

UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN NICKEL-PLATING.

Specification forming part of Letters Patent No. **211,071**, dated December 17, 1878; application filed
November 13, 1878.

CASE C.

To all whom it may concern:

Be it known that I, EDWARD WESTON, of Newark, New Jersey, have invented certain Improvements in Solutions for Employment in Effecting the Electro-Deposition of Nickel, of which the following is a specification:

My improvements relate to the composition of nickel-depositing solutions.

Heretofore the solutions which have been found most useful, and which have been usually employed, have been composed of the double sulphate of nickel and ammonia, or of the double chloride of nickel and ammonium. Both these solutions, under the action of the current, evolve more or less hydrogen, a portion of the ammonium-salt is decomposed, and the metal deposited is always hard and tends to separate in laminæ from the surface on which it has been deposited. This tendency increases as the thickness of the deposit increases.

It is probable that the hardness of the deposit of nickel is to some extent owing to the presence of the hydrogen with which it is associated. The deposit obtained from the double chloride has a peculiarly matted surface, is difficult to polish, and is extremely liable to tarnish on exposure to the air. The deposit obtained from the double sulphate is easier to polish, but is also very hard and inflexible, and if thick is especially liable to separate in laminæ from the surface on which it has been deposited.

It has been found that the solution of the double chloride of nickel and ammonium is better adapted for coating iron with nickel than the double sulphate solution, the latter answering better for brass. In use, both these solutions are gradually changed in their composition. Thus, the ammonium-salt is decomposed by the action of the current, and free ammonia is evolved; the solution becomes richer in nickel, and the amount of the ammonium-salt in the solution gradually decreases. By these changes in the composition of the solution the qualities of the deposited metal, as to color, hardness, and flexibility, are also changed. These changes, which involve serious difficulties in the management of the so-

lution, even for electro-plating purposes, when only a thin deposit is required, have rendered it practically impossible to obtain a thick deposit of nickel, as is required in the case of electrotyping.

My present invention is based upon my discovery that the deposition upon the cathode of sub-salts of nickel is wholly prevented when the solution employed is composed of chloride or sulphate of nickel and a solution of boric acid, or of compounds of boric acid, and also upon my discovery that borate of nickel, although insoluble in water, is very soluble in many of the solutions of the salts of nickel.

I have discovered that the power of boric acid or its compounds to prevent the deposition of sub-salts of nickel on the cathode is so great that solutions which have not been heretofore capable of being practically used, because of the sub-salts of nickel deposited from them, can be made practically effective solutions by the addition of boric acid or of its compounds, even in minute quantities. For example, the solution of the double salts of nickel and potassium, and the solution of the double sulphate of nickel and magnesium, and other solutions of similar composition, which heretofore could not be practically used, are converted into excellent plating-solutions by the addition of a small percentage of boric acid, either in its free or combined state.

My present invention, therefore, stated broadly, consists in the addition of boric acid, either in its free or combined state, to solutions of nickel salts, for the purpose of improving the usefulness of such solutions in the art of electrolysis, by rendering them more constant and stable in their composition.

The proportions in which boric acid is to be added to the various nickel solutions are not arbitrary, but may be varied at will. In all cases the addition of boric acid, either in its free or combined state, to a solution of nickel salts diminishes the liability to the evolution of hydrogen when the solution is employed for the electro-deposition of nickel, and increases the rapidity of the deposition by permitting the use of a more intense current, and improves the character of the deposit by rendering it

less brittle and by increasing the tenacity with which it will adhere to a metal surface.

In another pending application, designated as "Case A," I have described and claimed, as a new article of manufacture, an electro-deposit of malleable ductile nickel; and I have also described and claimed in another pending application, designated "Case B," soluble salts of nickel and boron as a new article of manufacture.

What I claim as my invention in the present case, is—

1. The electro-deposition of nickel by means of solutions of the salts of nickel containing boric acid, either in its free or combined state.

2. A solution of the single or double salts of nickel to which has been added boric acid, either in its free or combined state.

EDWARD WESTON.

Witnesses:

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W. L. STEVENS.

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