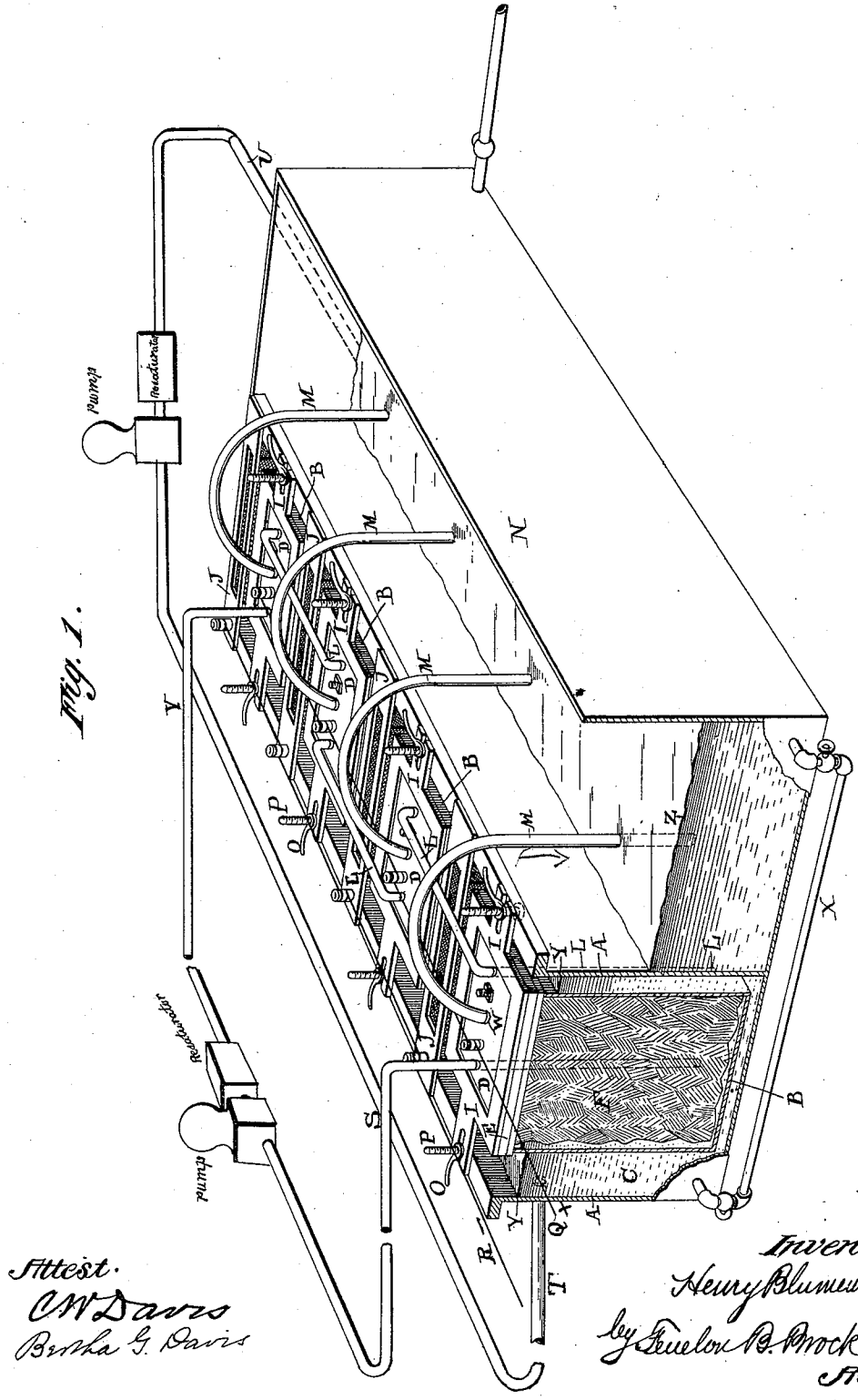
(No Model.) 2 Sheets—Sheet 1.

H. BLUMENBERG, Jr.

ELECTROLYSIS.

No. 565,324. Patented Aug. 4, 1896.

Fig. 1.



