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ELECTRODE FOR ELECTROLYTIC CELLS

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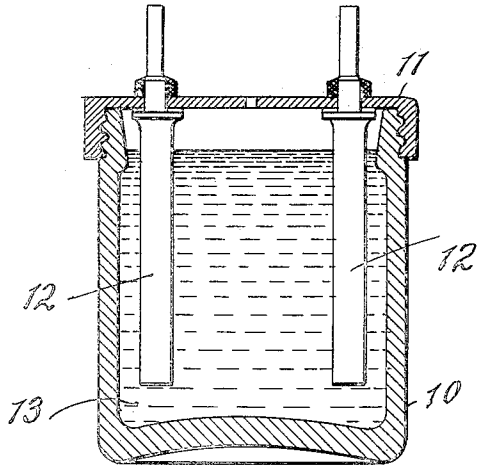

Inventor:
Ernest F. Lundeen.
Kerr Hudson & Kent
Attys

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UNITED STATES PATENT OFFICE

ERNEST F. LUNDEEN, OF CLEVELAND HEIGHTS, OHIO, ASSIGNOR TO WILLARD STORAGE BATTERY COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF WEST VIRGINIA

ELECTRODE FOR ELECTROLYTIC CELLS

Application filed January 31, 1927. Serial No. 164,663.

This invention relates to electrolytic cells and particularly to an improved electrode for use in cells employed as rectifiers.

Considerable effort has been expended towards increasing the life of electrolytic cells used as rectifiers, since deterioration of the electrolyte and of the electrodes is commonly quite rapid. Working upon the problem of reducing the deterioration of a film-forming aluminum electrode, Mr. Campbell C. Carpenter has discovered and covered in U. S. Letters Patent No. 1,600,397, issued September 21, 1926, an electrolyte which was a great improvement over those previously used. The electrolyte described in the said patent contains a citrate such as citric acid.

I have found that electrolytes of this character, while improving the efficiency and life of the cell, gradually attack chemically the non-film-forming electrode which is ordinarily composed of lead, and while this chemical action is not rapid, nevertheless it does, in the course of time, become sufficient to hasten the decomposition of the citric acid or other material for the same purpose during idle periods and to cause the metal of the electrode to be carried over electrolytically onto the film-forming electrode. Where the material of the non-film-forming electrode is lead, the coating so formed on the aluminum electrode during the periods when the rectifier is idle interferes with the functioning of the rectifier. For instance, I have found that after such periods of idleness an appreciable length of time is required, sometimes as much as five minutes, before rectification actually begins. When iron or steel is employed instead of lead, the chemical action referred to is less pronounced. With iron or steel of ordinary character, however, another difficulty is encountered, namely, the formation of an explosive gas during periods of rectification, a hazard which is great enough to make lead preferable to iron for commercial use.

Having come to a realization of the above facts, I made the discovery that if an alloy of iron with a considerable proportion of chromium be employed as the material for the non-film-forming electrode no explosive gas is given off, and, furthermore, the electrode is not attacked by the electrolyte when the cell is idle and the decomposition of the electrolyte is accordingly much slower, all of which results in greatly increased efficiency and longer life of the cell. Steel rather than iron may be employed, but iron makes the better electrode, in other words, the carbon content of the alloy should be low for best results. The formula which I prefer at the present time is substantially as follows:

Iron ---------- 86.85 parts,
Carbon ---------- .15 parts, and
Chromium ---------- 13 parts, by weight.

Although my improved electrode is particularly advantageous when used with an electrolyte such as that disclosed in the Carpenter patent above referred to, it does, however, resist harmful chemical action of any kind as distinguished from electrolytic action, and, therefore, has a quite general application.

In the accompanying drawing wherein I have shown one of the numerous forms of cells which may be employed advantageously, the single figure is a sectional view, and in it 10 represents the jar, 11 the cover therefor, 12 the electrodes which are supported by the cover, and 13 represents the electrolyte.

Changes may be made in the ingredients employed and in the proportions of the ingredients, and I therefore aim in my claims to cover all modifications which do not involve a departure from the spirit and scope of my invention.

Having described my invention, I claim:

1. In an electrolytic cell, a suitable electrolyte, a film-forming electrode, and a ferrous electrode containing substantially thirteen per cent by weight of chromium.

2. In an electrolytic cell, a suitable electrolyte, a film-forming electrode, and a ferrous electrode containing more than ten per cent by weight of chromium.

3. In an electrolytic cell, a suitable electrolyte, a film-forming electrode, and a ferrous electrode containing a relatively small percentage of carbon and more than ten per cent by weight of chromium.

4. In an electrolytic cell, an electrolyte

which will combine under electrolytic action with a film-forming electrode and containing a substance to retard coagulation of the salt resulting from the combination of the electrolyte with the film-forming electrode, a film-forming electrode, and an electrode composed of an iron chromium alloy.

5. In an electrolytic cell, an electrolyte containing citric acid, a film-forming electrode, and a ferrous electrode containing more than ten per cent by weight of chromium.

In testimony whereof, I hereunto affix my signature.

ERNEST F. LUNDEEN.