

# UNITED STATES PATENT OFFICE.

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## DIAPHRAGM AND METHOD OF MAKING THE SAME.

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Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, HEINRICH HIRTZ, a subject of the Emperor of Germany, residing at No. 5 Kingdon road, West Hampstead, in the county of Middlesex, England, chemist, have invented certain new and useful Improvements in Diaphragms and Methods of Making the Same, of which the following is a specification.

Diaphragms for electrolytic cells made of various kinds of fabric such as asbestos cloth, nitrated cotton cloth or the like are satisfactory in respect of the fact that they offer comparatively little resistance to the passage of the electric current, but they are not efficient in respect of their permeability to electrolytes which are to be kept separate.

My invention relates to fabrics and a method of modifying the same when designed to be used for the purpose in question by impregnating them successively and if necessary repeatedly with a solution of a double cyanid or a mixture of double cyanids and a solution of a metallic salt or mixture of metallic salts, the double cyanid and metallic salt being such that when the solutions meet in the fabric a deposit is formed in the pores thereof which has the desired effect on the permeability of the fabric.

Particularly suitable for the invention are the alkali ferrocyanids and ferricyanids. For instance a textile diaphragm of asbestos cloth may be dipped into a solution of alkali ferrocyanid or ferricyanid and then into a solution of copper sulfate.

When the diaphragm is to be used for an electrolytic cell wherein a solution of a metallic salt that forms an insoluble double cyanid is to be electrolyzed it is preferable to use a solution of this salt as one of those with which the cloth is to be impregnated and a simple manner of doing this is to saturate the cloth first with a concentrated solution of alkali ferrocyanid or ferricyanid and then either before or after it has dried, to place it in position in the solution in the electrolytic cell, whereupon the desired deposition occurs while the cloth is in place.

Having thus described the nature of my said invention and the best means I know of carrying the same into practical effect I claim:—

1. A process for modifying textile fabrics that are to be used as diaphragms in electrolytic cells consisting in impregnating the fabric successively with a solution of a dou-

ble cyanid and a solution of a metallic salt that forms an insoluble compound with the said cyanid, substantially as described.

2. A diaphragm for use in an electrolytic cell consisting of a suitable textile fabric having deposited in it an insoluble double cyanid, substantially as described.

3. A diaphragm for use in an electrolytic cell wherein a solution of a metal yielding an insoluble double cyanid is to be electrolyzed, consisting of a suitable textile fabric having deposited in it such double cyanid of the said metal, substantially as described.

4. The process of manufacturing diaphragms for electrolytic cells which consists in subjecting a suitable textile fabric to the combined action of a soluble double cyanid and a metallic salt, capable of uniting with the cyanid and forming a semipermeable membrane, substantially as described.

5. The process of manufacturing diaphragms for electrolytic cells which consist in first impregnating a suitable textile fabric with a solution of a double cyanid and then subjecting the same to the action of a metallic salt, capable of uniting with the cyanid and forming a semipermeable membrane substantially as described.

6. The process of manufacturing diaphragms for electrolytic cells from a suitable textile fabric which consists in first treating the fabric with a solution of a double cyanid and subsequently with a solution of a metallic salt, capable of uniting with the cyanid and forming a semipermeable membrane substantially as described.

7. The process of manufacturing diaphragms for electrolytic cells which consists in treating a suitable textile fabric with an alkali ferrocyanid and subsequently with a metallic salt capable of uniting with the ferrocyanid and forming a semipermeable membrane, substantially as described.

8. The process of manufacturing diaphragms for electrolytic cells from a suitable textile fabric which consists in incorporating in such fabric a semipermeable membrane of an insoluble double cyanid, substantially as described.

9. The process of manufacturing diaphragms for electrolytic cells from a suitable textile fabric which consists in incorporating in such fabric a semipermeable membrane of ferrocyanid of copper, substantially as described.

10. A diaphragm for electrolytic cells com-

prising a textile fabric having incorporated therein a semipermeable membrane of an insoluble double cyanid, substantially as described.

5 11. A diaphragm for electrolytic cells comprising a textile fabric having incorporated therein a semipermeable membrane of ferrocyanid of copper, substantially as described.

10 12. A diaphragm for use in electrolytic cells, consisting of a textile fabric containing an insoluble chemical agent, said agent being one of a plurality of chemical agents which when combined produce a semipermeable  
15 membrane, substantially as described.

13. A diaphragm for use in electrolytic cells, consisting of a textile fabric containing a double cyanid, substantially as described.

14. A diaphragm for use in electrolytic cells, consisting of a textile fabric containing an alkaline cyanid of iron, substantially as described. 20

In testimony whereof I have signed my name to the specification in the presence of two subscribing witnesses.

HEINRICH HIRTZ.

Witnesses:

T. J. OSMAN,

JOSEPH MILLARD