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Henry Blumenberg Jr.
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Atty.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

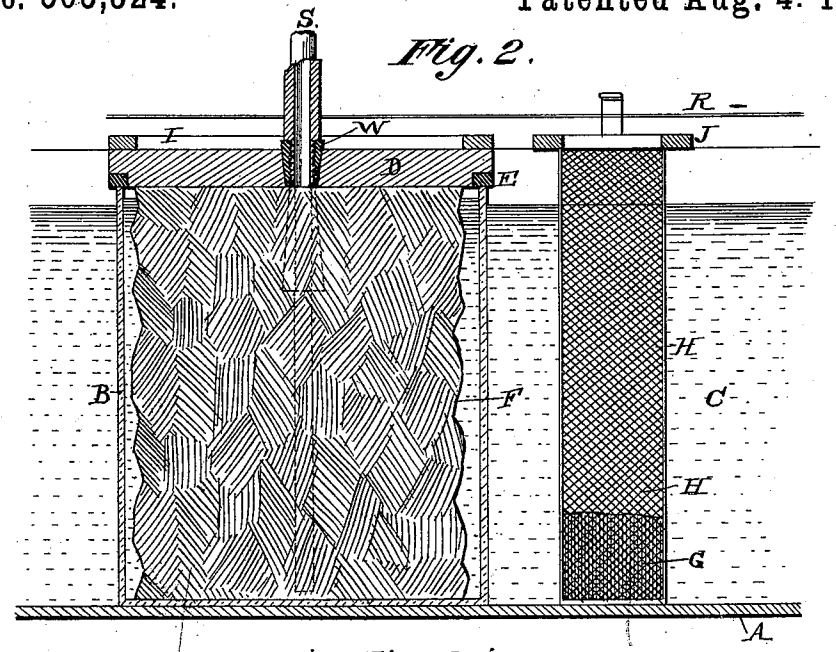


Fig. 3.

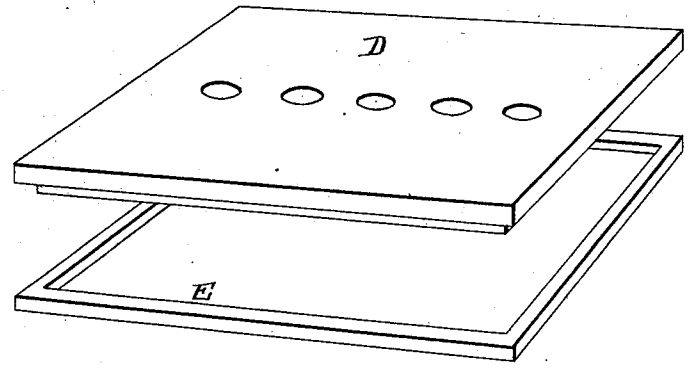
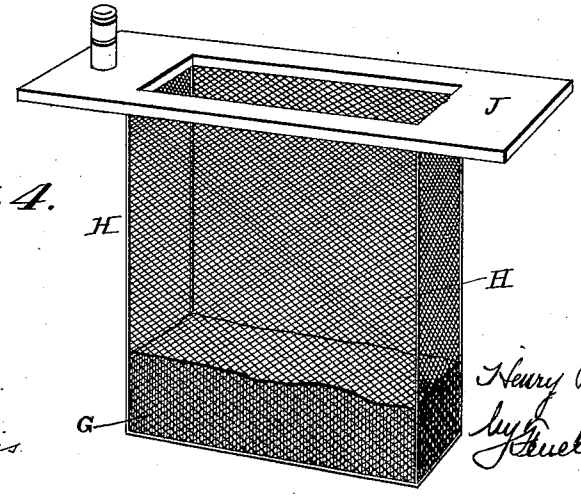


Fig. 4.



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Atty.

UNITED STATES PATENT OFFICE.

HENRY BLUMENBERG, JR., OF WAKEFIELD, NEW YORK.

ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 565,324, dated August 4, 1896.

Application filed January 10, 1895. Serial No. 534,481. (No model.)

To all whom it may concern:

Be it known that I, HENRY BLUMENBERG, Jr., a citizen of the United States, residing at Wakefield, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Electrolysis; and I do 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, reference being had to the letters of reference marked on the accompanying drawings, which form a part of this specification.

Figure 1 represents a perspective view of an apparatus, partly in section, to which I have applied my improvements and in which I carry out my process. Fig. 2 represents a partial longitudinal section of the vat. Fig. 3 represents detached a perspective view of the cover and packing-ring of one of the electropositive compartments. Fig. 4 is a perspective view of one of the cathodes and the cathode-holders.

