

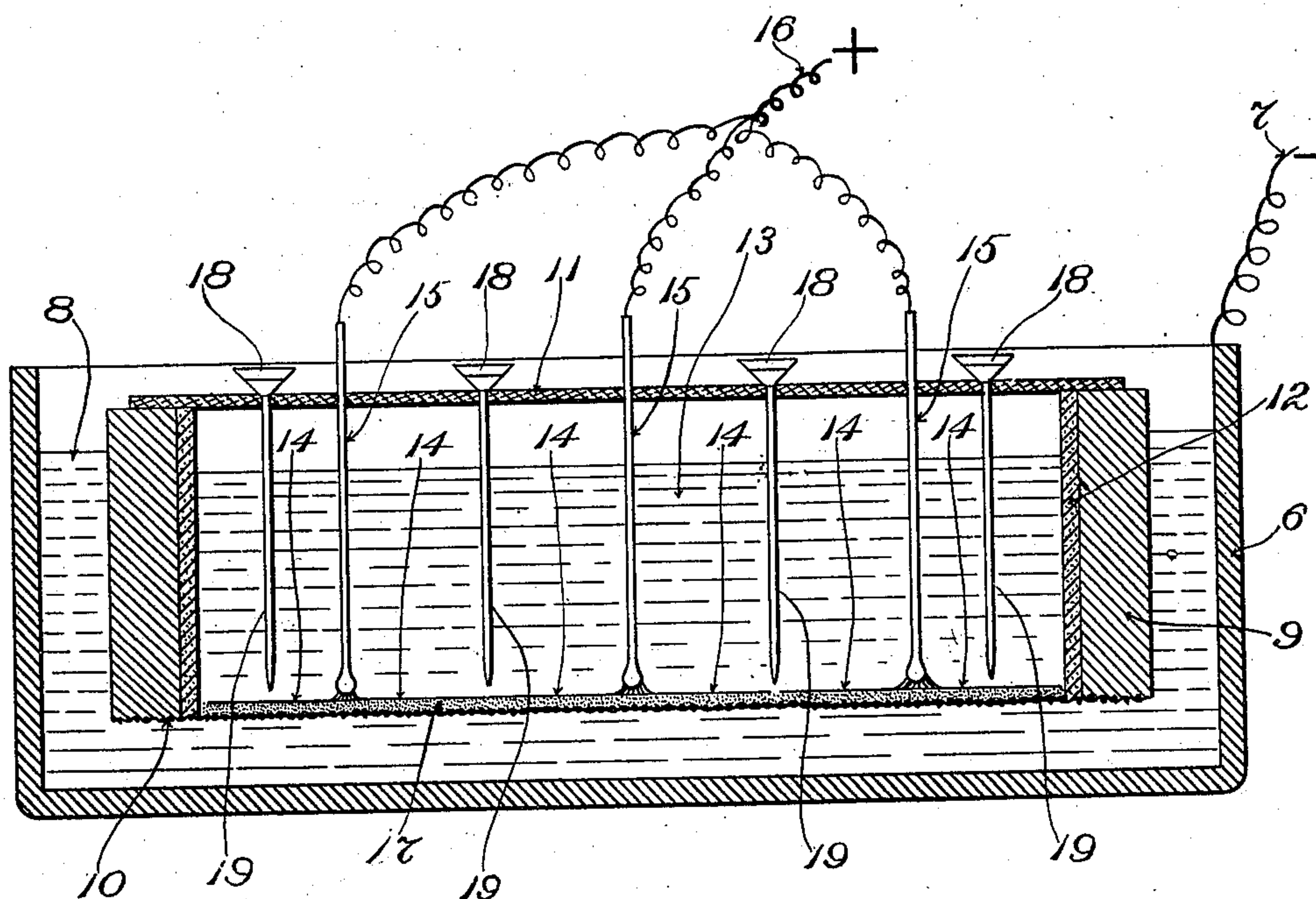
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E. A. LE SUEUR.
ELECTROLYTIC CELL.

(Application filed Mar. 8, 1898.)

(No Model.)



Witnesses:

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UNITED STATES PATENT OFFICE.

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ELECTROLYTIC CELL.

SPECIFICATION forming part of Letters Patent No. 692,531, dated February 4, 1902.

