UNITED STATES PATENT OFFICE.

EMILE PLACET AND JOSEPH BONNET, OF PARIS, FRANCE, ASSIGNORS TO THE ELECTRO METALLURGICAL COMPANY, LIMITED, OF LONDON, ENGLAND.

PROCESS OF INTRODUCING CHROME INTO METALS OR ALLOYS.

SPECIFICATION forming part of Letters Patent No. 573,615, dated December 22, 1896.

Application filed January 14, 1896. Serial No. 575,505. (No specimens.) Patented in France November 4, 1893, No. 233,846.

To all whom it may concern:

Be it known that we, EMILE PLACET and JOSEPH BONNET, citizens of the Republic of France, residing at Paris, in said Republic, have invented certain new and useful Improvements in Processes of Permitting the Introduction of Chrome in the Metals and Alloys and the Resulting Products, (patented in France on the 4th day of November, 1893, No. 233,846,) of which the following is a specification.

We have ascertained by many experiments that metals and alloys are greatly improved by the addition, even in minute quantities, of chrome. Up to this day these experiments could not be made because the chrome, which was heretofore obtained at high temperatures, was not pure chrome, but simply a carburet of chrome more or less impure. It was impossible to drive off the carbon and other impurities which this carburet of chrome contained, and consequently when it was attempted to make alloys with this carburet of chrome they (these alloys) were found to be completely changed or altered by the carbon and the other impurities which this carburet of chrome carried with it. It is no longer so with the chrome which we have obtained by electrolysis. This chrome is absolutely pure and improves all the metals or alloys with which it may be associated, communicating to them qualities which are its own. It renders them harder, more resisting to shocks, to traction, and to friction. It renders them inalterable under the destructive action of the atmosphere, dampness, acids, and high temperatures. We obtain these new alloys by introducing directly into the metal or alloy while in fusion pure chrome in desired proportions according to the quality of the metal we wish to obtain. Although chrome does not melt except at an excessively high temperature, which is very difficult to obtain in ordinary furnaces, we nevertheless obtain perfect alloys of chrome and other metals and alloys without necessarily reaching the point of fusion of chrome. This singular fact may be explained by stating that in such case as we have in view a veritable solution of chrome is effected in the other metals in fusion.

Sometimes in order to facilitate the formation of the alloy of chrome with other metals we add to the alloy (in formation) one or more metals which act as auxiliaries, such as zinc, manganese, magnesium, aluminium, antimony, bismuth, palladium, amalgam of sodium, &c., or we add oxids or salts, which by their decomposition at a high temperature leave in the alloy a metal or a body which facilitates the fusion or the formation of the alloy, such as oxid of zinc, oxid of manganese, permanganates, fluosilicates, borates, cyanids, fluorids, chlorids, phosphids, silicids, &c., or of metals which we desire to alloy.

To prevent the oxidation of the chrome at the time that we introduce our alloys, we preliminarily cover the pieces of chrome of more or less thickness with metal which protects them, such as copper, nickel, gold, silver, zinc, tin, platinum, &c. The coating of the chromium with a less oxidizable metal may be effected by electrolytic action in the well-known manner of electroplating; but the coating may be applied in any convenient manner. A few thousandths of pure chrome added to copper, nickel, aluminium, gold, or silver, zinc, lead, tin, &c., suffices to increase in marked degree the hardness and tenacity of these metals. We employ often chrome at from 0.5 per cent. to fifteen per cent. or twenty per cent. The alloys with the highest proportions of chrome are generally so hard that they cannot be worked except on the emery-wheel or other similar grinding device.

The following are, as a matter of example, some of the advantageous results which are produced by the chrome upon metals and alloys: Chrome added in the proportions from 0.5 per cent. to twenty per cent. to copper or copper alloys, such as bronzes, brasses, german silver, &c., improves the metal to such a point that their resistance to rupture becomes equal to that of steel. A small quantity of chrome added to monetary alloys renders them more inalterable and more resisting to friction. A little chrome added to the printing-type renders the alloys more resisting to pressure and to the indispensable cleaning. The chrome renders metals or alloys more resisting to high temperatures for

the manufacture of twyers, bed-plates of fireplaces, &c., and other implements used in connection with furnaces, &c. It also renders them more resisting to acids, to alkalies, and to other chemical products for the manufacture of chemical apparatus and culinary utensils. The chrome in increasing the hardness of metals renders them more sonorous, and to this end can be used in the manufacture of bells, trumpets, piano-wires, &c. It also increases the electrical resistance of manganese, ferromanganese, ferronickel, and other metals which serve the purpose of making wires of high electrical resistance. Chrome added to copper, platinum, palladium, manganese, tungsten, cadmium, &c., increases the antimagnetic properties of these metals, and are used in the construction of watches, chronometers, and other instruments which should be insensible to magnetic perturbations.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

A mode of introducing chrome into metals or alloys, the same consisting of the direct introduction into the metal or alloy in fusion of the pure chrome preliminarily coated with an adherent layer of less oxidizable metal whereby the oxidation of the chrome at the moment of its introduction into the metal or alloy is prevented, the temperature of the bath being below the fusing-point of chrome, the latter dissolving in the other metals in fusion, substantially as described.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

EMILE PLACET.
JOSEPH BONNET.

Witnesses:
CLYDE SHROPSHIRE,
EDOUARD BARBARY.