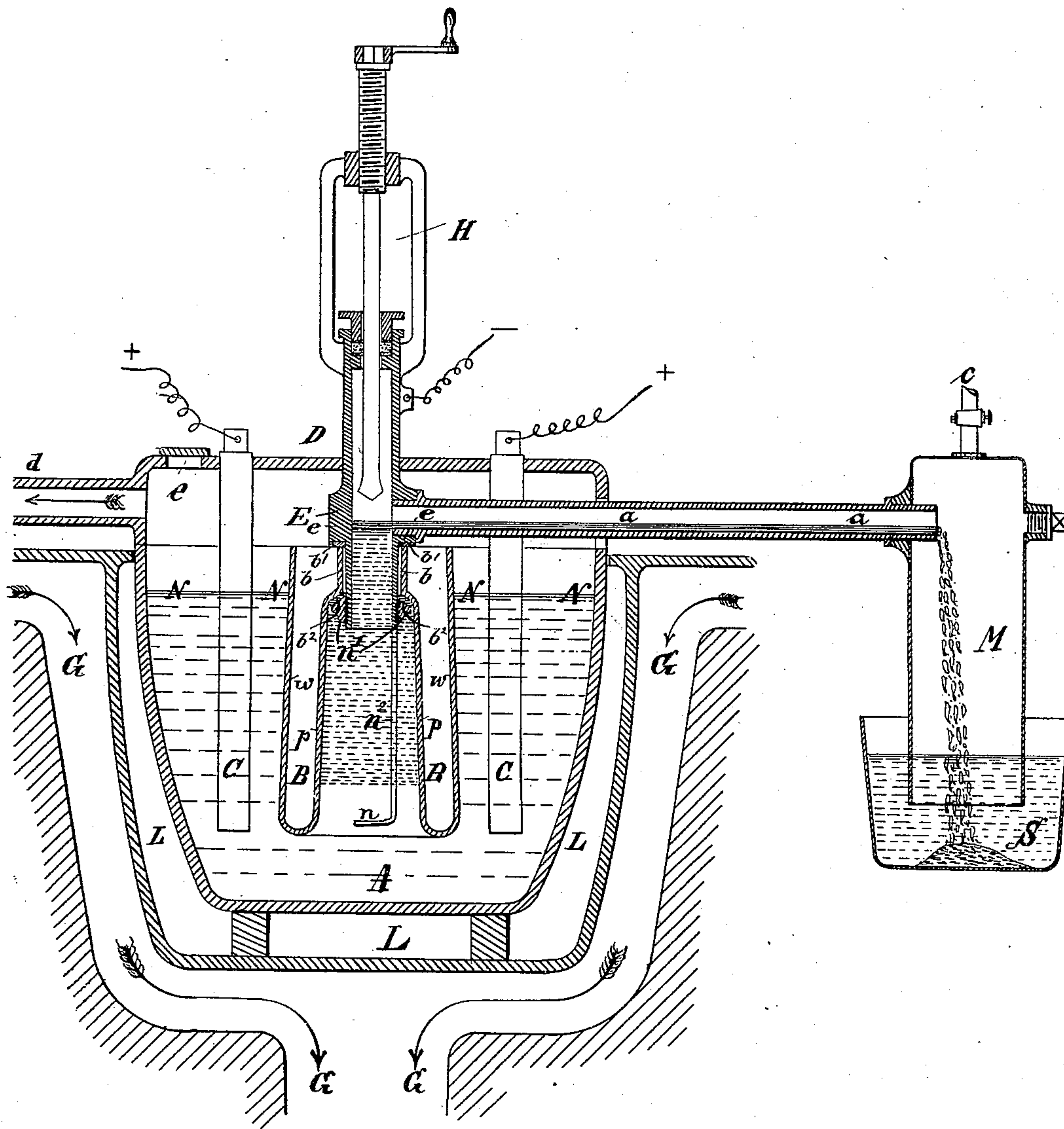


(No Model)

L. GRABAU.
APPARATUS FOR OBTAINING METALS OF THE ALKALIES FROM MOLTEN
CHLORIDE.

No. 464,096.