Application filed March 8, 1898. Serial No. 673,054. (No model.)

To all whom it may concern:

Be it known that I, ERNEST A. LE SUEUR, a
subject of the Queen of Great Britian, residing
at Rumford Falls, in the county of Oxford
and State of Maine, have invented certain
new and useful Improvements in Electrolytic
Cells, of which the following is a specification,
reference being had therein to the accompany-
ing drawing.

10 The drawing represents in vertical trans-
verse section a cell embodying my present in-
vention.

My invention consists in an electrolytic cell
or apparatus of improved character by means
15 of which the process of producing a solution
of the required alkaline hydrate may be car-
ried on more directly than heretofore and con-
tinuously. I have illustrated in the accom-
panying drawing a simple embodiment of the
20 invention and will now proceed to describe
the same.

A leading characteristic of my improved
cell or apparatus may be expressed by stating
that in the working thereof the alkaline metal
25 as it is set free by the electrolytic action is
absorbed by one side of a quantity of mer-
cury and is continuously separated from the
mercury at the other side of the latter, where-
by as fast as the alkaline metal enters the
30 mercury it is removed therefrom and con-
verted into the required hydrate. Thus 6
designates an external containing tank or ves-
sel, which preferably is formed of iron and
has the negative wire connected therewith,
35 as at 7. The said tank or vessel 6 is more or
less completely filled with water 8.

9 designates a frame consisting (conven-
iently) of wooden strips united to one another,
so as to form a rectangular frame of the re-
40 quired dimensions. 10 designates a sheet of
fine reticulated or foraminated metal—such,
for instance, as fine wire-gauze—which is ap-
plied to the opening at the lower side of the
said frame. 11 is a cover of slate which is
45 applied to the top of the said frame 9, and 12
is a lining of cement which is applied to the
inner surface of the frame 9 for the protec-
tion of the latter.

The frame 9 is partly immersed in the water
8, which is contained within the tank or con- 50
taining vessel 6, and in the said frame 9, above
the wire-gauze 10, is supposed to be contained
in the present instance a quantity of brine,
as 13. Within the compartment which is in-
closed by the frame 9 and its wire-gauze 10 55
is placed one or a series of anodes. The lat-
ter may be of any approved or suitable con-
struction. I have herein shown a series of so-
called "filamentary electrodes," each consist-
ing of a plurality of filaments, as 14 14, of 60
platinum or other suitable material, extend-
ing in different directions horizontally from
the lower end of a stem 15 of glass or other
suitable material.

16 is the positive wire, it being in connec- 65
tion with the filaments 14 14 of each of the
anodes, as by having a branch thereof passed
down within the interior of each of the stems
15 15 and electrically connected in suitable
manner with the filaments at the lower end 70
of such stem. Each of the said stems 15 15
is passed through a hole that is made there-
for in the cover 11.

17 is a layer of gravel or other material suit- 75
able for the purpose, which rests on the up-
per surface of the sheet of wire-gauze 10 and
serves to separate the filaments of the anodes
from the said gauze. The sheet of gauze 10
is shown herein as arranged in a horizontal
position between the contents of the anode- 80
compartment and the contents of the tank or
vessel 6 exterior to the frame 9. The said
sheet consists of a sheet of amalgamated
finely reticulated or foraminated metal—for
instance, a sheet of amalgamated wire-gauze— 85
that is to say, I apply to the sheet of wire-
gauze which I employ a small quantity of mer-
cury, the quantity being sufficient to serve by
its union with the gauze to close the meshes
of the latter. To prevent forcing of the mer- 90
cury out of the meshes of the gauze and con-
sequent flow of the contents of either com-
partment into the other, I maintain an equal
pressure in the two compartments. This may
be effected, for example, by properly propor- 95
tioning the height of the liquid contents of

each compartment. An inclined position of the sheet of wire-gauze 10 would cause the mercury to tend to gravitate toward the lowest portion of the said sheet. To obviate this tendency, I dispose the said sheet in a horizontal position, as above stated.

