

UNITED STATES PATENT OFFICE.

EDWARD C. BROADWELL, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR
TO MATTHEW J. GRIER, OF SAME PLACE.

PROCESS OF PLATING METALS WITH ALUMINIUM.

SPECIFICATION forming part of Letters Patent No. 527,478, dated October 16, 1894.

Application filed August 7, 1893. Serial No. 482,613. (No specimens.)

To all whom it may concern:

Be it known that I, EDWARD C. BROADWELL, a citizen of the United States, and a resident of the city and county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in the Art of Plating Metals with Aluminium, of which the following is a clear and sufficient specification.

The object of my invention is to coat or plate metals with aluminum or an alloy of aluminum with a metal acting as a diluent to cheapen the coating. This class of alloys is well known with reference to metals in general. Of tin may be mentioned terne, of gold the well known alloys called in the trade "auroid metals". As to aluminum the one most in use may be said to be aluminum terne which is composed of aluminum and lead in varying proportions. Hitherto a reguline coating of aluminum or such alloy as above described has not been produced except by electrical deposition. Aluminum has been supposed to have heretofore been alloyed with iron when the aluminum is molten and the same has been subjected to great heat, and incidentally a more or less complete hiding of the iron been accomplished; but the chemical affinity between the two metals is such, that a commercially complete coating has not been effected; and no actual success is possible, because the aluminum permeated into the iron making it brittle and because it is impossible to so time the operation to give a coat to the exterior surface only, and also because the aluminum united irregularly:—mingling with the entire mass of the iron at some points, at others leaving the surface entirely bare, with any moderate amount of dipping, and, with an immoderate amount of dipping, such as would have been sure to produce a coat all over the surface of the article to be coated, the latter would be injuriously heated, and such an amount of aluminum consumed that no commercial use could be made of it.

My invention consists therefore in placing upon the surface of the metal to be coated (the foundation metal) a chemical compound, that is decomposed partly or entirely into its elements by the action of the molten alumi-

num upon the same, the aluminum acting as a reagent, some of the elements of which compound then act, or one of them acts, as a linking or binding medium to connect the aluminum to the surface of the metal to be coated. This produces a thin reguline coating on the surface of the metal to be coated.

In practicing my invention, I place the compound that is decomposed by the reagency of the molten aluminum on the foundation metal by means of a flux. The best chemical compound I know of for this purpose and the best way of applying it by means of a flux I will now describe. This flux, in practice, contains a salt, containing an element of the chlorine group and having, as its basic element a metal more electro-negative than aluminum, (the above mentioned salt being the best kind of chemical compound, decomposable by molten aluminum as above mentioned of which I am now aware.) As an instance of such salt, chloride of iron, fluoride of tin, iodide of zinc or the double fluoride of tin and zinc may be mentioned. I cannot, of course, utilize a salt which cannot be decomposed by the reagency of molten aluminum. As an instance of such salt I would mention chloride of sodium which is a more stable compound than the corresponding salt of aluminum, and which indeed would be formed, were aluminum chloride and sodium brought together, the aluminum being reduced and the sodium and chlorine combining to form sodium chloride.

In practice I prepare the flux in the following manner: I make a solution of chloride of zinc or chloride of tin and keep the same sufficiently acid by the introduction, from time to time, of small quantities of hydrochloric acid. By this I am able to make continuously well covered plates or other articles.

I find the best way of applying the flux to the foundation metal is by dipping it into a bath of the flux, when the latter is slightly heated, and they drying slightly. Of course when the flux is applied, the chemical compound therein is also applied. After this is done, the foundation metal is ready for dipping into the bath that contains the metal to form the coating. I would say that neither

the heating of the flux nor the drying of the foundation metal is essential to the practice of my invention.

5 The dipping bath is composed of molten aluminum or alloy thereof prepared in any usual or convenient manner. Upon dipping the foundation metal in this bath, the compound on the same is decomposed and the aluminum of the bath or the alloy of the class
10 previously mentioned thereof as the case may be, forms a surface coating thereon, not penetrating into the interior of the mass except incidentally.

I do not limit myself to a mechanical application of the compound to the article to be coated, as, for instance, by fluxing it as above described, as the compound may be placed on the foundation metal in many ways, for instance, in case the foundation metal were
20 iron, by treating the same with hydrochloric acid and thus forming chloride of iron thereon, which will be decomposed by the reagency of molten aluminum.

I do not claim any process which produces
25 a substantial amalgamation or alloying of the metal to be coated and the aluminum. Neither do I claim any process by which an alloy of aluminum is produced which partakes so largely of the characteristics of the metal
30 other than aluminum; that the chemism between this metal and the metal to be coated is sufficient to bind the foundation metal and the alloy together without the use of the above described process.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The art of forming on metals a surface coating of aluminum or alloy thereof, which consists in placing on the foundation metal a compound decomposable by the reagency of aluminum in a molten state and subsequently bringing the foundation metal into the presence of molten aluminum or the molten alloy thereof which is to form the coating substantially as described. 45

2. The art of forming on metals a surface coating of aluminum or aluminum alloy which consists, first in placing upon the surface of the metal to be coated, a salt of a metal reducible from such salt by the reagency of aluminum in a molten state and second in dipping the metal, after treatment with such salt, into a bath of molten aluminum or alloy thereof substantially as described. 50

3. The art of forming on metals a surface coating of aluminum or alloy thereof which consists in treating the metal to be coated with a haloid salt of a metal reducible from such salt by aluminum and, second in dipping the metal thus treated into the aluminum or alloy thereof which is to form the coating substantially as described. 55

EDWARD C. BROADWELL.

Witnesses:

M. W. COLLET,
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