

# UNITED STATES PATENT OFFICE.

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## METHOD OF PROTECTING MOLTEN METALS.

943,639.

Specification of Letters Patent.

Patented Dec. 14, 1909.

No Drawing. Original application filed March 5, 1909, Serial No. 431,434. Divided and this application filed April 23, 1909. Serial No. 431,832.

*To all whom it may concern:*

Be it known that we, WALTER S. ROCKEY and HILLIARY ELDRIDGE, citizens of the United States, and both residents of New York, in the county of New York and State of New York, have invented a certain new and useful Improved Method of Protecting Molten Metals, of which the following is a specification.

Our invention relates to the melting of metals and protecting same from rapid oxidation and volatilization, and further relates to the use of the said melted or molten metal to serve as a bath for the plating of iron and steel either in sheet or rod form, or for cast metal, and also relates to the joining or brazing of iron and steel either in sheet or rod form, or castings, and plating the same simultaneously.

When metals such as copper and zinc are melted together to produce brass, and the heat is increased above a proper degree, the zinc rapidly oxidizes and also volatilizes. To prevent the volatilization and oxidation of metals of this character, we have discovered that we can use boron tri-oxid or the borates, which are of less specific gravity than that of brass, tin, zinc, lead and other metals usually used for plating purposes or for casting, and since the said materials require a higher temperature to melt the same than the metals which are to be protected and have a lighter specific gravity than the coating metal, the said materials will float upon the top, and upon the surface of the molten metals, forming a cover for same and preventing the oxygen in the air from acting on the metals. They also prevent the volatilization of the metal when heated to a temperature at which they would normally volatilize. We have also discovered that when zinc and copper are to be fused together, that by first reducing the boron tri-oxid to a fluid condition and first adding the zinc which is immediately melted, that when copper is added to the molten zinc, the copper is dissolved or melted in the zinc which affects the copper and causes it to melt at about or just above the temperature of the zinc, and at a temperature considerably below that at which copper normally melts which is 1080 centigrade.

The object of our invention, therefore, is to provide means for preventing the rapid volatilization or oxidation of a molten metal

by covering the same with boron trioxid or a suitable borate or a suitable silicate which will permit the said metals to be kept at a considerably higher temperature than that at which they would normally oxidize or volatilize.

A further object of our invention is to use this metal or metals so protected, as a bath in which we may dip iron or steel, either in cast, drawn or rolled condition, or in the form of a wire to plate the same with the metal.

In carrying out our invention for the purpose of plating a metal, we proceed as follows:—We select a crucible of neutral material, such as graphite, and into this we first place boron trioxid or a suitable borate or a suitable silicate in sufficient quantity that when melted it will cover the metal to be protected; after melting the boron tri-oxid or borate or silicate, we then add the metal or metals which we desire to plate with, or which we may wish to use to withdraw from the crucible for the purpose of casting, such as zinc, and copper or tin; or a combination of metals such as zinc and copper to form brass, and after this is melted it forms the bath on the surface of which floats the boron trioxid or substitute. Iron or steel may be immersed through the boron trioxid into the molten metal, which metal may be at a temperature sufficient to volatilize or oxidize if it were not protected by the boron trioxid but which does not need to be at such a high temperature if it is desired to coat at a lower temperature. When the metal to be coated is passed through the covering material which acts on the surface of the solid metal to remove all grease or oxid and places the same in condition to receive a coating of the molten metal, the molten metal being at a high temperature, it is more evenly and perfectly coated upon the solid metal than would otherwise be the case. When the rod or any other form of iron or steel, which is being coated, is being withdrawn from the bath, the coated surface must pass through the material floating on the surface of the bath and be thereby coated to prevent the rapid vaporization or oxidation of the metal which forms the plating, since it acts as an insulating material and prevents the air from striking the surface of the freshly coated metal.

Also a further object of our invention is



to use these fused metals or metallic alloys which are protected by the fused covering of boron trioxid or the borates heretofore described, as a combined brazing and plating medium for iron or steel, in sheet, rod, tube or cast form. To aid in our description of this procedure, we will explain that we find in practice that the joining or brazing of iron or steel by means of the aforesaid described metals or alloys are dependent and cannot be consummated without plating simultaneously. To illustrate we will proceed to describe the joining or brazing of a tube and the simultaneous plating thereof. We will take a sheet iron or steel tube, formed by what is termed by sheet metal workers the "double or lap" seamed process, commonly known as a water lead. This tube is immersed in the heretofore described molten bath and in the same manner as the described method of plating, and is withdrawn in the same manner as described for plating, and is found to be brazed and plated or coated inside and outside by the metal brass, zinc, tin, lead or other metals that may be employed in the process.

This application is a companion application to that filed by us under date of March

5th, 1909, bearing Serial No. 481434 and entitled "Method of protecting molten metals." Nothing herein contained is intended to conflict with the matters contained in the said companion application.

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

1. The method of protecting molten metals consisting in first reducing boron trioxid ( $B_2O_3$ ) to a fluid condition by heat and then reducing the metal to be protected to a fluid condition by heat beneath the surface of said boron trioxid.

2. The method of protecting molten metals consisting in first reducing a suitable borate to a fluid condition by heat and then reducing the metal to be protected to a fluid condition by heat beneath the surface of the said borate.

Signed at New York, in the county of New York and State of New York, this 15th day of April, A. D. 1909.

WALTER S. ROCKEY.  
HILLIARY ELDRIDGE.

Witnesses:

G. F. QUACKINBUSH,  
P. HERMAN.