The finely reticulated or foraminated metal sheet 10 separates the brine above the same from the water below the same. The inner compartment practically comprises a complete cell within itself, and the decomposition of this brine takes place therein. The cathode thereof is in reality the upper surface of the amalgamated sheet. In the illustrated cell there is one anode at the filamentary electrode or electrodes, one cathode at the upper surface of the amalgamated sheet 10, a second anode at the under side of the said amalgamated sheet, and a second cathode at the surface of the metallic containing vessel—that is to say, there are, in effect, two cells dissimilar in character and functions connected in series, and the liberation of hydrogen and alkali occurs at the surface of the metallic containing-tank. In some cases I contemplate forming the outer containing vessel of electrically-inert material and connecting the negative wire directly to the sheet 10. In this case the cathode action will not take place at the tank-surface, and the hydrogen and alkali will appear at the under side of the amalgamated sheet. In either case the liberation will occur in the water of the outside compartment. It will be obvious that a sheet of metal perforated with numerous fine holes will be an equivalent of the gauze to which reference is made herein and may be substituted therefor. By placing the brine in the compartment above the sheet of iron gauze 10 I cause the chlorine to be evolved above the said sheet, so that there is no tendency of such gas to collect below the latter, and the objectionable sequences of such collection thereby are obviated. Suitable provisions will be made in practice for leading the chlorine away as fast as it is formed.

The working of my improved cell will be obvious—that is to say, as fast as the alkaline metal is set free by the electrolytic action in the anode-compartment above the sheet 10 it will become absorbed by the mercury which is amalgamated with the wire of which the said sheet is composed, while just as fast as it enters the mercury it will be removed therefrom by the water in contact with the under surface of the said sheet and by chemical union with the said water will be converted into the required hydrate. Should the salt to be electrolyzed not be perfectly pure, there will accumulate in the mercury in the gauze a quantity of impurities, which will rapidly cause the said mercury to lose its fluidity. Since the amount of mercury in the gauze is so extremely small, a very small accumulation, as mentioned, will suffice to spoil the proper action of the partition. With a

view to eliminating as far as possible the injurious consequences of such admixture with impurities I arrange a quantity of pure mercury in receptacles 18, from which it is allowed to drip through glass tubes 19, drawn down fine at their lower ends upon the gauze at a sufficient number of points to wash out the impurities constantly being deposited during the operation of the cell. As fast as the mercury is thus supplied to the top surface of the gauze impure mercury drips from the bottom of the latter and may be collected and purified in any suitable manner, as by distillation. In the particular form of the apparatus described in the present application the mercury is delivered upon the top of the layer of gravel and will then percolate through to the gauze beneath. It will be obvious that any other convenient method may be utilized of supplying fresh mercury to the amalgamated surface of the sheet of gauze with a view to maintaining it sufficiently free from impurities.

I claim as my invention—

1. An electrolytic cell for the decomposition of the salts of the alkaline metals, having an anode, a cathode consisting of an amalgamated reticulated or foraminated metallic sheet, one side of which receives the alkaline metal, said cell constructed to contain in contact with that side of said sheet the solution to be decomposed and also to hold in contact with the other side of said sheet a body of water into which the said metal is discharged, and having means of supplying fresh mercury to said sheet to maintain the mercury held thereby free from impurities, substantially as described.

2. An electrolytic cell for the decomposition of the salts of the alkaline metals, having an anode, a cathode consisting of amalgamated wire-gauze one side of which receives the alkaline metal, said cell constructed to contain in contact with that side of the said sheet the solution to be decomposed and also to hold in contact with the other side of said sheet a body of water into which the said metal is discharged, and having means of supplying fresh mercury to said sheet to maintain the mercury held thereby free from impurities, substantially as described.

3. An electrolytic cell for the decomposition of the salts of the alkaline metals, having an anode, a cathode consisting of a horizontal amalgamated reticulated or foraminated metallic sheet, one side of which receives the alkaline metal, said cell constructed to contain in contact with that side of said sheet the solution to be decomposed and also to hold in contact with the other side of said sheet a body of water into which the said metal is discharged, and having means of supplying fresh mercury to said sheet to maintain the mercury held thereby free from impurities, substantially as described.

4. An electrolytic cell for the decomposi-

tion of the salts of the alkaline metals, having
an anode, and also having a cathode consisting
of an amalgamated reticulated or forami-
nated metallic sheet, and having means of
5 supplying fresh mercury to said sheet to main-
tain the mercury held thereby free from im-
purities, substantially as described.

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

ERNEST A. LE SUEUR.

Witnesses:

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