

UNITED STATES PATENT OFFICE.

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METHOD OF PROTECTING MOLTEN METALS.

943,161.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that we, WALTER S. ROCKEY and HILLIARY ELDRIDGE, citizens of the United States, and residents of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Methods 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 any of the fusible halogen salts of the metals, such as sodium, calcium or potassium, which halogen salts 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 halogen salts of potassium, calcium or sodium require a temperature of from 650 inclusive to 815 degrees centigrade to melt the same, and the metals which are to be protected melt at a considerably less temperature and each of greater specific gravity, the halogen salts will float to 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 surface of the metals and also prevents the volatilization of the same when they are heated to a temperature considerably above that at which they would normally become volatile. We have also discovered that when zinc and copper are to be fused together that by first reducing the halogen salts 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 a halogen salt, such as a chlorid, bromid, or iodid of potassium, calcium or sodium, or other suitable halogen salt which will permit the said metals to be kept at a considerably higher temperature than that at which they would normally oxidize or vaporize.

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 a halogen salt of one of the metals, for instance, potassium chlorid in sufficient quantity that when melted it will cover the metal to be protected, after melting the chlorid, 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 potassium chlorid. Iron or steel may now be immersed through the chlorid into the metal, which metal may be at a temperature sufficient to volatilize or oxidize the same if it were not protected by the chlorid, but which does not need to be at such a high temperature if it is desired to coat at a lower temperature. When the iron to be coated is passed through the chlorid, the chlorid acts on the surface of the iron to remove all grease or oxid of iron, and places the iron in the best possible condition to receive a coating of the metal, and by reason of the metal being at a comparatively high temperature, it is more evenly and perfectly coated 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 coating of the chlorid which is floating on the surface of the bath, and the chlorid coats the metal on the rod and prevents the rapid vaporization or oxidation of the metal which forms the plating on the rod or any other form of iron or steel, 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 metallic halogen salts 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 together 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 aforesaid molten bath heretofore described and in the same manner as the aforesaid 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 metals brass, zinc, tin, lead or other metals that may be employed in the process.

In place of using a single halogen salt of metal, combined bromids, iodids or chlorids, known as double chlorids, may be used. It will be seen from the above that when the metals are used as a bath the halogen salt performs the double function of protecting the bath and also cleaning the metal and protecting its surface immediately after it is plated from oxidation or vaporization. It will also be seen that this coating can be used to protect molten metals from contact with the air and prevents the loss of heat and permits of the metal being withdrawn at a temperature higher than the normal temperature of these metals would otherwise permit of, into molds for casting purposes.

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 a suitable halogen salt 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 halogen salts.

2. The method of plating iron or steel, cast or malleable, consisting in first reducing in a suitable crucible a suitable halogen salt to a fluid state by heat, then reducing below the surface of said salt the metal or metals to form a bath to a fluid condition by heat and protecting the same beneath the surface of the halogen salt and then immersing the metal to be plated first through the halogen salt into the said metal bath, and from the metal bath through the halogen salt to the atmosphere, substantially as set forth.

3. The method of protecting molten metals consisting in first reducing a suitable chlorid 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 chlorid.

4. The method of protecting molten metals consisting in first reducing chlorid of potassium 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 chlorid of potassium.

5. The method of simultaneous plating and brazing of iron or steel, cast or malleable, consisting in first reducing in a suitable crucible, a suitable halogen salt to a fluid state by heat, then reducing below the surface of said halogen salt, the metal or metals to form a bath to a fluid condition by heat and protecting same beneath the surface of the halogen salt then immersing the iron or steel to be plated and brazed, first through the halogen salt into the said metal bath and from the metal bath through the halogen salt to the atmosphere substantially as set forth.

Signed at New York in the county of New York and State of New York this 4th day of March A. D. 1909.

WALTER S. ROCKEY.
HILLIARY ELDRIDGE

Witnesses:

G. F. QUACKINBUSH,
PAUL HERMAN.