

UNITED STATES PATENT OFFICE.

JEAN HAWTHORNE, OF NEW YORK, N. Y.

METHOD OF CLEANSING METAL.

No. 871,994.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JEAN HAWTHORNE, a citizen of the United States, residing at New York city, New York, have invented certain
5 new and useful Improvements in Methods of Cleansing Metal, of which the following is a clear, full, and exact description.

The object of this invention or discovery is to clean metals without undue rubbing or
10 manual work, and I believe that in essence it consists of electro-chemically cleaning the surface of the article to be operated upon by converting the oxid or sulfid of the metal (which presents a tarnished appearance)
15 into metal. The solution which I use for this purpose is preferably one which will cut or dissolve grease or dirt so that chemical action may uniformly take place on the article, as well as removing such grease or
20 dirt.

Many different kinds of metal may be cleaned by the selection of the proper electrolyte and electrodes, it being a mere chemist's skill that is required after the under-
25 lying key to the situation is disclosed.

I will describe this invention particularly with reference to the cleaning of gold and silver, premising that other metals such as copper, brass, etc. may be cleansed similarly
30 by the selection of the proper electrolyte and electrode. So far as I have gone in my researches, it now seems to me that the electrolytic action must be one set up by the difference of potential existing between the
35 two electrodes of the cell one of which is the article to be cleansed; and I have been unable to secure good results by the use of outside electric potential, but I do not limit myself to this preferred method of securing
40 difference of potential for other means may undoubtedly be used for producing the current for this cleansing effect.

Briefly stated, the process for cleaning gold and silver is as follows:

45 I prefer to use as the anode a receptacle or dish of tin or aluminium, although a plate, metal basket or other form of anode may be used. In the receptacle or surrounding the cathode (metal to be cleaned) I place a comparatively weak but hot solution of soda ash, which in some commercial samples consists of 97% Na_2CO_3 (sodium carbonate)
50 .75% sodium bicarbonate .80% sodium chlorid together with minute traces of other
55 impurities and moisture.

The silver or gold to be cleaned is immersed

in this electrolyte and no action will be apparent while immersed and suspended therein (save that action common to soda ash in solution for cleansing grease and dirt), but
60 so soon as a part of the silver or gold touches or is electrically connected with the metal of the vessel, a primary voltaic cell is produced with the current flowing through the electrolytic solution from the tin or aluminium anode
65 to the silver or gold cathode. Immediately a transformation will take place upon the surface of the silver depending in length of time upon the strength and temperature of the solution. What occurs to the best of my
70 belief is as follows. Ionic tin carrying a + charge is set free in the solution. The solution then contains ions of Na, H and Sn, all +, and $-\text{CO}_3$ and OH. The H and OH are derived by the dissociation of water. The
75 Ag (silver) having a very much less electrolytic solution tension than the Sn tends to collect all the + ions in the solution, but the tin ions are not deposited on the silver, because they replace (in the solution), those
80 ions lost by the solution. Of these the H gives up its charge and escapes as molecular hydrogen. The + charge flows back to the tin outside of the solution and this electrolytic action continues. Now if the silver has
85 upon its surface any tarnish consisting of a sulfid or oxid of silver, the nascent hydrogen reduces it to metallic silver, apparently without removing any of the silver. This is, I believe, the chemical explanation of the electro-
90 chemical part of the cleansing process. There is, as stated before, a certain amount of cleaning due merely to the common action of soda ash upon fat and grease. It will thus be seen that little, (and I have not found
95 that any), of the silver is dissolved or lost, and that no plating effect is produced upon the silver, and though the anode may lose some of its metal, it loses it merely to the solution. It is for this reason that I now
100 believe an outside source of E. M. F. would be impracticable, for with an outside circuit there would be a liability to plate instead of clean the article, which might produce a satisfactory appearance for the time being, but
105 would be disastrous to the article in the long run.

As a general direction I would say that it seems desirable to develop a completely self-contained electric battery. By self-contained I simply mean that no outside E. M.
110 F. be employed. I use the article to be

cleaned as a cathode, an anode of an electrolytic solution tension greater than that of the article to be cleaned. The anode enters the solution without attacking or being deposited upon the silver. Acids should not be used to get the best effect. Salts of the anode carrying a + charge such as SnCl_4 should not be used on account of their liability to plate the silver with tin, and in the case of silver and gold a solution should be employed, such for example as sodium carbonate. I prefer to use my electrolyte warm, but not unduly hot; just warm enough to be comfortable for the hands of the individual cleaning the silver. Unless the solution is made unduly strong, no uncomfortable effect is produced upon the hands. After removing an article from the cleansing solution, when the electrolytic action has brightened its surface, I generally rub it with a soft cloth to remove moisture, first rinsing it as should be done in all dish washing, in clear warm water.

What I claim is:

1. The process of cleaning tarnished silver which consists in placing the silver to be cleaned in an alkaline electrolytic solution adapted to set free hydrogen on the surface of the silver, electrically connecting said silver to an anode of greater electrolytic solution tension than said silver, and generating an electro-motive force between said anode and silver solely because of the difference in tension between the same, said anode being capable of passing into the solution during

the electrolytic action and being there held in solution without plating upon the silver.

2. The process of cleaning tarnished silver which consists in selecting a suitable containing vessel of tin, placing therein a suitable electrolytic solution adapted to set free hydrogen, placing the silver to be cleaned in said solution in electric connection with said vessel, and generating an electro-motive force between the same solely because of the difference of the solution tension of the two metals, whereby hydrogen is set free on said silver and silver sulfid tarnish on said silver is broken down into metallic silver which remains on the surface of the silver.

3. The process of cleaning tarnished silver which consists in selecting a suitable vessel of tin, placing therein a suitable electrolytic solution of sodium carbonate, placing the silver to be cleaned in said solution in electric connection with said vessel, and generating an electro-motive force between the same solely because of the difference of the solution tension of the two metals, whereby hydrogen is set free on said silver and silver sulfid tarnish on said silver is broken down into metallic silver which remains on the surface.

Signed at New York city this 25th day of March 1907.

JEAN HAWTHORNE.

Witnesses:

F. WARREN WRIGHT,
EMERSON R. NEWELL.