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APPARATUS FOR OBTAINING PERSALTS, E. G. PERSULPHATES, BY ELECTROLYSIS
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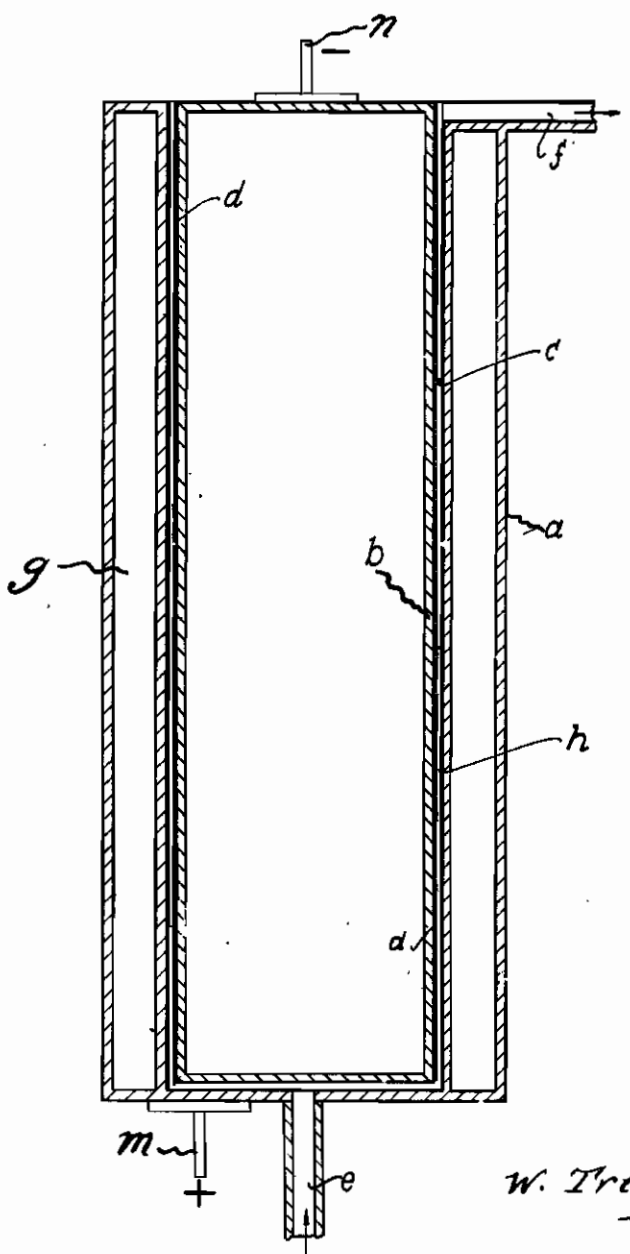

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ALIEN PROPERTY CUSTODIAN

APPARATUS FOR OBTAINING PERSALTS, E. G. PERSULPHATES, BY ELECTROLYSIS

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This invention relates to an apparatus for obtaining persalts, e. g. persulphates, in electrolytic cells of the known structural kind in which the cathode and the anode are arranged within one another and the cell wall is formed of the anode or of the cathode, the electrolyte being in the compartment between the anode and the cathode which is traversed by the current.

In such cells operations are carried out either with a diaphragm or the cathode surface is kept particularly small with respect to the anode surface. In the apparatus with a diaphragm the compartment between the anode and the cathode is divided into two spaces. The distance between the electrodes must here be substantially greater than when a diaphragm is absent since for reasons of strength this must have a fairly great wall thickness. Because of the diaphragm and the thicker liquid layer the electric resistance is considerably greater and as a result the consumption of elcctric energy is higher than when the diaphragm is absent. If in the latter case the cathodic decomposition is prevented by diminution of the cathode surface, whereby parts of the cathode surface may be covered in known manner by a non-conductor, then the polarisation and decomposition of the persalts can be prevented only by high current strengths and a greater distance between the anode and the cathode.

It is already known in the case of electrolytic cells of other structural kind, that is to say with cathode and anode not arranged within one another, that by wrapping porous filaments of non-conducting and chemically unattackable fibre round the cathode to sufficient winding thickness the decomposition at the cathode can be prevented even in strongly acid solution. Heretofore for preparing ammonium persulphate weakly acid solutions have been used (solutions of ammonium bisulphate in water) and the cathode consisting of a carbon rod of about 20 mm. diameter tightly wound with an asbestos cord 3 mm. in diameter. In order to make ammonium persulphates in strongly acid solution, for example one from which hydrogen peroxide can be obtained by distillation without addition, such an apparatus has not heretofore been used since the opinion was held that the protective layer around the cathode would then have to be substantially thickened and consequently an uneconomically high voltage would be required.

It has now been found that operations may be carried out with satisfactory yields with a substantially thinner winding for the cathode even in the case of a strongly acid solution (e. g. of 300 g. of ammonium bisulphate in one litre of sulphuric acid of specific gravity 1.2) if according to the invention a current concentration is employed exceeding 1000 amps per litre of electrolyte.

Further according to the invention in order to prevent decomposition at the cathode of the persalt formed at the anode filaments or threads are employed for wrapping round the cathode consisting of non-conducting fibres, for example slag wool or glass wool, which are not attacked by the constituents of the electrolyte, lie in one direction and do not felt together. In this respect such threads or filaments differ advantageously from those heretofore used, more particularly from asbestos filaments. Further they have the advantage that they do not swell in aqueous solution and also retain their rigidity in the wet state. More particularly the fibres of glass wool filaments are not felted together, they lie in one direction and permit the hydrogen forming at the cathode to pass through everywhere. The electrical resistance of the cells in the case of asbestos windings, especially in weakly acid solutions, becomes greater after a time since the pores between the close windings become choked with deposit. This drawback does not occur in the case of glass wool filaments or threads in strongly acid solution.

Finally according to the invention the distance between the anode and cathode amounts to only a few millimetres, e. g. 2.5 mm., but at most 5 mm. Of this distance the protective layer around the cathode takes up about 1.5 mm. and the rest is occupied by the fluid compartment between protective layer and anode. The hydrogen bubbles appearing between the glass wool threads or fibres reduce the space for the electrolyte because of their volumc, e. g. to one third. The hydrogen bubbles effect an extremely vigorous mixing of the electrolyte; as a result they prevent parts of the electrolyte remaining for a fairly long time at one plaee in the cell and decomposition of the persalts formed at the anode due to superheating. In this apparatus the decomposition and superheating is further prevented by the fact that the electrolyte continuously flows through the cell. Owing to the fact that the space for the electrolyte is chosen extremely small and the hydrogen bubbles reduce it further, a current concentration exceeding one thousand amps per litre is maintained.

In the present apparatus hollow metal electrodes are used which can be cooled in known manner. The cathodes are so arranged in the cell that the distance between anode and cathode is everywhere equally large.

The employment of the invention is not limited to only strongly acid solutions; on the contrary it may be employed just as well in the case of weakly acid and neutral solutions.

WERNER TRINIUS.