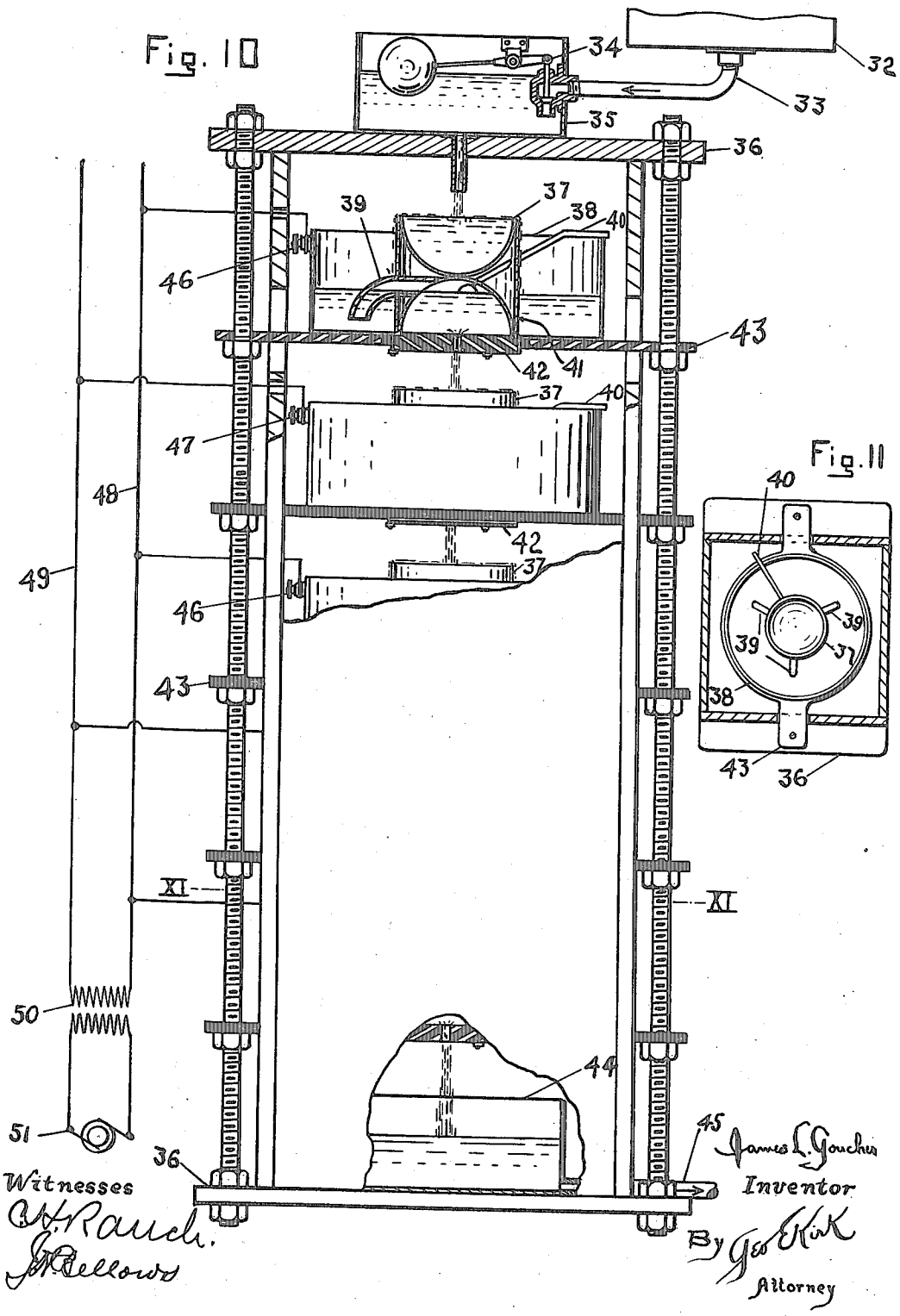


Fig. 11

Witnesses

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UNITED STATES PATENT OFFICE.

JAMES L. GOUCHER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NEW YORK CONVEYANCERS COMPANY, A CORPORATION OF NEW YORK.