My invention relates to the production of an oxysalt or chlorate from the corresponding haloid salt or chlorid by electrolysis.

The improvements consist in the following process and apparatus for attaining the above object, the novel features of which will be hereinafter pointed out and claimed.

In the drawings, A represents the vat proper.

B are a series of porous electropositive compartments or pots, of which four are shown. There may be any desired number of these compartments.

C is the electronegative compartment common to all the compartments B.

D are the covers of compartments B, and E the packing-rings which render the joints between the compartments and covers air-tight.

F are the anodes, and G the cathodes. The former are fastened to the under side of the cover D and the latter are held in the cathode-holder H.

The porous compartments or pots B are held in position by the metallic frames I, resting upon vat A, and the cathode-holder is supported by the slotted metallic cross-bar J, to which the reticulated metallic envelop H is attached.

L are a series of pipes, the inlet ends of which descend to the bottom of pots B through covers D and discharge through the covers of the adjoining pots at their bottoms.

M are a series of pipes communicating with the tops of covers D and discharge the liberated gas into the lower portion of the compartment N.

O and P are nut-and-screw devices for securely fastening the frame-plates I to the vat A. Similar devices may be applied to the cross-bars J.

Q is the wire leading from the positive pole of a battery (not shown) and connecting with all the anodes F, and R is a wire leading from the negative pole of the battery and connecting with the cathodes G.

The saturated solution of haloid salt or chlorid is introduced into the apparatus through the pipe S and is discharged through the pipe V after traversing the series of positive compartments. The pipes T and U are connected with the apparatus at either end and are in turn connected with a tank and a pump (not shown) into a continuous circulating system hereinafter more particularly referred to.

The anodes F are preferably made of retort-carbon, but other known material may be employed. It is a well-known fact that chlorin gas will destroy carbon in any shape, but that retort-carbon retards its disintegration; but it has been heretofore found to be brittle, porous, and non-conducting, and much difficulty has been found in making suitable connections with the battery. I have eliminated this in a marked degree by making a substitution product of the hydrocarbon series by displacing the hydrogen contained therein by a halogen, preferably chlorin. This anode is then saturated with the same, and is coked, so as to make the anode less porous and brittle and more conducting. The substances which can be used with good results in thus treating the anode are paraffin, ozocerite, or asphaltum, but others may be used, and I do not therefore wish to be confined to any one of the hydrocarbon series which may be suitable for the purpose.

The cathodes G are preferably peroxid of manganese, though other well-known materials may be used. The covers D are prefer-

ably of hard-pressed porcelain, and an elastic packing E is employed between the cover and pot B to produce an air-tight joint. All the openings in the covers D, through which the various pipes enter and the anode is supported, are provided with tubular rubber bushings or other suitable packing W to produce air-tight joints at all these points.

X is a valved pipe which connects the lower portions of the negative compartments C and tank N for a purpose hereinafter referred to.

A saturated solution of a haloid salt or chlorid is introduced through the pipe S and is discharged into the bottom of the first positive compartment B of the series. It thence flows through the series of pipes L, each of which receives the solution near the bottom of each compartment B, and discharges it into the bottom of the next succeeding pot or cell B, and so on throughout the series, the solution finally being forced out through the pipe V, leading from the last one of the series. As soon as the battery is turned on the electric energy traverses the vat in the well-known manner, and chlorin gas is thereby liberated in each of the compartments B in their upper portions. As these cells are air-tight, as has been heretofore explained, the pressure of the gas forces itself from each compartment through the pipes M into the tank N, where it is discharged below the surface of the liquid therein, as shown. This chlorin gas there decomposes the basylous radicals which were previously allowed to flow into the tank N by opening the valves in the pipe X, and thereby allowing them to flow from the electronegative compartment C by gravity until they reach a relative level in the two compartments, indicated respectively by Y and Z, after which the valves in pipe X are closed and the respective levels maintained through the pipes T and U in the continuous system before referred to by opening the valves as required, the electrolyte being received by the pipe T and discharged by the pipe U. The electrolyte which is traversing the compartments B through the series of pipes before referred to is kept at a steady flow, equal at least to the emptying of each compartment every hour. This prevents polarization, clogging, and various other faults which nearly all processes now have.

