(No Model.) 2 Sheets—Sheet 1.

C. T. J. VAUTIN.

PROCESS OF AND APPARATUS FOR THE PRODUCTION OF CAUSTIC ALKALI.

No. 531,235. Patented Dec. 18, 1894.

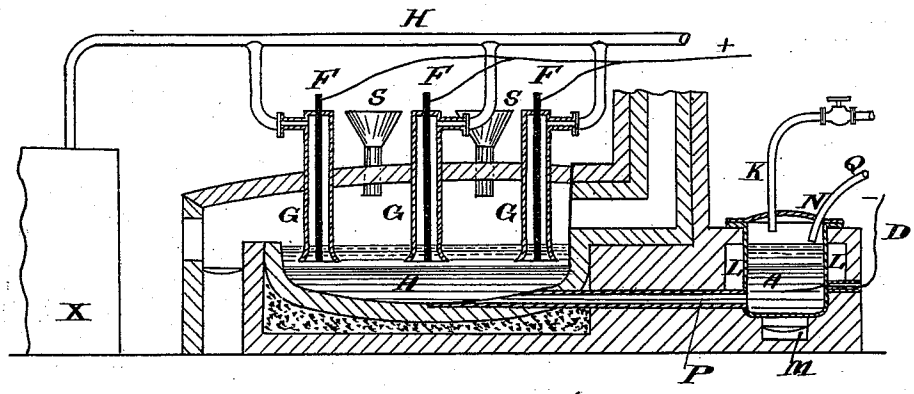

Fig. 1.

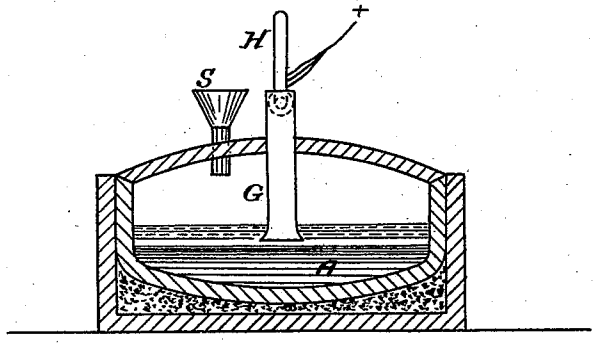

Fig. 2.

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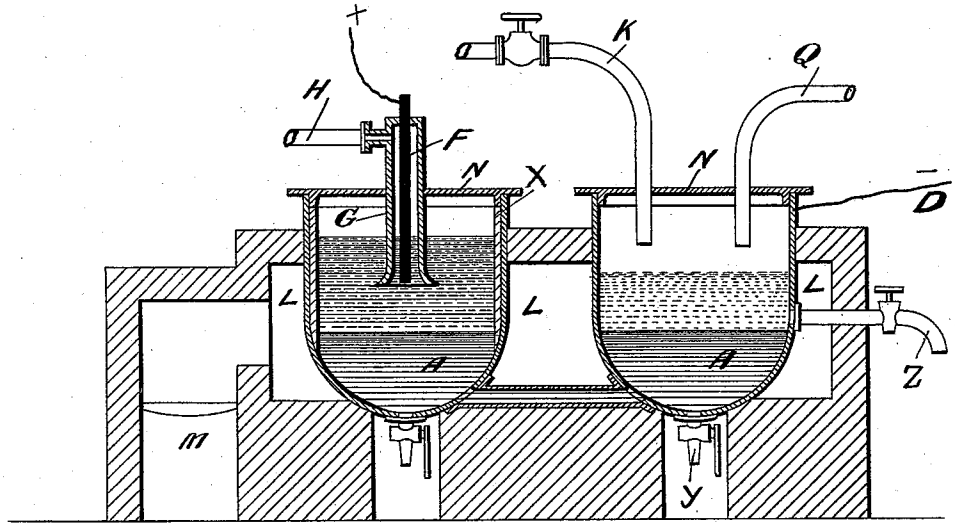

FIG. 3.

Attest
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UNITED STATES PATENT OFFICE.

CLAUDE THEODORE JAMES VAUTIN, OF LONDON, ENGLAND.

PROCESS OF AND APPARATUS FOR THE PRODUCTION OF CAUSTIC ALKALI.

SPECIFICATION forming part of Letters Patent No. 531,235, dated December 18, 1894.

Application filed January 11, 1894. Serial No. 496,459. (No specimens.)

To all whom it may concern:

Be it known that I, CLAUDE THEODORE JAMES VAUTIN, residing at London, England, have invented an Improved Process of and Apparatus for the Production of Caustic Alkali, of which the following is a specification.

My invention consists of an improved process, and means used therein, for the production of caustic alkali, such as the hydrates of sodium and potassium, from salts of sodium and potassium, such as chlorides, by electrolysis.

In order that my invention may be the better understood, I now proceed to describe the same in relation to the means illustrated herewith, reference being had to the letters marked thereon.

Figure 1 is a longitudinal section of a furnace, showing auxiliary pot or vessel for the production of caustic alkali, and means for the collection of chlorine. Fig. 2, is a transverse section of the said furnace, showing means for the continual supply of the alkali salt. Fig. 3, is a sectional elevation of two pots combined.

