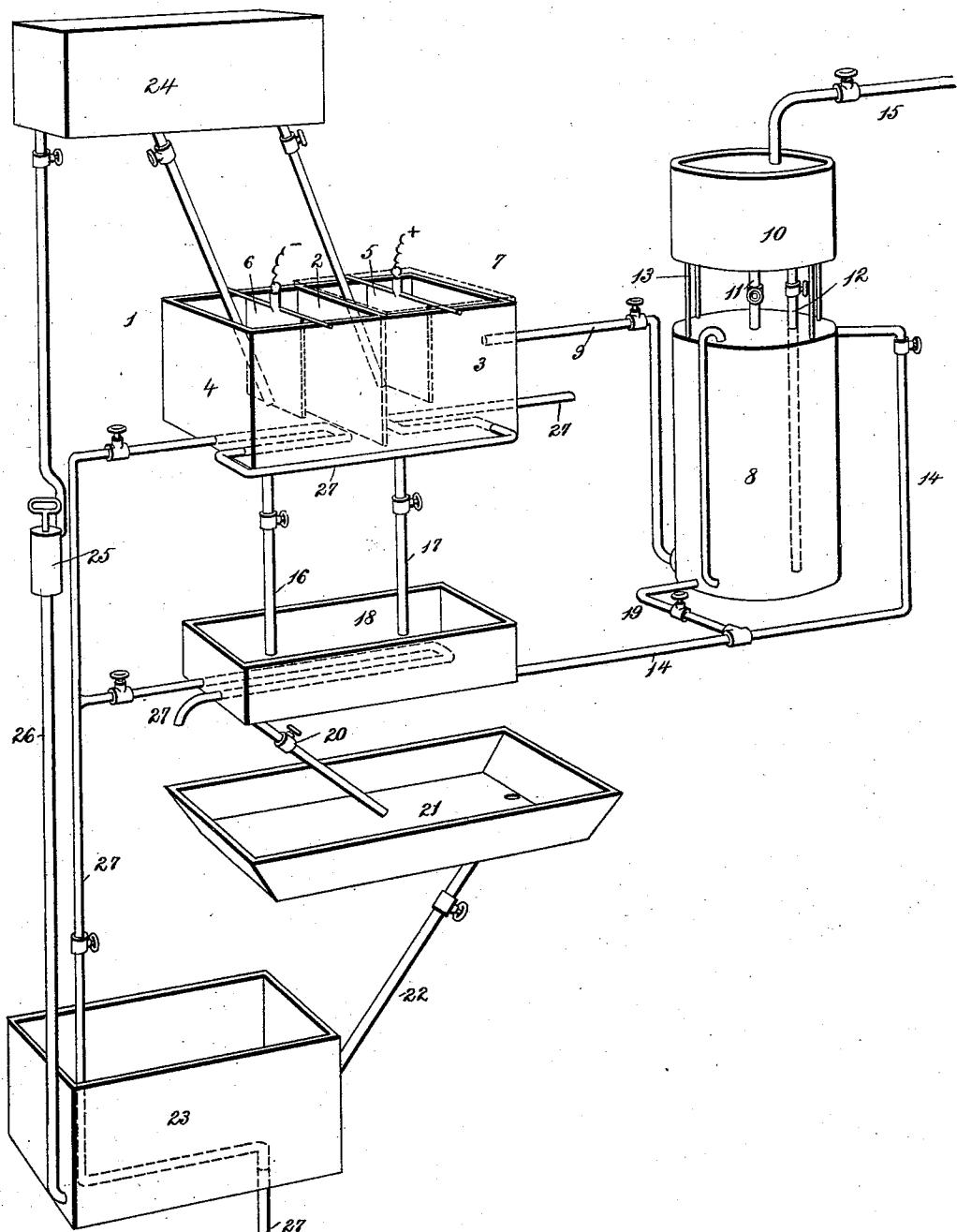


(No Model.)

H. BLUMENBERG, Jr.
ELECTROLYSIS.

No. 537,179.

Patented Apr. 9, 1895.



Witnesses

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HENRY BLUMENBERG, JR., OF MOUNT VERNON, NEW YORK.

ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 537,179, dated April 9, 1895.

Application filed March 30, 1894. Serial No. 505,788. (No model.)

