

UNITED STATES PATENT OFFICE.

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GALVANIC CELL.

1,243,111.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, JOHN F. SANDERS, a citizen of the United States, residing in the city of Roseburg, county of Douglas, and State of Oregon, have invented certain new and useful Improvements in Galvanic Cells, of which the following is a specification.

My invention relates to galvanic cells, and more particularly to improvements in cathodes for galvanic cells.

The main object of my invention is to provide an improved cathode for galvanic cells which shall be capable of generating more electric current, and which is practically indestructible, in that it can be repeatedly and quickly depolarized without any perceptible damage thereto, thus making it as good as new after each depolarization.

I have discovered that palladium and rhodium possess peculiar properties which in a very special way adapt them for use in the manufacture of cathodes for galvanic cells, and so far as I am aware they have never before been so used. Palladium and rhodium have substantially the same properties or characteristics, with the exception that rhodium when used alone will not absorb or occlude hydrogen gas to the extent that palladium will, but by combining rhodium with palladium in the manufacture of a cathode, the rhodium makes possible a much quicker depolarization of the cathode than when the cathode is made of palladium alone. This is due to the peculiar catalytic property of rhodium when used in combination with palladium, and while an improved cathode can be made of palladium alone, my preferred construction is a combination of the two for the reason just mentioned.

A cathode made of a combination of palladium and rhodium can be used in exactly the same way as are other cathodes, with greatly increased efficiency and with the special advantage that it can be more quickly, and repeatedly depolarized without affecting its usefulness and efficiency.

Another object of my invention is to provide an improved form of cathodes, whether made of a combination of palladium and rhodium, or of other suitable metals, that is, to so construct the cathode that the greatest possible surface is secured for absorbing or occluding hydrogen gas, for it is well-known that the capacity of any galvanic cell to produce electric current depends absolutely upon

the ability of the cathode to absorb hydrogen, that is, the cathode which will absorb or occlude the greatest amount of hydrogen will develop the greatest amount of electric current.

My invention will be clearly understood by a description of the preferred application thereof. To manufacture my improved cathode, whether of a combination of palladium and rhodium, or of palladium alone, the palladium, or both, as the case may be, is fused, or melted, with a sufficient quantity of zinc to dissolve the same, zinc being used because it will fuse at a comparatively low temperature and will then convert the palladium and rhodium into the same molten condition, and also because it can afterward be dissolved out of the cathode. This molten mixture is then poured into suitable forms, such as may be desired for the cathode, and after it is set, or hardened, it is subjected to a bath of diluted sulphuric acid which dissolves, or eats out, the zinc, thereby leaving the cathode porous, or of a sponge-like form. In using this construction it is necessary that the cathode plate be comparatively thin so that all of the zinc in the composition will be dissolved. Otherwise the zinc would cause certain local or disturbing currents in the cathode.

In order to make a thicker, or heavier cathode of my newly discovered metals, and which shall embody my improved construction, as where greater endurance is required in the battery, I dissolve the palladium in any of the acids capable of dissolving the same, preferably acquir-regia, then add sufficient alkali to make an alkaline solution, and sufficient pure alcohol to hold the alkali in solution, and then cause the precipitation of the palladium by the addition of chlorid of ammonia. This resulting precipitate is palladium ammonia chlorid, or palladium black.

If this heavier cathode is to be made of the combination of the palladium and rhodium, which is my preferred construction, this precipitate is removed and rhodium in finely powdered condition, is combined therewith, the composition being mixed, or kneaded, into a homogeneous mass, and then pressed into the desired mold to secure the form desired for the cathode. The composition is next heated, or ignited, sufficiently to cause the evaporation of the ammonia and chlorine, which leaves a palladium-rhodium cathode

of porous or sponge-like construction embodying my invention.

A cathode made of palladium and rhodium, according to my invention, can be depolarized by ignition in a very few minutes, and this process of burning out the hydrogen from the cathode may be repeated without any apparent damage to the cathode, and, on the other hand, it seems to improve the cathode by increasing its ability to occlude hydrogen. As stated, the combination of rhodium with the palladium in the manufacture of the cathode facilitates, or makes possible this quicker depolarization of the

cathode. My improved cathodes can also be quickly depolarized by submersion in ammonium persulfate, or other solution which is capable of giving off oxygen, or they can be depolarized by an electric current in the same manner that cathodes now in use are depolarized.

I claim:

A cathode for galvanic cells made of a combination of palladium and rhodium.

JOHN F. SANDERS.

Witnesses:

ALICE BLACK,
O. P. CUSHOW.