Patented Dec. 1, 1891.



Witnesses.

J. Thomson Cross.

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UNITED STATES PATENT OFFICE.

LUDWIG GRABAU, OF HANOVER, GERMANY.

APPARATUS FOR OBTAINING METALS OF THE ALKALIES FROM MOLTEN CHLORIDE.

SPECIFICATION forming part of Letters Patent No. 464,096, dated December 1, 1891.

Application filed November 15, 1889. Serial No. 330,458. (No model.) Patented in Germany October 8, 1889, No. 51,898; in Belgium October 8, 1889, No. 88,001; in France October 8, 1889, No. 201,187; in England October 8, 1889, No. 15,792; in Italy October 8, 1889, XXIII, 26,300, LIII, 44; in Switzerland October 8, 1889, No. 1,471; in Spain November 25, 1889, No. 10,018, and in Austria-Hungary March 8, 1890, No. 43,733 and No. 4,471.

To all whom it may concern:

Be it known that I, LUDWIG GRABAU, engineer, a subject of the German Emperor, residing at Hanover, Prussia, German Empire, have invented certain new and useful Improvements in Apparatus for Obtaining Metals of the Alkalies from Molten Chloride, (for which I have obtained Letters Patent in the following countries: in Germany, dated October 8, 1889, No. 51,898; in Belgium, dated October 8, 1889, No. 88,001; in France, dated October 8, 1889, No. 201,187; in England, dated October 8, 1889, No. 15,792; in Italy, dated October 8, 1889, Vol. 23, No. 26,300, and Vol. 53, No. 44; in Austria-Hungary, dated March 8, 1890, No. 43,733 and No. 4,471; in Spain, dated November 25, 1889, No. 10,018, and in Switzerland, dated October 8, 1889, No. 1,471;) 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, reference being had to the accompanying drawing, and to letters of reference marked thereon, which form a part of this specification.

The invention relates to apparatus for obtaining the metals of the alkalies by means of electrolysis, and more particularly to the pole-cells thereof.

This invention is an improvement on apparatus described in Letters Patent granted to me in England under date of July 14, 1887, No. 9,904, and on apparatus described in an application for Letters Patent of the United States of America filed by me on or about the 9th day of August, 1887, Serial No. 246,528.

All attempts to obtain the metals of the alkalies on a large scale from the molten or liquid chlorides by means of electrolysis heretofore made, and with which we are acquainted, have not proved successful, inasmuch as it has been found impossible to keep up a regular course of operation for a sufficient length of time owing to the rapid destruction of the apparatus, this destruction taking place in the cell of the pole designed for the reception of the metal deposited. As these cells must be made of a fire-proof material, which

is also a non-conductor of electricity—such, for instance, as porcelain, fire-brick, or the like—the rapid destruction of the said cells would appear to be due to the chemical action of the metals of the alkalies, assisted by the comparatively high temperature of the molten chlorides. More careful inquiries have, however, established that the speedy destruction of the pole-cells is not due to the direct destructive action of the metal of the alkalies, but that the real cause of this action seems to be due to the fact that the electric current passes through the walls of the cell. In fact, it has been found that even well-glazed porcelain cells are capable of conducting electric currents, so that their walls were soon broken through.

The object of this invention is to obviate this detrimental action of the electric currents by means of a pole-cell of such construction as to prevent the passage of the electric current through its walls. This result is attained, according to the present invention, by means of an annular partition-wall extending from the lower edge of the bell-shaped pole cell to a point above the surface of the molten mass, so that conductivity between the material within the pole-cell and the material surrounding the same can only take place through the open lower end of the cell, but not through the walls thereof.

In the accompanying drawing I have shown in vertical axial section an apparatus constructed according to my present invention.

The apparatus consists of a melting pot or vessel A, inclosed within a larger vessel to form an encompassing air-jacket L. The vessels A L are preferably heated by hot gases, which pass through ducts G.