To all whom it may concern:

Be it known that I, HENRY BLUMENBERG, Jr., a citizen of the United States, residing at Mount Vernon, 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

10 the art to which it appertains to make and use the same, reference being had to the figures of reference marked on the accompanying drawing, which forms a part of this specification.

The object of my invention is to obtain by 15 electrolytic action the oxy-salts such as chlorates, from the haloid salts of the alkaline metals and metals of the alkaline earths.

Generally stated, in carrying my process into effect, I prepare a saturated solution containing a haloid salt corresponding to the oxy-salt which I produce. For this purpose a vat is used such as is shown in the accompanying drawing. This vat is divided into two compartments by a porous partition, or instead a 25 porous vessel is placed therein, in either case the vat being divided into two compartments. An electric current is then led through the solution, caution being taken that the positive wire is connected to the positive compartment 30 and the negative wire to the negative compartment of the vat. The basic radicals such as potassium are then set free in the electro-negative compartment, and the acid radicals, such as chlorine and oxygen are set free in 35 the electro-positive compartment.

In exemplification of my invention we will place in the vat a potassic chloride. The electric current separates it into its electro-negative and electro-positive constituents.

40 The potassium being the base will be deposited in the electro-negative compartment, where it takes up an atom of oxygen from the electrolyte and also sets free an atom of hydrogen, forming hydrate of potash.

45 The drawing represents in perspective view, an apparatus by means of which my invention may be carried into effect.

In the drawing 1 represents the electrolyzing vat, divided by the porous partition 2 into 50 a positive compartment 3 and a negative compartment 4.

5 is the anode, and 6, the cathode, which are

connected by the usual wires leading to a suitable battery. Both the anode and cathode may be of any of the usual substances generally employed in similar apparatus.

55 The positive compartment 3 is covered by an airtight cap or plate 7, shown in dotted lines thereon. The electro-negative compartment contains the caustic solution or basic radical.

60 8 is a gasometer connected with compartment 3 by a valved pipe 9 leading into the bottom of the gasometer, and communicating with the positive compartment near its top. 65 The gasometer 8 has an upper vessel 10 open at the top, while the lower vessel, 8, proper, is closed at the top.

65 11 is a pipe connecting the lower end of vessel 10 with the upper end of vessel 8, and 70 is provided with a valve.

70 12 is another valved pipe connecting the lower end of vessel 10 with vessel 8, and extending through the top of the latter vessel to a point near the bottom thereof.

75 13 are supporting rods for maintaining the vessels in their proper relative position.

14 is a pipe having a valve therein, communicating with the top of the gasometer 8, which allows the gas to flow out of said vessel when 80 the valve is open.

15 is a valved pipe communicating with any source of water supply, by means of which the vessel 10 and the vessel 8 are both filled with water by opening the valve in the pipes 85 11 and 12. The water flows in by the pipe 12 which reaches nearly to the bottom of the gasometer 8, and displaces the air, the latter escaping by the pipe 11, until the gasometer is full.

90 When all the valves have been closed, above referred to, the operation within the vat 1 may be started by turning on the electric current therein. The acid radicals, such as chlorine and oxygen, are liberated in the electro-

positive division 3, and such as will thereupon be forced from such closed compartment through pipe 9 into the gasometer 8, upon opening the valve in said pipe.

95 As the acid radicals enter the bottom of vessel 8 they displace the water therein to a certain extent, that is to say, some of the acid radicals will displace the water while some will be absorbed by it. According to the pressure and volume

of the gas the water is forced up into the upper vessel 10 through pipe 12, upon its valve being opened. The gasometer will be made large enough, of course, to hold all the acid radicals which may be liberated in one or more operations of the vat 1. The haloid salt is decomposed by the battery current into its basic and acid radicals. The latter are now in the gasometer and the former are in the electro-negative compartment 4.

