M. WILDERMANN.

ELECTROLYTIC CELLS FOR THE ELECTROLYSIS OF ALKALINE SALTS.

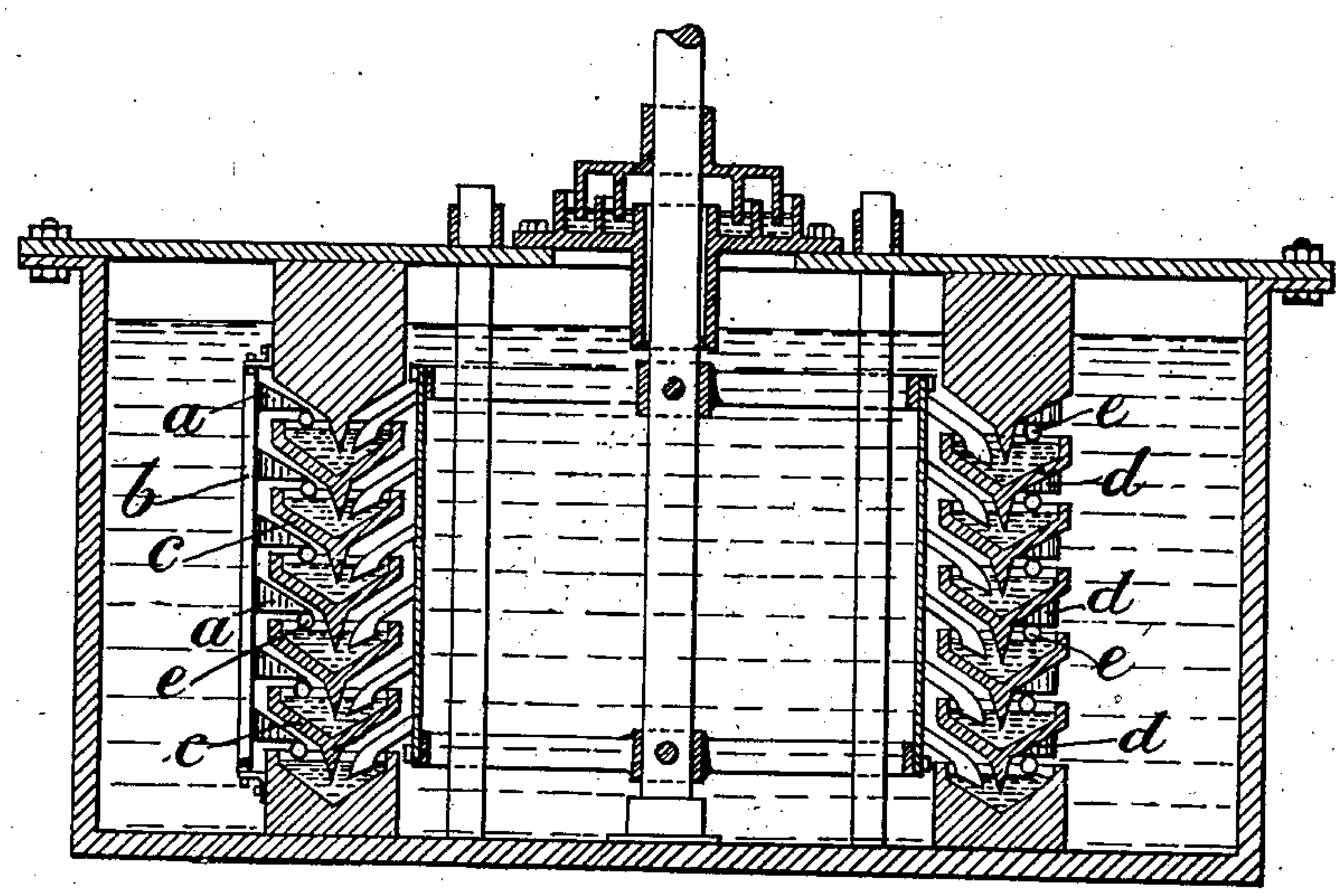
APPLICATION FILED DEC. 10, 1910.

998,063.

Patented July 18, 1911.

2 SHEETS—SHEET 1.

Fig.1.



