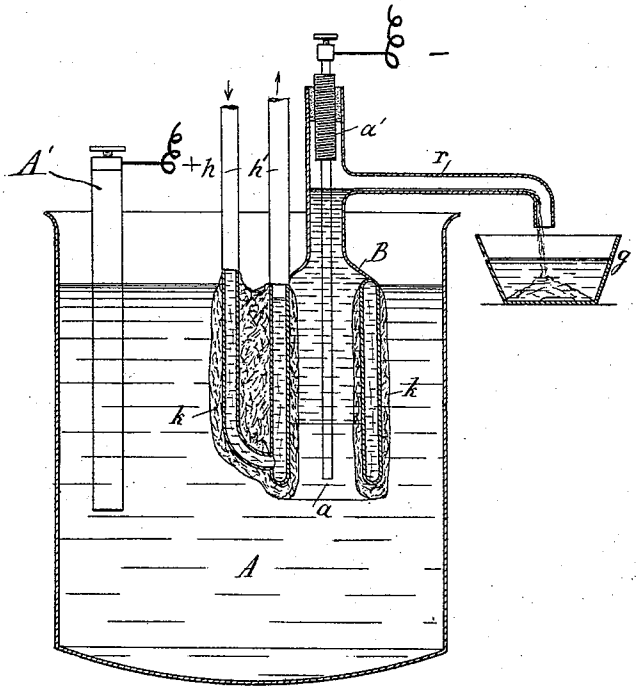
(No Model.)

L. GRABAU.

PRODUCTION OF INSULATING COATINGS OR LININGS IN ELECTROLYTIC APPARATUS.

No. 465,369. Patented Dec. 15, 1891.



Witnesses:
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UNITED STATES PATENT OFFICE.

LUDWIG GRABAU, OF HANOVER, GERMANY.

PRODUCTION OF INSULATING COATINGS OR LININGS IN ELECTROLYTIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 465,369, dated December 15, 1891.

Application filed August 9, 1887. Serial No. 246,528. (No model.) Patented in France July 13, 1887, No. 184,793; in Germany July 14, 1887, No. 45,012; in England July 14, 1887, No. 9,904; in Belgium July 14, 1887, No. 78,212, and in Austria-Hungary March 3, 1888, No. 48,508 and No. 8,864, and January 17, 1889, No. 37,807 and No. 64,055.

To all whom it may concern:

Be it known that I, LUDWIG GRABAU, a subject of the King of Prussia, residing at Hanover, 41 Schiffgraben, Prussia, German Empire, have invented certain new and useful Improvements in Pole-Cells for Electrolytical Apparatus, (for which I have obtained Letters Patent in the following countries: in Germany, No. 45,012, dated July 14, 1887; in England, No. 9,904, dated July 14, 1887; in Belgium, dated July 14, 1887, No. 78,212, and under date of May 12, 1888, No. 78,212; in France, dated July 13, 1887, No. 184,793, and May 12, 1888, under same number as a certificate of addition, and in Austria-Hungary, dated March 3, 1888, No. 48,508 and No. 8,864, and January 17, 1889, No. 37,807 and No. 64,055;) and I do hereby 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.

In the reduction of salts of metals to a metallic state by melting such and subjecting the molten salt to the action of an electric current, difficulties have heretofore been encountered in the construction of the pole-cells. The refractory materials which have heretofore been employed for this purpose have been found, except under exceptional circumstances or conditions, deficient in resistance to the destructive action of the molten or fused salts or of some component thereof, and for this reason the treatment of salts of metals by fusion and electrolysis has heretofore not been carried out with entire satisfaction or produced entirely satisfactory results.

The invention has for its object the provision of means whereby a refractory, as well as an insulating, coating is formed upon the surface of the cell in contact with the fused material, which coating is not affected by said material, and acts also as an insulator.

To this end the invention consists in the construction of the cell, as will now be fully described, reference being had to the accompanying drawing, which as an example shows by a sectional view a pole-cell constructed according to this invention in its applications to an apparatus more particularly designed for the reduction of sodium salts.

B indicates the pole-cell, which is constructed of such refractory materials as are usually employed and has the form of a hollow cylinder of reduced diameter at the upper portion. In fact, the cell has substantially the form of a bottle without bottom, the body of the bottle being formed of double walls, the intervening space being connected by a pipe or duct *h* with a refrigerant-supply, which refrigerant may be a liquid or a gas, *h'* being the exhaust or discharge pipe. The neck of the cell has a branch pipe *r* for the discharge of the sodium, and in the upper end of said neck is adjustably secured the negative electrode, which may be a bar of iron *a*, screw-threaded at its upper end *a'* for vertical adjustment, for purposes presently explained, and connected by wire with the negative pole of the source of electricity. The cross-sectional area of the negative electrode is preferably so chosen that the resistance thereof to the passage of the current will be sufficiently strong to heat the same to such a degree as to prevent the fluid or fused mass in the immediate vicinity thereof from congealing and forming a crust thereon.

A' is the positive electrode, which may be of carbon, and is connected by wire with the like pole of the electrical source.

The vessel or crucible A may be heated in any desired or preferred manner, and during the process of reduction a refrigerant is passed through the double walls of the pole-cell to cool the surfaces immersed in the fused mass to such a degree as to cause that portion thereof in immediate contact with the cooled surfaces to congeal and form a protective crust thereon.

It has hereinbefore been stated that the negative electrode is adjustable vertically within the pole-cell. The object of this is to maintain the electrode within the fused mass, even should all of the fused material within the pole-cell congeal.

As the specific gravity of sodium is less than that of its salt, the sodium will rise along the electrode *a a'* and flow through pipe *r* into the receiver *g*, which contains petroleum.

By the described improvement I provide not only a protective crust or coating, since such crust or coating is not affected by sodium, but also an insulating-coating for the

pole-cell and the inlet and eduction pipes *h h'*, so that all the sodium will form and collect within said cell, while the process of reduction may thus be made a continuous one; and, lastly, I avoid the admixture of impurities with the sodium which may result from the decomposition of the pole-cell, which has been the case heretofore where cells of porcelain have been used.

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

1. In an electrolytical apparatus, the combination, with the melting-pot and one of the electrodes, of a cell encompassing the electrode, said cell being open at bottom and constructed with double walls to form a chamber, said chamber being provided with a feed and an exhaust port, substantially as and for the purpose specified.

2. In an electrolytical apparatus, the combination, with one of the electrodes, of a bell-shaped pole-cell having double walls to form a cooling-chamber, and means for causing a cooling agent to circulate therethrough, said cell being provided with a neck or extension, in which the electrode is adjustably supported, and a discharge-passage in communication with said neck for the discharge of the metal, for the purpose set forth.

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

LUDWIG GRABAU.

Witnesses:
C. LÜTTGE,
JOHS. KRACKE.