

UNITED STATES PATENT OFFICE.

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PROCESS OF ELECTROPLATING.

1,364,051.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, JAMES S. GROFF, a citizen of the United States, residing at Newport, Rhode Island, have invented new and useful Improvements in Processes of Electroplating, of which the following is a specification.

This invention relates to an improved process or method of electro-plating metallic bodies as well as to the improved coating and the article coated thereby.

One of the objects of the present invention is to provide an improved method of coating metallic bodies with a primary view of preventing erosion or oxidation of the metal so treated.

The protective coatings now employed are not efficient because they do not afford thorough protection to the surfaces especially when said surfaces are subjected to expansion and contraction due to various variations in temperatures or when in the form of a container they are subjected to excessive pressures. It has been discovered, particularly in the construction and use of air flasks employed in torpedoes, for example, that the condensation of moisture contained in the air forced into the air flask under pressure condenses and subsequently produces rust and corrosion on the interior of the flask which in time seriously weakens the walls thereof. This objection is overcome in the present invention by suitably coating the interior of the flask with an alloy adapted to prevent corrosion or oxidation and at the same time possess sufficient ductility to permit the expansion of the flask under a high pressure as well as the expansion and contraction due to variations in temperature.

A further object is to provide an improved method for coating metallic bodies and particularly steel which will be relatively inexpensive to perform both from the financial point of view as well as that of time.

A further object is to provide an improved coating for metallic bodies or casings of absolute homogeneity and free from all pin holes or starting points for corrosion.

A further object is to provide an improved alloy for coating metallic bodies which will

be harder and less corrodible and more pliable and elastic than any other heretofore attempted so far as known.

Other objects will be in part obvious and in part hereinafter pointed out.

While the invention will be hereinafter described primarily with regard to its relation to the coating of air flasks and other parts of torpedoes it is, of course, to be understood that there are also involved certain new and distinct methods of commercial application for the prevention of corrosion of other metals.

It may have been attempted to coat metal either by lead or tin but such methods would be impracticable in the present case for the reason that a lead plating is not sufficiently hard and a tin plating is not sufficiently pliable and elastic to withstand the expansion and contraction of metals under conditions of pressure or temperature changes.

The present invention uses substantially equal parts of lead and tin which are used in casting the anode subsequently used. Tin occupies practically the same position in the scale of electromotive forces of solution that lead does. That is to say, it takes about the same electromotive force to deposit tin (from the acid solution) that it does lead, or to dissolve it from the anode. Consequently a mixture of tin and lead will behave practically as one metal.

The preferred method for preparing electrolyte for this process consists in using a lead fluoborate solution by dissolving dry white lead in fluoboric acid with a small amount of glue or other colloids, dissolved in hot water. The anodes are then immersed in electrolyte and a sheet of steel is arranged in solution to act as a temporary cathode. The electrolysis is begun and continued until the concentration of the lead and tin in the electrolyte is substantially equivalent to percentages of both metals used in the anodes. The bath is then ready for the electrolytic deposition of the lead-tin coating which is performed in the usual well-known manner by substituting the article to be coated for the temporary cathode.

Recent investigations have proven that the fluoborate solution gives much more satisfactory results than the fluosilicate, the

deposit being more homogeneous and adhering better to the surface of the article or container to be coated.

As an example of the electrolyte used, it is stated that the following ingredients in the contents are employed: hydrofluoric acid 204 lbs., boric acid 90 lbs., white lead 120 lbs., glue 6 ounces, all of which are thoroughly mixed in water to provide a solution of approximately 120 gallons. In making this solution, the boric acid is preferably dissolved in the hydrofluoric acid to which is added white lead in the form of a thin paste in water until effervescence has ceased. Glue dissolved in a little warm water is then added and thoroughly mixed with the above solution.

The entire solution is then placed in a pitch lined tank with the lead-tin anode and a temporary steel cathode and the electrolysis started and continued until the proper proportion, that is, substantially 50% lead-tin, is obtained. With the use of a substantial three-volt current, it has been found upon tests that the coat of the temporary cathode increases at the rate of about 3% of tin per eight hours until equilibrium of ingredients with the anode has been obtained. When this point arrives the temporary cathode is removed and the article to be processed is substituted.

This process is vastly superior to what is known as the hot process of "wiping" or "dipping and stripping" in that the final coating is of absolute homogeneity and free from all points permitting the starting of corrosion.

It is thus seen that the present invention provides a simple and practical process of coating metal and particularly air-containers and is adapted to accomplish, among

others, all of the objects and advantages herein set forth.

What I claim is:

1. The herein described method of protecting metal against corrosion which consists of forming an anode of lead and tin, providing an electrolyte of lead fluoborate and a cathode of steel and operating the electrolysis until the lead and tin in the electrolyte is substantially equivalent to percentages of both metals used in the anodes.

2. The herein described method of protecting metals against corrosion which consists in electrolytically depositing a lead-tin coating thereon.

3. The herein described method of protecting metals against corrosion which consists in electrolytically depositing a lead-tin coating thereon, the electrolyte being formed in part from a lead fluoborate solution.

4. The herein described method of protecting metals against corrosion which consists in forming an electrolyte having substantially equivalent percentages of lead and tin and electrolytically depositing the lead-tin coating upon the metal to be protected.

5. An air flask or other parts of a torpedo, having an electrolytically deposited coating of lead and tin.

6. A container for compressed air adapted to withstand expansion under heavy pressures or due to variation in temperature, having a pliable and elastic coating of lead and tin electrolytically deposited thereon for the protection of steel or other metals used which are subject to expansion and contraction.

Signed at Newport, Rhode Island, this 28th day of June, 1920.

JAMES S. GROFF.