Attest.
Bent M. Stahl.
Edward N. Sarton

Inventor.
Meyer Wildermann.
by Spear, Middleton, Donaldson & Spear
Attys.

M. WILDERMANN.

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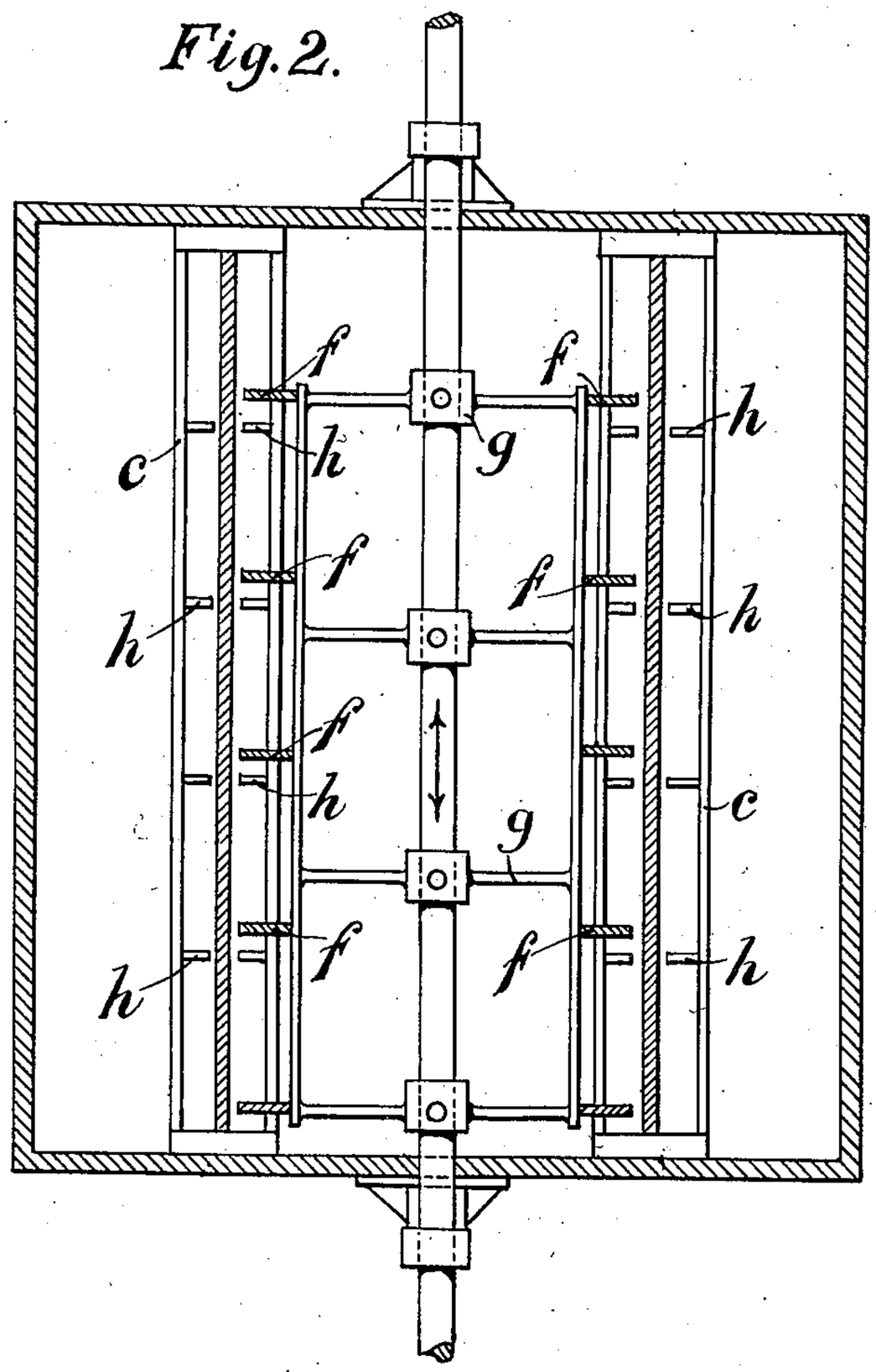
Fig. 2.



Attest.

Bert. Th. Stahl.

Edward N. Santee

Inventor.

