

UNITED STATES PATENT OFFICE.

CHARLES S. MINCHEW, OF TAUNTON, MASSACHUSETTS, ASSIGNOR TO REED & BARTON, OF SAME PLACE.

IMPROVEMENT IN PROCESSES OF ELECTROPLATING.

Specification forming part of Letters Patent No. **175,134**, dated March 21, 1876; application filed February 12, 1876.

To all whom it may concern :

Be it known that I, CHARLES S. MINCHEW, of Taunton, in the county of Bristol and State of Massachusetts, have invented a new and useful Improvement in the Process of Plating Metals; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to an improved process of plating the baser metals with a coating of the finer metals, and especially for plating britannia and other soft metals or alloys with silver, whereby the union between the plate and the base is rendered more intimate, and the ware rendered harder and more durable, and sonorous to such an extent as to make it difficult to distinguish it from solid silver. To my improved process of plating I have given the name "impulsio-plating," in order to distinguish it from the ordinary electroplating, and because the coating is driven into the surface of the metal on which it is put by means of heat and pneumatic pressure. It is not confined to coating with silver, as gold, platinum, nickel, aluminum, copper, brass, and other metals may be employed.

The rationale of the process is very simple, but the various details require much care and attention.

In carrying out my invention the first necessary condition is, that the metal to be coated shall be "chemically clean" when immersed in the solution in which it is to be coated. There are several ways in which the attainment of this end may be defeated: by inadequate means for cleaning, by the passage through the air of two or three feet after being cleansed, or by the metal being positive in the coating solution; in this case the metal is fouled on contact. This refers to cyanide solutions, to sulphate and chloride solutions, to double sulphates and chlorides, as of nickel and ammonia, and of platinum and potash or soda; all of these may be used in certain cases of impulsio-plating. There is a special solution used for cleansing in impulsio-plating in all cases, because most solutions leave foreign matters on the metal that is to be plated, and if the said metal be in the

slightest degree porous, as is the case with britannia metal, lead, and zinc, upon heating the metal these impurities volatilize and cause an irruption in the coating.

The method used for cleansing the articles to be coated is as follows: They are first boiled in caustic alkali to free them from grease, and they are then mechanically cleaned with fine sand, and brushes, and water. Then they are wired and hung in running water, ready for being made chemically clean.

This is done by means of nascent hydrogen in a hot alkaline solution of oxalate of soda or potash, not carbonized. The water of solution is decomposed on the article by means of a strong current of electricity, the article being made negative. If the solution be kept strong and not carbonized, a film of this solution is sufficient to protect the article from contact with the air in its quick transit from the last purifying process to the solution wherein it is to be coated. The time for it to be transferred can easily be seen by the experienced eye, the article assuming gradually a more silvery appearance.

After the proper amount of silver or other metal is put on in the coating-bath, the articles are taken out, washed, and dried. They are then subjected to a temperature of about 180° Fahrenheit of heat, for the purpose of driving the silver or other metal into the surface of the coated metal. A furnace, steam-chest, hot-water bath, or any other uniform heat may be used to drive the silver or other coating in; but care must be taken that the heat is not carried so high as to melt the articles, as the heat required is not sufficient to melt soft solder, but only to dry and expand the metal.

The proper temperature is ascertained by a thermometer, or trials on a pad of prepared test-paper. An article is taken out from time to time and tried upon the pad, and the color is noted, whether it scorches it straw-color, yellow, pale-brown, deep-brown, or black. Alum-water is used for regulating this paper as to the color for the proper degree of heat. The theory of this part of the process, which is technically called "driving in," is this: The

coating metal, in all cases, is one of the superior metals as compared with the coated metal, and is less porous, whether hot or cold.

The article being heated, it naturally expands and becomes more porous, as of course both article and coating do, but their relative porosity remains the same; consequently, on expansion, there will be an infinite number of small cysts, into which, by atmospheric pressure, the coating will be driven on attaining the proper heat; then, on the instantaneous quenching in cold water, the coating is seized and retained by the suddenly contracting under metal. This is seen to be the case on filing or polishing the coating off the under metal; for though the coating may be filed off till both coating and under metal are removed together, yet the under metal remains spotted all over with an infinity of little points of the coating metal, which have insinuated themselves into the expanded pores of the base metal. This makes the base metal considerably harder and stronger, so that the ware may be made lighter, and the union between the plate and base metal is so intimate as to cause both to vibrate in unison and give resonance to the ware.

Very thin deposits of silver are made at a time; and in order to complete the process of coating thus described, and to produce a plate of sufficient thickness, the ware is subjected to retreatment by the alternate steps of coating with the metal and driving in until the proper thickness of plate is attained, which

for the most part will be after the second or third coating. If the metal be very porous, however, the treatment must be longer continued.

Articles made of britannia, pewter, or white metal composed (in part) of tin or soft metal hardened by antimony, copper, &c., known as britannia-metal goods, when silver-plated by my process, are thus rendered much harder, stronger, and more durable, possessing to such a degree sonorousness and all the qualities of the silver coating that it is difficult to distinguish the article in use from the same when made from solid silver.

Having thus described my invention, what I claim as new is—

1. The process herein described of rendering the ware to be plated chemically clean, by first washing and then treating it with nascent hydrogen liberated from an alkaline solution by the electrical current.

2. The herein-described process of plating, coating, or impregnating the baser metals, and their alloys, with the finer metals, by first depositing a thin coating of the precious metal upon the article from a bath by the electric current, then heating the coated article and suddenly cooling it, the said steps being repeated until the desired thickness of plate is attained.

CHARLES S. MINCHEW.

Witnesses:

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