T. A. EDISON.

CLEANING OF METALLIC SURFACES.

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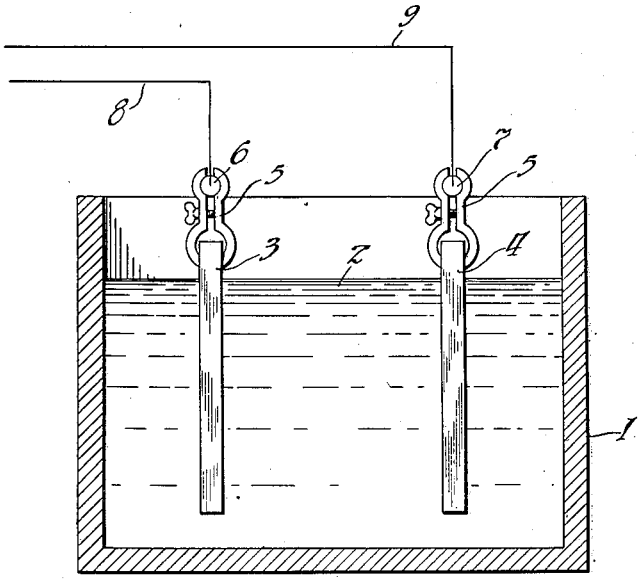
1,369,271. Patented Feb. 22, 1921



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UNITED STATES PATENT OFFICE.

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CLEANING OF METALLIC SURFACES.

1,369,271. Specification of Letters Patent. Patented Feb. 22, 1921.

Application filed July 3, 1919. Serial No. 308,379.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, and a resident of Llewellyn Park, West Orange, Essex county, New Jersey, have invented certain new and useful Improvements in Cleaning of Metallic Surfaces, of which the following is a description.

My invention relates to the cleaning of metallic surfaces and more particularly to the cleaning of the surfaces of metallic objects electrolytically preliminary to subsequent treatment by which the surfaces so cleaned are coated with another metal or material, as, for example, in processes of electro-plating, amalgamating, tinning, galvanizing, enameling, etc., or in the process of coating such a surface with a thin layer or film of a selenide as described in my copending application Serial No. 305,821, filed June 21, 1919, and entitled Electro-plating.

Heretofore in cleaning the surfaces of metallic objects electrolytically, it has been customary to employ an electrolytic cell comprising electrolyte such as a solution of caustic soda, caustic potash or the like, an anode composed of a suitable material which will not dissolve in the electrolyte, and the metal to be cleaned opposed to said anode in the electrolyte as a cathode. With the use of such an electrolytic cleaning solution, however, it often happens that the dirt is not completely removed from the cathode, that is, the metal to be cleaned, and moreover, a black deposit is usually formed on the cathode, probably due to the presence of more or less foreign material in the caustic soda or caustic potash, as it is impossible to obtain the latter in a pure state.

The principal object of my invention is to provide an improved electrolytic cell including an improved electrolyte therefor, whereby metallic surfaces may be quickly and completely cleaned electrolytically, and whereby no deposit of foreign material will be formed on the surfaces so cleaned.

My invention also resides in an improved process for cleaning metallic surfaces electrolytically.

I have discovered that the foregoing results may be obtained upon the passage of a current of sufficient density through an electrolytic cell comprising an electrolyte consisting of a slightly alkaline and nearly saturated solution of a metal of the alkali group, an anode composed of material which will not dissolve in the electrolyte and a cathode consisting of the metal to be cleaned.

In the accompanying drawing the single figure is a diagrammatic view in section of an electrolytic cleaning cell in accordance with my invention.

Referring to this drawing, the cell comprises a suitable tank or receptacle 1 containing an electrolyte 2 consisting of a solution such as described above, an anode 3 composed of a material which is not attacked by the electrolyte, and a cathode 4 consisting of the metal to be cleaned and opposed to the anode 3 in the electrolyte 2. The anode 3 and the cathode 4 are respectively suitably supported, as by means of heavy clamps 5 formed of conducting material, from a pair of bars 6 and 7 of conducting material carried by the tank 1. A pair of conductors 8 and 9, respectively connected with the anode and cathode, serve to supply the cell with current from any suitable source (not shown).

