

UNITED STATES PATENT OFFICE.

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ELECTROLYSIS OF FUSED ALKALINE CHLORIDS.

No. 868,670.

Specification of Letters Patent.

Patented Oct. 22, 1907.

Application filed June 13, 1905. Serial No. 265,025.

To all whom it may concern:

Be it known that we, FRANZ VON KÜGELGEN, a subject of the German Emperor, and GEORGE O. SEWARD, a citizen of the United States, both residing at Holcombs Rock, in the county of Bedford and State of Virginia, have jointly invented certain new and useful improvements in the Electrolysis of Fused Alkaline Chlorids, of which the following is a specification.

In the production of the alkali group of metals by the electrolysis of their fused chlorids, a main difficulty is in keeping the temperature of the electrolyte so low that there will be no tendency for the metal formed to dissolve therein and, reaching to the anode, recombine with the chlorine. The higher the fusion point of the electrolyte used, the narrower are the limits between which it is necessary to keep the temperature. A mixture of chlorids has been proposed for the purpose of reducing the melting point of the electrolyte.

The present invention is based upon the discovery that mixtures of alkaline-chlorids with fluorids have very low melting points, and are therefore especially suitable for electrolysis. The decomposition voltage of the fluo-
rid used must be higher than the decomposition voltage of the chlorid which it is desired to decompose. One or more fluorids may be used as the case demands.

According to our invention we use with the alkaline chlorid a fluo-
rid of higher decomposition voltage, such as an alkaline fluo-
rid or an alkali-earth fluo-
rid, or preferably a mixture of both; but a mixture of other fluorids may be used. As an example, we will describe the production of metallic sodium by the electrolysis of sodium-chlorid. In this case we use sodium fluo-
rid and calcium fluo-
rid as the flux and the mixture of sodium-chlorid and fluorids is subjected to electrolysis in a suitable vessel, using preferably a carbon anode and an iron cathode and collecting the sodium in such manner that it will not be burned by the air. The proportions may be varied, and we have found that 15 parts of fluorids to 100 parts NaCl form a very fluid and effective electrolyte.

Sodium is separated at the cathode and chlorine at the anode, the fluo-
rid remaining practically unchanged if the voltage is kept sufficiently low. Sodium-chlorid is fed continuously as needed to replace that decomposed, and the process is continuous. This method has the advantage over the use of mixed chlorids that, even if some of the fluo-
rid is decomposed, we get only sodium at the cathode. We may vary the process by using with the sodium chlorid an alkali-earth fluo-
rid, as calcium fluo-
rid.

Our invention is applicable to the production of potassium and other alkaline metals.

In practicing our invention any suitable electrolytic cell may be used, and the process may be carried out in any known way, and any of the precautions and manipulations known to those skilled in electrolysis may be employed.

We claim as our invention:—

1. The process which consists in electrolyzing a mixture of an alkaline chlorid with a fluo-
rid of higher decomposition voltage.
2. The process which consists in electrolyzing a mixture of sodium chlorid with a fluo-
rid or fluorids of higher decomposition voltage.
3. The process which consists in electrolyzing a mixture of an alkaline chlorid with an alkaline fluo-
rid and an alkali-earth fluo-
rid.
4. The process which consists in electrolyzing a mixture of an alkaline chlorid with an alkali-earth fluo-
rid.
5. The process which consists in electrolyzing a mixture of an alkaline chlorid with sodium fluo-
rid and calcium fluo-
rid.
6. The process which consists in electrolyzing a mixture of sodium chlorid with sodium fluo-
rid and calcium fluo-
rid.

In witness whereof, we have hereunto signed our names in the presence of two subscribing witnesses.

FRANZ VON KÜGELGEN.
GEORGE O. SEWARD.

Witnesses:

F. VON BIDDER,
J. H. WEBB.