APPARATUS FOR ELECTROLYTIC PURIFICATION OF LIQUIDS.

1,145,862. Specification of Letters Patent. Patented July 6, 1915.

Application filed March 10, 1909. Serial No. 482,539.

To all whom it may concern:

Be it known that I, JAMES L. GOUCHER, a citizen of the United States, residing at New York, New York county, New York, have invented new and useful Apparatus for Electrolytic Purification of Liquids, of which the following is a specification.

This invention relates to the handling of a substance to be treated, and more especially to combining electrical and mechanical action in treating the substance.

This invention has utility when embodied for the treatment of food, as milk, which it purifies, sterilizes and generally improves all the qualities thereof, particularly making more digestible, more uniform, and of seemingly finer texture or grain.

Referring to the drawings: Figure 1 is an elevation, with parts broken away, of an embodiment of apparatus involving the invention in a milk treating mechanism, the door to the structure being open; Fig. 2 is an elevation of the opposite side of the structure from the showing of Fig. 1, with the door thereto also open; Fig. 3 is an enlarged section view on line III—III of Figs. 1 and 2; Fig. 4 is an enlarged detail in section of the valve controlling the current flow or mechanical feature of the invention; Fig. 5 is another view of the valve partly in section at right angles to showing in Fig. 4 and also showing float; Fig. 6 is an enlarged medial vertical section, with parts broken away of the structure of Figs. 1, 2 and 3; Fig. 7 is a medial vertical section of a form of electrode in itself adjustable, the view being similar to that of Fig. 6; Fig. 8 is a bottom plan view of insulator closing the lower portion of the electrode of Fig. 7; Fig. 9 is a plan view of shelf of Fig. 7, on a reduced scale; Fig. 10 is an elevation with parts broken away of a milk treating mechanism in which the varying of the distance between electrodes is brought about by adjusting the shelves; and Fig. 11 is a section in reduced scale on the line XI—XI of Fig. 10.

The substance to be treated, herein being disclosed as milk, is conducted from the storage tank 1 through line 2 to the treating mechanism 3, having the door 4, shown in Fig. 1 as open. The rate of flow of the milk from pipe line 2 into the mechanism is controlled by float valve 5, which serves to keep the liquid in the mechanism always under a constant head, thereby insuring a uniform rate of flow. The reservoir 6 into which the milk is discharged from valve 5, is located on one of the shelves 7 of the mechanism. These shelves 7 have openings 8 therein permitting flow of the milk from the bottom openings in reservoirs 9 successively.

In each reservoir 9 is an upwardly facing bowl, zone walled, doubly curved walled, or concave receptacle 10 into which the milk falls from reservoir 6 or 9, and overflowing into the reservoir proper it is conducted through spout 11 into oppositely directed bowl or concave receptacle 12, the ball valve controlled vent 13 permitting initial filling thereof, while the spout 11 may operate as a siphon in emptying vessel or reservoir 9, as the milk passes through the perforation in the insulator 14. The insulator closes the lower side of the receptacle 12, while the opening therethrough is equally spaced from the concave walls of the receptacle. This opening or perforation registers with the opening 8 in the insulating shelf 7.

The opposite side of the mechanism 3 from that having the door 4, is equipped with a door 15 inclosing the electric terminals. This door is mounted on mechanism housing by the hinges 16. The reservoirs 9 together with the hemispherical receptacles therein serve as electrodes, one vessel being equipped with electrical terminal 17, the next with terminal 18, the following with 17, etc., the terminals 17 being connected to main 19 and the terminals 18 to main 20 of opposite sides of an alternating current circuit, shown as stepped to suit the conditions by transformer 21. The treated product, after passing through the treating mechanism 3 is discharged into tank 22.