The electrolyte 2 preferably consists of a nearly saturated solution of either sodium sulfate or potassium sulphate rendered slightly alkaline by the addition of a sufficient amount of a hydroxid of a metal of the alkali group, preferably caustic potash or caustic soda; and when such an electrolyte is employed, the anode is preferably formed of pure carbon, such as graphite, which is only slightly attacked by electrolysis in the electrolytic solution. I find that graphite is preferable over other forms of carbon, owing to its insolubility in an alkaline solution when subjected to electrolysis.

In order to effect the cleaning of the surface of the cathode 4 consisting of the metal to be cleaned, a current equivalent to about 150 amperes per square foot of such surface is passed through the cell. The passage of this current results in the evolution of the alkali metal and simultaneously, due to the decomposition of the water in the electrolyte, in the evolution or generation of great quantities of hydrogen gas on the surface of the cathode. This hydrogen gas in detaching itself from the cathode mechanically strips off or detaches the foreign matter so as to leave an absolutely clean surface. This result is facilitated by reason of the fact that oil, grease, dirt and other foreign material are more or less porous so that the

gas has an opportunity of forcibly detaching itself from the surface to carry the foreign material with it. This action is almost entirely mechanical, though the oil and grease are eventually decomposed to a great extent by the alkali. The nascent potassium or sodium evolved in the cell, primarily on the cathode, also reduces any oxid of the metal of which the cathode is formed and which may be present on such cathode, to metal.

When a current of the density above mentioned is passed through the cell, all grease and other dirt and impurities are completely removed from the surface of the metal to be cleaned, that is, from the cathode 4, in from one to five minutes according to the state of cleanliness of said surface. Where a cell such as that shown is employed, both faces of the cathode 4 should be successively opposed to the anode in the operation of the cell, in order to effectively clean the entire surface of the cathode. The same result may, of course, be obtained by using a cell in which the cathode is disposed between a pair of anodes. The cleaned metal or cathode 4 is then removed from the cell and washed, after which it is ready for subsequent treatment, for example, the application thereto of a coating such as a film consisting of a selenide, which may be formed thereon in the manner described in my application above referred to.

Having now described my invention, what I claim as new and desire to protect by Letters Patent of the United States is as follows:

1. An electrolyte for use in an electrolytic cell adapted to be employed for cleaning metals, comprising an alkaline solution of a sulfate of a metal of the alkali group, substantially as described.

2. An electrolyte for use in an electrolytic cell adapted to be employed for cleaning metals, comprising a solution of a sulfate of a metal of the alkali group and a hydroxid of a metal of the alkali group, substantially as described.

3. An electrolyte for use in an electrolytic cell adapted to be employed for cleaning metals, comprising a solution of a sulfate of a metal of the alkali group and a hydroxid of potassium or sodium, substantially as described.

4. An electrolyte for use in an electrolytic cell adapted to be employed for cleaning metals, comprising a nearly saturated solution of a sulfate of a metal of the alkali group containing an amount of a hydroxid of a metal of the alkali group sufficient to render the same slightly alkaline, substantially as described.

5. An electrolytic cell for cleaning metals, comprising an electrolyte consisting of a solution of a sulfate of a metal of the alkali group, an anode formed of graphite, and a cathode consisting of the metal to be cleaned, substantially as described.

6. The method of cleaning a metal electrolytically, which consists in employing the metal to be cleaned as a cathode opposed to a suitable anode in an electrolyte consisting of an alkaline solution of a sulfate of a metal of the alkali group, and passing through the electrolytic cell a current equivalent to approximately 150 amperes per square foot of the surface to be cleaned, substantially as described.

7. The method of cleaning a metal electrolytically, which consists in employing the metal to be cleaned as a cathode opposed to a suitable anode in an electrolyte consisting of an alkaline solution of a sulfate of a metal of the alkali group, and passing through the electrolytic cell for a period of from approximately 1 to 5 minutes a current equivalent to approximately 150 amperes per square foot of the surface to be cleaned, substantially as described.

This specification signed this 24th day of June, 1919.

THOS. A EDISON.