

UNITED STATES PATENT OFFICE.

JAMES POWELL, OF CINCINNATI, OHIO.

NICKEL-DEPOSITING SOLUTION.

SPECIFICATION forming part of Letters Patent No. 229,274, dated June 29, 1880.

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To all whom it may concern:

Be it known that I, JAMES POWELL, of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Nickel-Depositing Solutions, of which the following is a specification.

My improvement consists in forming nickel-plating solutions, whereby the difficulty of electrolyzing certain acid or neutral nickel salts is entirely overcome.

It is well known to electroplaters and others versed in the art that the double salts of nickel as commonly used, such as the double sulphate of nickel and ammonia, or the double chloride of nickel and ammonia, or the double seleniate of nickel and ammonia, and other similar double salts, become altered in their proportions and undergo various changes, dependent upon the power of the electric current or the length of time to which said solutions are subjected to its action. These changes are particularly liable to occur in such solutions as contain ammonia, from the fact that the ammonia is given off in the gaseous condition at the negative pole in the solution. On the other hand, the simple acid salts of nickel have not hitherto been found to answer for the purpose of electro-deposition, from the fact that such solutions refuse to yield a reguline or cohesive deposit of metallic nickel; but, on the contrary, such nickel solutions as the simple sulphate, the seleniate, the chloride, the tartrate, the acetate, the citrate, and kindred salts invariably yield, under the influence of the electric current, a deposit more or less gray, powdery, or black, and having no cohesiveness or ductility whatever. This seems to be caused by the decomposition of the solution and the deposit of a suboxide or subchloride or other subsalts, along with a certain proportion of metal.

I have discovered by a series of investigations and experiments that the addition of benzoic acid to any of the salts of nickel corrects in a marked degree this tendency to an imperfect deposit, and prevents the decomposition of the solution, and consequently the formation of the subsalts referred to, and that which previously was wholly worthless as a depositing solution and yielded a black powdery metal unfit for any practical purpose, when properly combined with benzoic acid

will then give a tough, cohesive, and reguline deposit of a beautiful silvery-white metallic nickel. I have discovered, also, that such a solution becomes more stable in its character, the dissolving of the anodes keeping pace with the rapidity of the deposit, thus maintaining a constant density of the liquid under varied conditions of work.

The amount of benzoic acid to be added is not arbitrary, but may vary from one-eighth of an ounce to one ounce of acid to each gallon of solution, according to the nature of the solution employed; or the benzoic acid may be displaced by the benzoates—as, for instance, the benzoate of nickel.

I have discovered, also, that benzoic acid is equally valuable as an ingredient in the solutions of other metals when said solutions are used for the electric deposition of metal from them in the art of electrotyping, plating, &c.

While I do not confine myself to any precise formula, so long as benzoic acid or its compounds make a constituent of a depositing solution, I prefer, among others, the following: To one gallon of pure water add four ounces of sulphate of nickel, two ounces of citrate of nickel, two ounces of phosphate of nickel, one ounce of benzoic acid.

The benzoic acid being sparingly soluble in water, it is better to heat the other nickel salts in the proportion of water named, and then while boiling hot add the benzoic acid, which will in this state combine with the nickel salts in a greater degree than with water alone.

A great advantage obtained from the use of the above-described solutions arises from the fact that the necessity of using chemically-pure salts or ingredients is dispensed with.

In preparing the sulphate, citrate, or chloride of nickel I prefer to take the common commercial acids to dissolve the nickel base, because of their cheapness, the otherwise injurious effect caused by impurities always contained in said commercial salts or acids being entirely overcome by the addition of benzoic acid, as stated. Thus I am enabled to produce nickel-plating solutions at a much less cost than has been heretofore attainable.

It is obvious that my improved solutions are equally applicable to the deposition of nickel in the electrotype process, by which the metal is caused to deposit over non-conducting sur-

faces made conducting by means of a thin film of plumbago, bronze-powder, &c., applied in the usual manner well known to electrotypers and others skilled in the art, the deposit so made being removable from the surface, mold, or matrix after the requisite degree of thickness is obtained.

I claim as my invention—

1. An electro-depositing solution consisting of a soluble metallic base, its solvent, and benzoic acid, substantially as described.

2. An electro-depositing solution of a soluble salt of nickel, its solvent, and benzoic acid, substantially as described.

In testimony of which invention I hereunto set my hand.

JAMES POWELL.

Witnesses:

JAMES H. LAYMAN,
GEORGE H. KOLKER.