The liquid leaving vessel 12 departs at a point approximately equi-distant from all the electrically charged walls thereof, and similarly, the liquid arrives in vessel 10 at a point approximately equi-distant from the electrically charged walls thereof, and as these succeeding receptacles are connected to opposite sides of an electric circuit, the liquid in serving as a conductor from 12 to 10 closes the circuit therebetween. An important feature in this connection is to have the electric carrying capacity of the liquid high and still not create localization at ter-

minals or where the liquid becomes a conductor. The configuration of the device of the disclosure accomplishes this end by diffusing the electric current over the bowl-shaped electrode to charge the stream, which mechanical current or stream is subsequently congested or restricted by perforate insulator, to at this point bring about maximum electrical carrying capacity of mechanical liquid stream, which as shown is at the point of maximum stream flow rate. On striking vessel 10 centrally, there is here also avoided any electrical localization which might tend to decompose the substance treated or objectionably coat the terminals, for there is the same diffusing of the current to the hemispherical equi-distant walls of the receptacle. By so handling, the electric current converges toward and diverges from the hemispherical faces of the electrodes, there is no excessive electrical heating of the substance treated and still electrical density sufficient to treat is produced.

To adjust the treating, the mechanical flow or electrical current may be varied, or the number of intervals of the electric current action changed by disconnecting one or more of the series of electrodes. Again, adjustment may be brought about by changing the distance apart of the electrodes, so that length of maximum electrically charged stream may be shortened or lengthened. In Fig. 7 this change of stream length is brought about by the adjustable electrode. Liquid overflowing from bowl 23 into reservoir 9 is drawn off through siphon spout 24, of bowl 25. The bowl 23 has a screw thread connection with the bowl 25. The bowl 25 forms a common electrode with the reservoir 9. The collar 26 fast with insulator 27 seals the receptacle 25, the collar 26 being screw threaded while the insulator 27 is shouldered to permit use of gasket 28. These elements are thus firmly locked in assembled relation. That there may be ready rotation of insulator 27, recesses 29 are provided therein. Opening 30 in shelf 31 allows of placing the assembled electrode and reservoir in position, the shelf and structure proper also being of insulating material. In general assemblage, Fig. 10 shows this adjustment of the electrodes relatively to each other by varying the positions of the reservoir carrying shelves. From the supply tank 32, the liquid passes through pipe line 33 through float valve 34 into tank 35 mounted on the treating mechanism structure 36. The constant volume stream, because under constant head, flowing from tank 35 falls into concave receptacle 37 from which it overflows into reservoir 38, thence through the three spouts 39 into receptacle 41 having the vent 40, and then out through perforate electrode 42 into bowl shaped electrode 37, then passing into oppositely directed bowl shaped electrode 41 as the successive stages of the treatment occur.

The maximum electrically charged and maximum velocity portion of the stream is that from the inverted bowl through the perforated insulator to the upright bowl. The larger cross-section of the stream in the bowls is the region of minimized stream velocity as well as minimized electrical action and here occurs a general mixing or commingling of the general mass of the substance to insure a uniform treatment. The reservoirs into which the bowls overflow render increasingly effective the mixing action and serve thus to add their larger capacity to the eddies in the reservoirs of the bowls.

In the disclosures herein there is provision for carrying on as a continuous process a most sure treatment. There is flexibility as to regulation and adjustment to meet varying conditions of material for operation desired or found most expedient. By inclosing the structures, contamination of the substance treated by the surrounding air is avoided. Further the liquid is not accessible to operators or attendants, nor are the electrically charged portions exposed to permit of any danger from accidental handling.

What is claimed and it is desired to secure by Letters Patent is:

1. A device for electrolytic treatment of liquids embodying a plurality of opposing vessel shaped electrodes arranged to form a series of space intervals in the successive treatment of a liquid, there being passages between the electrodes through which the liquid may successively act to complete circuits with the electrodes in passing the space intervals, and means for varying the space intervals of treatment.

2. A device for electrolytic treatment of liquid embodying a series of perforate insulators, and vessel shaped electrodes having faces electrically conducting, said faces being disposed toward and concentric with said insulators to form treating space intervals from electrode to electrode through an insulator perforation intermediate the electrodes to permit treatment of the liquid by closing the circuit in the space intervals successively.

3. A treating mechanism for a continuous stream of substance to be treated, said mechanism comprising an insulator having an opening therethrough affording a passage determining the cross section of the stream of the substance treated, and an electrode forming a vessel facing the entrance to the opening, uniformly distant therefrom throughout its extent and disposed to be contacted by the substance treated.