I do not wish to limit myself to the arrangement of the two vessels A L to form a space between them, as any other construction of jacketed melting-vessel may be employed. It is apparent, however, that the arrangement described is a very convenient one, since the removal of vessel A from the jacket L is thereby greatly facilitated.

The vessel A, which is closed at top by means of a cover D, contains a bell-shaped

pole-cell B, made of porcelain or other suitable refractory material, and also the carbon electrodes C, these being arranged around the pole-cell B. The pole-cell B is inclosed within
 5 a chamber formed by an annular partition *w*, that extends from the lower edge of the cell up through and projects beyond the surface N N of the molten mass. A space is thus left
 10 between the wall *p* of the cell and the partition *w*, from which the molten mass is excluded. The said molten mass, therefore, does not come in contact with the outer surface of the cell-walls *p*, and an electrical connection between the molten mass inside and
 15 outside the pole-cell through the walls thereof is therefore impossible.

E is a tubular support for the pole-cell B, said support having its lower end screw-threaded, and is provided with a discharge-
 20 pipe *a*, that discharges into a receiver or collector S. The pipe *a*, as shown, is secured in an enlargement of the support E, which enlargement provides an annular shoulder or seat *e* for the upper end of the inner con-
 25 tracted portion or neck *b* of the pole-cell B, a suitable packing *b'* being interposed between said neck and shoulder or seat. The cell B is firmly secured to the support E by means of a nut *n'* screwed onto the lower end of said
 30 support, a packing *b''* being interposed between said nut and the neck *b* of cell B, as shown. Any other means may, however, be resorted to for securing the cell to its sup-
 port.

35 The support E is preferably made of iron and constitutes the negative electrode, and its conducting-surface is preferably increased by attaching thereto a wire *n''*, that extends nearly to the lower open end of the cell, and
 40 by attaching to said wire a metallic cross-piece *n* for the purpose of reducing the resistance of the molten metal to the passage of the electric current.

A boring-tool H is connected with and ex-
 45 tends into the tubular support E for the purpose of removing obstructions.

The specific gravity of the metals of the alkalis being less than that of the molten chlorides, the liquid metal collected in the
 50 pole-cell rises to the surface of the molten

mass, and as it forms in the cell it flows through the discharge-pipe *a* and is collected outside of the decomposing apparatus in the receiver M. The receiver employed for collecting the metal may consist of a vessel S, 55 filled with petroleum, into which dips a bell-shaped or cylindrical vessel M, open at its lower end and connected at or near its upper end with the discharge-pipe *a*, the said vessel M being preferably kept filled with any 60 suitable gas—such as hydrogen or nitrogen—through the medium of a pipe *c*, connected with the top of said vessel. The chlorine developed is drawn off through a pipe *d*, connected with the melting-vessel A, while the 65 salt supply is introduced through a feed-aperture *e* in the top of the said chamber.

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

1. In an electrolytical apparatus, the combination, with the containing-vessel or melting-pot and one of the electrodes, of a pole-cell for said electrode, constructed with double walls inclosing a chamber that is open at the 75 top, for the purpose set forth.

2. In an electrolytical apparatus, the combination, with the melting-pot and one of the electrodes and a tubular support for said electrode, having a discharge-pipe connected 80 therewith, of a bell-shaped pole-cell constructed of refractory material and with double walls inclosing a chamber that is open at top, said cell being connected with the support below the discharge-pipe, substan- 85 tially as and for the purpose specified.

3. In an electrolytical apparatus, the combination, with the melting-pot and one of the electrodes, of a tubular support for said electrode, a discharge-pipe connected with said 90 support, and a cell suspended therefrom and constructed with double walls inclosing a chamber that is open at top, for the purpose set forth.

In testimony whereof I affix my signature in 95 presence of two witnesses.

LUDWIG GRABAU.

Witnesses:

MAX EPSTEIN,
 W. KESSLER.