To carry my improved process into effect, I place a charge of metal A which will alloy with sodium or potassium and which will not be affected by a fused caustic alkali when in a molten condition, such as metallic lead, in the bottom of the furnace or vessel, in which the operation is to be carried out, and this charge of metal or metallic lead constitutes the cathode A of an electric circuit D F. Above this charge of metal or lead A, is added a sodium or potassium salt, such as a carbonate of sodium or potassium but preferably sodium or potassium chloride, as an electrolyte and I may mix with the said chloride other salts, such as chloride of calcium or strontium to reduce the temperature at which the electrolyte melts.

One or more anodes F of carbon or other suitable material, are inserted into the sodium or potassium salt, and they are surrounded by a case G of refractory and impervious material, such as fire-clay, to protect them from the products of combustion of the fuel used in the furnace, and also serve to collect the chlorine gas, which is liberated and rises at the said anodes where chlorides are used, and is led away by suitable pipes H to a chamber X containing calcic hydrate, or powdered slaked lime, for the purpose of producing bleaching powder. The whole charge of the furnace is exposed to gentle heat until the metallic or lead charge A is melted, and the sodium or potassium salt or mixture of salts is fused. An electric current is then passed through the charge, and electrolysis takes place. The chlorine is liberated at the anodes F when chlorides are used, for the electrolyte and is collected by the surrounding tubes G, and pipes H, and carried to a chamber containing calcium hydrate, or powdered slaked lime, to be converted into chloride of lime, or to be utilized in any other convenient manner. The sodium or potassium freed at the surface of the molten bath of metal or lead A, is entirely absorbed, forming an alloy with the lead or other metal of which the bath or cathode is composed. An auxiliary pot or vessel N provided with a grate M and flues L L for heating the same, is connected by a conduit P, communicating with the lower part of the metallic bath in the hearth. The charge of alloyed metal, or lead and sodium or potassium (the cathode) is thus in free communication with the auxiliary pot or vessel N, and it is found that as the sodium or potassium is removed from the alloy in the pot N, in the form of a hydrate, it will be continually replaced by fresh sodium or potassium in consequence of the diffusion of further sodium or potassium from the hearth of the furnace through the metal in the conduit P to the metal in the pot N.

The conversion of the sodium or potassium into the hydrate,—that is into caustic alkali—may be effected by a jet of steam admitted by the pipe K to the surface of the charge in the auxiliary pot or vessel N, without chilling the molten alloy. The caustic alkali, so produced, may be removed in a fused condition by ladling or by an exit pipe as may be desired. The production of caustic alkali may thus be a continuous process; the removal of the caustic alkali from the metal in the pot N being compensated for by the continuous deposition of the sodium or potassium by electrolysis in the metallic bath or cathode in the furnace in consequence of the diffusion of alkaline metal from the furnace to the outer pot.

The charge of sodium or potassium salts in the furnace may be maintained through a suitable hopper or hoppers S; the metal or lead bath remaining as a collector and carrier of the sodium or potassium, and the chlorine (where chlorides are used as the electrolyte) being collected simultaneously for the production of bleaching powder, or otherwise.

It is obvious that instead of an open hearth furnace, the process as above described could be conducted in a pair or series of conjoined crucibles N N, Fig. 3, one provided with a suitable lining *x*, containing the electrolyte for electrolysis and the cathode, and the preparation of the caustic alkali being effected in the other, which is provided with a draw-off cock *y* in its bottom and the lateral draw off cock Z.

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

1. A continuous process for the production of a caustic alkali, consisting of the treatment in a fused condition by electrolysis of a salt of sodium or potassium forming the electrolyte, upon a molten bath of lead alloying with sodium and potassium, and not affected by fused caustic alkali, the said metal forming the cathode of the electric circuit; the conversion into a caustic alkali of the sodium or potassium from its alloy with the molten cathode, by the treatment of a part of said cathode, *in situ*, by water in any form; and the removal of the caustic alkali from the surface of the molten bath for collection and utilization, substantially as described.

2. A process, consisting of the treatment by electrolysis of the chlorides of potassium or sodium in a fused condition over a cathode of molten lead; the treatment by water in any form, of part of the cathode *in situ*, without removal or diminution of the lead, to convert the potassium or sodium into caustic alkali; the collection of the chlorine evolved at the anodes of the electric circuit; and the conversion of the chlorine into the chloride of lime, substantially as described.

3. The treatment of a part of a cathode of an electrolytical furnace, consisting of a molten alloy of lead with sodium and potassium, by heating the said part to be treated, while still in fluid communication with the said cathode, and by introducing a jet of steam upon the surface of the said separated part, to convert the sodium or potassium as it collects by transfusion through the molten cathode, into a caustic alkali, for collection and utilization, substantially as described.

4. The combination of two covered furnaces or equivalent furnace pots, connected at the bottom by an open conduit; grates and flues adapted thereto to externally heat the same; anodes in one pot or furnace, protected by surrounding refractory tubes having connecting pipes; a fluid cathode common to both furnaces or pots; and a steam admission pipe, and exit pipe passed through the cover of the other pot or furnace, to carry the herein described process into effect, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLAUDE THEODORE JAMES VAUTIN.

Witnesses:

RICHARD A. HOFFMANN,

CHARLES H. CARTER.