

UNITED STATES PATENT OFFICE.

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PROCESS OF PRODUCING CHEMICAL COMPOUNDS BY ELECTROLYSIS.

SPECIFICATION forming part of Letters Patent No. 602,872, dated April 26, 1898.

Application filed July 6, 1897. Serial No. 643,540. (No specimens.)

To all whom it may concern:

Be it known that we, JOSEPH W. RICHARDS, a subject of the Queen of Great Britain, and CHARLES W. ROEPER, a citizen of the United States, residents of Bethlehem, in the State of Pennsylvania, have invented a certain new and useful Improvement in Processes for the Production of Chemical Compounds by Electrolysis, whereof the following is a specification.

Our invention relates to those processes in which a desired compound is obtained by the electrolysis of a solution containing one or more of the elements necessary to form the compound in connection with an electrode which under the electrolytic attack supplies the remaining element or elements, the resultant compound being insoluble in the electrolyte.

The invention consists in the employment of an alternating current in conjunction with electrodes of similar composition in such process.

In an application filed July 6, 1897, Serial No. 643,542, we have described a process for the production of metallic sulfids by employing as an anode the metal whose sulfid it is desired to obtain in the electrolysis of a solution containing a hyposulfite salt, the sulfid sought for being thus formed at the anode and precipitated therefrom. It is convenient to select this process in order to illustrate the application of our present invention. Thus, for example, in the formation of cadmium sulfid we prepare two electrodes of metallic cadmium and employ as electrolyte a solution of sodium hyposulfite—say ten per cent. An alternating current is then passed through the solution with the electrodes as poles. As a result, at each electrode, while it is acting as an anode, there is formed an insoluble sulfid of cadmium, while at the same electrode when acting as a cathode hydrogen is set free.

Important advantages result from our invention. The production of the insoluble precipitate and the hydrogen in alternating succession at the electrodes facilitates the loosening of the precipitate from the metal pole by reason of the mechanical action of the bubbles of hydrogen, so that the sulfid is disengaged as it is formed, falling to the bot-

tom of the vessel and thus enabling the electrodes to constantly present a clean metal surface to the attack of the electrolyte. Another advantage is the substantially uniform consumption of both electrodes and the consequent avoidance of unnecessary resistance, such as occurs when there is any unequal or unilateral attack. It is to be understood in this connection that by an "alternating current" we mean one in which the poles are systematically reversed at short intervals, either as an incident to the production of the current or otherwise.

It is a necessary limitation of our process that it can only be used where as a result of the electrolysis an element is liberated or a compound derived at one of the poles which under the conditions designated is inert with respect to the elements or compounds liberated or formed at the other. These conditions usually exist wherever gases are liberated or insoluble precipitates are formed at one pole. Under these conditions the precipitate formed when the current passes in one direction is not decomposed or dissolved, but is simply mechanically dislodged when the current passes the other way. Subject, however, to this limitation our invention is applicable to all processes for the electrolytic production of precipitated compounds formed by the combination of one or more elements from an electrolyte with one or more elements from the electrodes.

We are aware that it has been proposed to use identical electrodes in processes for forming precipitates in order that when one electrode has been substantially consumed the current may be mechanically reversed, so as to transfer the region of consumption to the other pole. By this method, however, the advantages of our invention are not attained. There is no continuous loosening of the precipitate from the electrode by the mechanical action of the gaseous products, and the consumption of the electrodes is so unequal as to interpose artificial and unnecessary resistance into the circuit, which results in an undue waste of electrical energy and lack of uniformity in the conduct of the process.

We are also aware that it has been proposed to use an alternating current in connection

with the electrolytic deposition of gold from its solution. As there is here no precipitation of a compound and no consumption of the electrodes the advantages which result from our invention are not present. Our invention is confined, as has been above stated, to electrolytic processes for obtaining compounds some elements of which are developed from the electrolyte and some from the consumption of the electrode as distinguished from those processes in which the electrolysis precipitates a metallic element from the electrolyte and electroplates it upon one of the poles.

15 Having thus described our invention, we claim—

1. The process of obtaining compounds electrolytically, which consists in passing an alternating current through electrodes of similar composition immersed in an electrolyte, one or more of whose constituents forms alternately at each electrode, by electrolytic attack thereon, a compound, partially derived from the consumption of that pole, which is

insoluble in either the electrolyte or the products formed at the opposite pole for the time being, and which is precipitated from the electrode of consumption, substantially as described.

2. The process of obtaining compounds electrolytically, which consists in passing an alternating current through electrodes of similar composition immersed in an electrolyte, one or more of whose constituents forms alternately at each electrode by electrolytic attack thereon a compound, partially derived from the consumption of that pole, which is insoluble in the electrolyte, and which is precipitated from the electrode of consumption, while one product of the electrolysis at the opposite pole for the time being is a liberated gas, substantially as described.

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