4. A treating mechanism comprising an insulator having an opening therethrough for the substance to be treated, and an elec-

trode having a continuous contact face uniformly distant from and facing toward the opening and with which face the substance may complete the circuit.

5. A treating mechanism for a continuous stream of substance to be treated, said mechanism comprising an insulator having an opening therethrough determining the cross section of the stream of the substance to be treated, and an electric circuit including a pair of electrodes, each having a concave face toward the opening in the insulator and with which faces the substance may contact to close the electric circuit through the opening and electrodes.

6. A treating mechanism comprising an insulator having an opening therethrough for the substance to be treated, and an electrode having a hemispherical face toward the opening whereby the substance may contact the electrode and convergingly travel into the opening.

7. A treating mechanism for a continuous stream of substance to be treated, said mechanism comprising an insulator having an opening therethrough determining the cross section of the stream of the substance to be treated, and a pair of electrodes, each provided with a uniformly conducting contact face for the substance, said faces forming a wall of a vessel throughout its extent uniformly distant from and opposing the opening entrance, whereby the substance between the opening and the faces may serve as conductor for radiating electrical current toward and from the opening.

8. A treating mechanism comprising a series of pairs of opposing concave electrodes, and means providing communication therebetween by passages of less cross sectional area than the electrodes for the substance treated, whereby the substance serving as conductor may close the circuit between successive pairs of electrodes.

9. A device for electrolytic treatment of liquid embodying a liquid stream conducting passage provided with an electrode having oppositely directed concave faces forming successively receiving and discharging portions of the passage for the liquid.

10. A mechanism comprising an insulator having a duct therethrough, and an electric circuit including an electrode having a horizontally curving face portion uniformly disposed toward the duct entrance to produce a uniformly conducting face in closing the electric circuit by the substance through the duct and electrode.

11. A mechanism comprising confining means, means for directing the fluid flow of the substance to be treated, and a pair of receptacles for the substance from one and into the other of which receptacles the substance may travel, said receptacles curving away from the directing means to form electrode faces of greater area than the cross secitonal area of the directing means through which the substance closes the circuit.

12. A treating mechanism comprising a succession of receptacles formed of doubly curved electrode faces, and insulation means providing a connecting passage between each pair of receptacles for permitting travel of the substance treated, each electrode having its face uniformly disposed relatively to a passage.

13. A device for electrolytic treatment of liquid comprising a passage having restricted portions, and electrodes in the passage having their active faces spaced from the restricted portions to supply electric current to the liquid, the density of which current in the liquid is increased through the restricted portions by the liquid closing the circuit between the electrodes on opposite sides of a restricted portion.

14. A device for continuously electrolytically treating liquid comprising relatively adjustable electrodes having doubly curved uniformly conducting faces successively discharging from one to another the liquid which thereby completes the circuit therebetween.

15. A treating mechanism comprising a perforate partition, and electrodes having uniformly active face areas each of greater extent than the cross section of the perforation, whereby the substance treated may pass through the partition and complete an electric circuit.

16. A continuous treating mechanism comprising an inclosed chamber through which the substance to be treated may travel, and relatively adjustable electrodes having spherically curved uniformly conducting faces to be contacted by the substance.

17. A device for electrolytic treatment of liquid embodying a receptacle having an inverted bowl shaped electrode face, a vent device permitting filling of said receptacle with the liquid, and a second electrode having a face exposed to the liquid to be treated, whereby the contacting of the electrode faces by the liquid may place the liquid in circuit.

18. A treating mechanism for liquid substances embodying a closed top receptacle having an opening therein permitting the filling of said receptacle with the substance, and a series of successive pairs of electrodes forming vessels in communication with said receptacle, said electrodes having doubly curved faces for contacting the substance.

19. In a treating mechanism for a substance, the combination of a series of electrodes, and insulation means providing a communicating passage between said electrodes permitting travel of the substance to

be treated, the faces of the electrodes each approximating the same distance throughout its extent from the adjacent passage in said means, there being a reservoir between each of said pair of electrode faces of greater cross sectional extent than said passage.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

JAMES L. GOUCHER.

Witnesses:
FRANK W. GOUCHER,
CHARLES H. KITCHEN.