It should be understood that there is no connection in the piping or tanking of the aciduous and basylous radicals; that is to say, between the pipes S and V and the pipes T and U. A suitable resaturating device is used in connection with the piping in order to keep the electrolyte saturated. By discharging and withdrawing the electrolyte from the bottom of each compartment or pot B while the pumps are forcing it through the various pots of the series it is kept well saturated, and it takes away a large percentage of impurities, while its continuous movement through the pots brings in fresh supplies of haloid salt in solution to be decomposed, which in turn is taken away to be resaturated and used over again.

The electronegative electrode H is made of reticulated metal or meshing, which will not to a large extent be acted upon by the electrolyte, and contains a metallic oxid, preferably, as stated, black peroxid of manganese. The advantages of such an electrode or cathode are that while the electric current is flowing through the electrolyzation-vat there is a large amount of hydrogen gas liberated, which under certain conditions is very obnoxious and causes a large loss of the electric current, and is also a great waste of chemical energy. Therefore to eliminate this I use the peroxid of manganese, the oxygen contained in which combines with the liberated hydrogen and heats the electrolyte thereby. This does away with the use of steam-pipes in the conversion of the hypochlorite that is first formed into the chlorid and chlorate, and also heats the adjoining partition of the electrolyzation-vat, and by radiation and conduction heats the electrolyte in the tank N, and thereby furnishes the necessary heat for the production of the chlorate, as above enumerated.

I claim—

1. The process, herein described, which consists in introducing an electrolyte containing a chlorid in solution into a closed positive compartment of an electrolyzation-vat, a separate electrolyte into an electronegative compartment, conveying the basylous radicals from the latter compartment to the bottom of a separate tank, and the chlorin gas from the electropositive compartment to the bottom of the same tank.

2. The process, herein described, which consists in introducing an electrolyte containing a chlorid in solution into a closed positive compartment of an electrolyzation-vat, a separate electrolyte into an electronegative compartment, conveying the basylous radicals from the bottom of the latter compartment to the bottom of a separate tank, and the chlorin gas from the top of the electropositive compartment to the bottom of the same tank.

3. The process herein described, which consists in causing an electrolyte containing a chlorid in solution to flow through an electropositive compartment, and a separate electrolyte through an electronegative compartment in an opposite direction, conveying the basylous radicals from the latter compartment to the bottom of a separate tank and the chlorin gas from the positive compartment to the bottom of the same tank.

4. The combination of a series of positive compartments, a negative compartment, common to all the positive compartments, means for circulating a separate electrolyte containing a chlorid in solution through the positive compartments, and means for circulating a separate electrolyte through the negative compartment.

5. The combination of an electrolyzation-vat, having positive and negative compartments therein, an anode, a cathode, a source of electrical energy, a tank in contact with said vat and located at one side thereof, means for connecting the second tank with the positive and negative compartments, and an electrolyte whereby heat is generated for the purposes set forth.

6. The process of treating retort-carbon for an electrode which consists in leading chlorin gas through a hydrocarbon, saturating the retort-carbon in the hydrocarbon so treated and finally coking the retort-carbon.

7. The combination of a vat provided with a series of electropositive compartments, an electronegative compartment and a second tank, said negative compartment being common to each positive compartment, and a series of pipes leading from the tops of each positive compartment and discharging into the second tank.

8. The combination of a vat having a negative and a positive compartment, an inlet and a discharge pipe for the positive compartment entering the bottom thereof, a second tank, and a pipe leading from the top of the positive compartment into the lower portion of said tank.

9. The combination of a vat having a negative and a positive compartment, an inlet and a discharge pipe for the positive compartment entering the bottom thereof, a second tank, a pipe leading from the top of the positive compartment into the lower portion of said tank and a pipe connecting the lower portion of the said negative compartment and said tank.

10. The combination of a vat having one or more electropositive compartments therein and inlet and outlet pipes for the same entering the bottom thereof, a pipe entering the lower portion of the vat for supplying the electrolyte thereto, and a pipe at the upper opposite part of the vat for conveying the same therefrom.

11. The process, herein described, which consists in separately leading and discharging an electrolyte containing a chlorid in solution into and from the bottom of the electropositive compartment, leading the chlorin gas from the top of said compartment into a tank, then leading a separate electrolyte into the bottom of the electronegative compartment and discharging it from the top thereof, and conveying a portion also of the latter electrolyte into said tank.

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

HENRY BLUMENBERG, JR.

Witnesses:
GRANT L. NICHOLS,
THOS. W. SMITH.