Meyer Wildermann.

by Spear, Middleton, Donnelan & Spear

Attys.

UNITED STATES PATENT OFFICE.

MEYER WILDERMANN, OF EALING, LONDON, ENGLAND.

ELECTROLYTIC CELLS FOR THE ELECTROLYSIS OF ALKALINE SALTS.

998,063. Specification of Letters Patent. Patented July 18, 1911.

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To all whom it may concern:

Be it known that I, MEYER WILDERMANN, chemist, a subject of the Czar of Russia, and resident of 10 Elers road, Ealing, London, W., England, have invented certain new and useful Improvements in Electrolytic Cells for the Electrolysis of Alkaline Salts, of which the following is a specification.

In Letters Patent No. 741864 an electrolytic cell with stagnant or stationary mercury cathode has been described, in which the mercury is contained in superimposed troughs. Within the troughs carbons float on the caustic side. Now it has been experienced that if these troughs are worked with high current densities, so that a great gas development takes place in the trough, and especially if, in consequence of the employment of many superimposed troughs, a gas current is set up on the alkaline hydrate side, the little carbons in the troughs are moved too far away from the mercury, and are even thrown out, and that in consequence of this it may even happen that the process cannot be carried out any further. On the other hand, the surface of the mercury rises and falls in accordance with the unavoidable alterations in the specific gravities of the solutions at the chlorin- and the alkaline hydrate side. The little carbons, therefore, must also be able to freely move up and down, so as to remain on the mercury. In practical working a free space of about 2–3 mm. is sufficient for this movement. According to the invention, arrangements, examples of which are shown in the drawing, are used for this purpose.

Figure 1 represents a longitudinal section through a circular cell. Fig. 2 is a plan view of a rectangular cell.

In order to prevent the falling out of the little carbons for instance bars *b* provided with suitable teeth *a* are employed, as shown in Fig. 1 on the left hand side, or the troughs *c* themselves are provided at suitable intervals with small noses *d*, as shown in Fig. 1 on the right hand side, so as to keep the little carbons *e* in their positions. Especially in circular cells also perforated carbons can be drawn upon a wire, and they can then be kept in their positions, by a sufficient number of toothed bars or by projections on the troughs. Perforated or non-perforated carbons can, for the same purpose, also be fastened to small weights, which would keep them in position, the little weights being covered with ebonite. The little carbons themselves are wound with wire, as is well-known, in order to produce electrical contact with the mercury.

In electrolytic cells of the type described it is further essential that the mixing action of the stirrers upon the amalgam only takes place at the chlorin side and that the amalgam, which is only mixed at the chlorin side is not mechanically transported from the decomposing chamber into the combining chamber by a movement imparted by the stirring blades. The amalgam, on the contrary, shall be transported from beneath the rib of the trough to the surface of the mercury on the NaOH side, in consequence of its buoyancy. With this working of the stirrers, which relates to the bodily transmission of the amalgam from the chlorin side to the NaOH side, and which assumes a sufficient mixing action for mixing the amalgam on the chlorin side as homogeneously as possible, one point however, has not been sufficiently taken into consideration. The amalgam, namely, must not only not be bodily moved from the chlorin side to the NaOH side, but the mercury must not be moved on the NaOH side along the trough or the formation of waves will result in the same, especially along the rib providing the seal, and to insure the cell having on the NaOH side along the rib practically a stagnant cathode, whereas the movement of the cathode on the chlorin side is unavoidable. The above is necessary on the one hand, to securely prevent the carbons being removed too far from the mercury or from falling out altogether, and on the other hand to prevent the passage of liquid from one compartment to the other in consequence of the small seal on the rib, thereby to avoid the NaOH being impurified by salt and especially the passage of the alkaline hydrate solution to the chlorin side and the formation of hypochlorites, which would destroy the anodes, and to prevent the decreased efficiency connected

therewith. It is evident that the attainment of this object is opposed to the attainment of the other object, namely to thoroughly mix the amalgam on the chlorin side, because the first requires that the stirrer moves as little as possible in the mercury, whereas the second requires the opposite, namely that it moves as much as possible and thoroughly mixes the amalgam.