To produce an oxy-salt, such as chlorate of potash, the valves of the pipes 16 and 17 communicating with the negative and positive compartments 4 and 3, respectively, are opened. The discharge from the pipe 16 are the basic radicals such as caustic potash, and from the pipe 17 comes the chlorine water, &c., both of which are discharged into the receptacle 18. Upon opening the valve and pipe 14 the chlorine gas and oxygen, constituting the acid radicals, as I have termed them, will be forced through said pipe into the receptacle 18, and commingle with the basic radicals or caustized solution in said receptacle. Accompanying the caustic solution, which has not yet been decomposed by the acid radicals from the positive compartment and which were discharged by the pipe 17, is a proportion of acid radicals. When the acid radicals, such as chlorine and oxygen, are all forced from the gasometer 8, the valve in the pipe 19 is opened and allows what chlorine water there is in the gasometer to pass into the receptacle 18, so that if there are any basic radicals left, such as caustic potash, they will also be decomposed into the chlorate. When this latter chemical operation is completed the valve in pipe 20 is opened and the contents of the receptacle 18 are permitted to pass into the tank 21, so that the chlorate of potash may be deposited and the liquid cooled. After such operation the valve-pipe 22 is opened, when the residue runs into the re-saturating receptacle 23. This residue may be pumped back again into the tank 24 by means of the pump 25 and the pipe 26, and then led into vat 1 by the two pipes from the tank 24.

In the successful operation of my invention I employ a system of steam coils and pipe connections in the vat 1, receptacle 18 and the tank 23. These pipes and coils are marked 27.

It is a well known fact that hypochlorite of potassium, if first formed and then decomposed into a chlorate, must have a temperature of something like 120° Fahrenheit. This, of course, can also be produced by the electric current, but then such a high efficiency could not be practically had in producing the chlorate. In manufacturing chlorate by this process a bi-product which is almost pure hydrogen gas is had, and this can be gathered if an air-tight cover 7, be placed over the electro-negative compartment 4. It will also be noted that if the steam coils in vat 1 are not employed I can produce hypo-chlorite for bleaching purposes, if care is taken to not

overheat the electrolyte. Such a product can be run off from receptacle 18 through pipe 20 into any suitable tank containing the article to be bleached.

In electrolyzing an impure chloride of potash or muriate, which may contain impurities, such as chloride of soda, nitrate of potash and nitrate of soda, the chlorine of the sodium will also be set free at the positive pole, while the sodium goes to the cathode with the potassium. Upon crystallization of the chlorate of potash the chlorate of sodium, being more soluble, will go with the bi-products, where it can be afterward taken from the mother liquids of the crystallization of the chloride. If there is any percentage of the nitrates of potassium or sodium it will not be advisable to use the contents of the compartments 3; for, as the radical of sulphuryl and nitryl decompose the water therein, setting free oxygen by secondary action and forming sulphuric and nitric acid, these, if they were led into receptacle 18 by pipe 17, would probably decompose the chlorate and also bring forward any primary and secondary impurities.

The contents of the positive compartment 3 can be profitably used for disinfecting sewage, &c., because the impurities of the chloride of potash, if large, mostly go into the compartment 3. From there they can be discharged by pipe 17, so that a chlorate will not be contaminated with impurities.

This process is admirably suited for making a very pure chlorate from a very impure chloride, and is one of its main features. The oxygen, of course, set free by the secondary action of the nitryl and sulphuryl radicals can be used for making the chlorate.

While the haloid salt in vat 1 is being decomposed, the oxy-salt (chlorate of potash) can be made. In that case the basic radicals of a succeeding operation in receptacle 18 are used. In such case I make use of the chlorate without employing the gasometer, the latter being used only when the oxy-salt is made from the basic and acid radicals of the haloid salts of that operation; but, as in electrolyzing chloride of potash, the basic radicals are in excess of the acid, and, therefore, there is a part left over which has not been satisfied; and this, when the chlorate has been taken from it can be used, provided proper arrangements are made to carry out the same.

The weight of the water in the upper vessel 10 of the gasometer puts a steady pressure on the chlorine gas through pipe 14, and through the caustic solution in the receptacle 18. The chlorine will be kept in the upper part of the gasometer 8, and the pressure of the solution which is forced up through the pipe 12 gives me a means for absolutely regulating the production of my chlorate in receptacle 18, by regulating the valve in pipe 14.

I claim—

The improvement in the art herein de-

scribed which consists in placing an electrolyte containing a haloid salt in a vat, electrolyzing the same thereby setting free the halogen under pressure in the positive compartment and the base without pressure in the negative compartment, leading the halogen into a gas holder and applying additional fluid pressure therein, and the base into a

tank, and bringing the halogen from the gas holder to the tank containing the base. ^{to}

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

HENRY BLUMENBERG, JR.

Witnesses:

PATRICK CONNORS,
SAMUEL LEVINESS.