As for successfully attaining the last purpose only the mixing and not the movement of the mercury is of importance, the said double purpose, namely the sufficient mixing of the amalgam with a movement of the mercury as restricted as possible is attainable. If, for instance, the number of the stirring arms *f* is doubled, then the stirrer *g* has in the same time to pass only half the distance, and in consequence of this the stirring arms *f* pass the amalgam just as often as before and mix the amalgam in the same way as before: however, they only move the same half the distance. The impact of the stirrers against the mercury and the progressive movement of the latter caused thereby is considerably lessened in this manner, the progressive movement of the mercury being further lessened at smaller distances when reversing the movement of the stirrers, by the surfaces of the stirrers themselves. In the same manner small ribs *h* can be arranged in suitable distances within the trough at the chlorin side or at the chlorin- and the alkaline hydrate side, in order to prevent the progressive movement of the mercury. In the same manner small ribs can be employed at the bottom of the trough instead of above on the chlorin side alone or on the chlorin and caustic side, or toothed bars can be employed at suitable distances on the chlorin or chlorin- and caustic side. In every case, however, the number of the stirrers and of the divisions in the troughs has to be chosen in such a manner that with a sufficient mixing of the amalgam necessary for a high efficiency the mercury at the alkaline hydrate side practically does not show any wave movement at the lower rib of the trough, but has a smooth surface.

What I claim as new and desire to secure by Letters Patent is:—

1. In electrolytic cells for the electrolysis of alkaline salts provided with a mercury cathode contained in superimposed troughs, with division ribs dipping into the mercury, with stirrers for mixing the mercury and amalgam on the anode side, with carbons floating on the mercury on the cathode side the provision of means for preventing the carbons from rising over a certain height in the troughs.

2. In electrolytic cells for the electrolysis of alkaline salts provided with a mercury cathode, contained in superimposed troughs, with division ribs dipping into the mercury, with stirrers for mixing the mercury and amalgam on the anode side, with carbons on the mercury on the cathode side, the provision of means for preventing wave movements of the mercury on the cathode side along the trough at the lower rib.

3. In electrolytic cells for the electrolysis of alkaline salts provided with a mercury cathode, contained in superimposed troughs, with division ribs dipping into the mercury, with stirrers for mixing the mercury and amalgam on the anode side, with carbons on the mercury on the cathode side, limiting supports for preventing the carbons from rising over a certain height in the troughs and means for preventing wave movements of the mercury on the cathode side along the trough.

4. In electrolytic cells for the electrolysis of alkaline salts provided with a mercury cathode, contained in superimposed troughs with division ribs dipping into the mercury, with stirrers for mixing the mercury and amalgam on the anode side, with carbons on the mercury on the cathode side, the provision of small weights for preventing the carbons from rising over a certain height in the troughs, and of means for preventing wave movements in the mercury on the cathode side along the trough at the lower rib of the trough.

5. In electrolytic cells for the electrolysis of alkaline salts provided with a mercury cathode, contained in superimposed troughs with division ribs dipping into the mercury, with stirrers on the anode side for mixing the mercury, with carbons placed on the mercury on the cathode side, the provision of means for preventing the carbons from rising over a certain height in the trough, and means for preventing the mercury on the cathode side from receiving wave movements along the trough, said means comprising surfaces limiting the movements of the mercury within the troughs.

6. In electrolytic cells for the electrolysis of alkaline salts provided with a mercury cathode, contained in superimposed troughs with division ribs dipping into the mercury, with stirrers on the anode side for mixing the mercury, with carbons placed on the mercury on the cathode side, the provision of means for preventing the carbons from rising over a certain height in the trough, and means for preventing the mercury on the cathode side from receiving wave movements along the trough, said means comprising projections in the troughs.

7. In electrolytic cells for the electrolysis of alkaline salts provided with a mercury cathode, contained in superimposed troughs with division ribs dipping into the mercury, with stirrers on the chlorin side for mixing the mercury, with carbons placed on the mercury on the caustic alkali side, the pro-

vision of means for preventing the carbons from rising over a certain height in the trough, and means for preventing the mercury on the caustic side from receiving wave movements along the trough, said means consisting in choosing the number of stirrers that no wave movement will result.

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

MEYER WILDERMANN.

Witnesses:
FRIEDRICH EDELMANN,
JULIUS OPPENHEIMER.