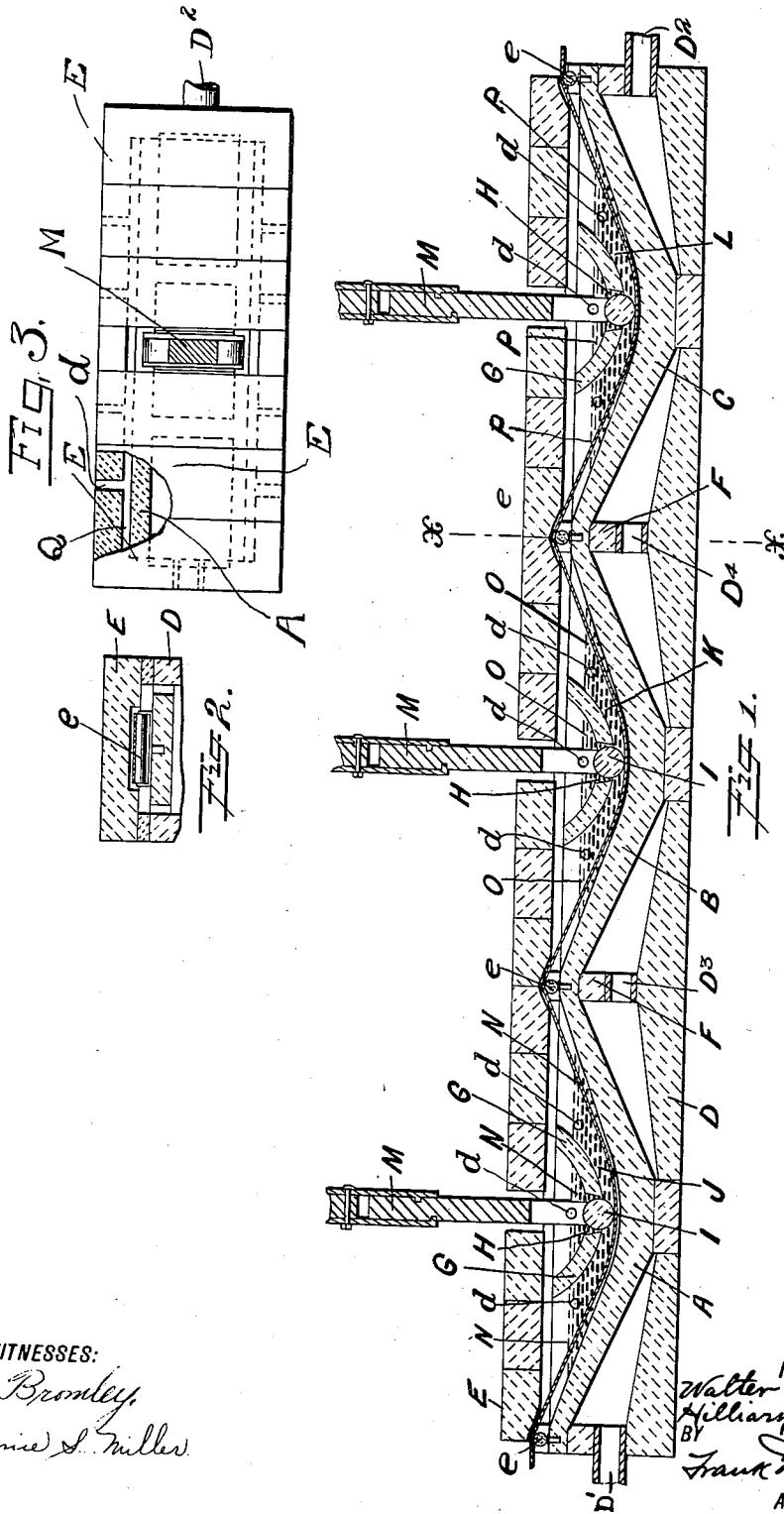


W. S. ROCKEY & H. ELDRIDGE.
METHOD OF PLATING METAL.
APPLICATION FILED APR. 25, 1910.

1,065,727.

Patented June 24, 1913.



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METHOD OF PLATING METAL.

1,065,727.

Specification of Letters Patent. **Patented June 24, 1913.**

Application filed April 25, 1910. Serial No. 557,312.

To all whom it may concern:

Be it known that we, WALTER S. ROCKEY and HILLIARY ELDRIDGE, citizens of the United States, both residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Methods of Plating Metal, of which the following is a full, clear, and exact specification.

Our invention relates to plating of metals by dipping of the metal to be plated beneath the surface of the plating metal when same is in a molten condition.

The object of our invention is to provide a method of plating a sheet of metal such as iron or steel in successive baths of the same metal or different metals to provide the base metal with a coating of laminated metals or to provide the said base metal with coatings of a single plating metal of different thicknesses to adapt it to the particular use for which it may be required.

A further object of our invention is to protect the plating metal or metals from being oxidized when exposed to the atmosphere in passing from one of said baths of metal to the next.

Referring to the drawings which form a part of this specification, Figure 1 is a longitudinal sectional view through a number of crucibles arranged end to end and indicated by A, B and C respectively. Fig. 2 is a partial end section on line X—X of Fig. 1, and discloses one of the fire bricks, and a roller mounted at the end of and between crucibles A, B and C and indicated by the letter *e*. Fig. 3 is a plan view of one of the crucibles shown partly in section and discloses the side passages formed between the fire box and the crucible.

The crucibles are set in a fire box the walls of which are indicated by D which is provided with inlets for the fuel at D' and D² respectively which fire box is provided with outlets for the products of combustion indicated by *d—d—d*, etc., shown in dotted lines and located in the side wall of the fire box D, which fire box is made of greater width than the crucibles A, B and C, so as to provide a passage Q at each side of the crucibles between the outer sides thereof and the inner sides of the said fire box.

E, E, etc., indicate fire bricks which span the fire box above the crucibles and serve as a cover for same. By removing a brick

from above any of the crucibles, the remaining bricks may be spaced apart from each other to form openings directly above the crucibles to cause the fuel to flow from the lower part of the fire box upward above said crucibles by means of which the degree of heat may be regulated to a certain degree to govern the temperature of the plating metals.

D³ and D⁴ indicate passages through the supporting walls F to permit the heat to travel freely from the ends of the fire box to the middle portion thereof. It is important that proper means be provided so that the crucibles may be kept at the same temperature or at different temperatures from each other as may be desired, but this feature forms no part of our present invention; the drawings being provided to illustrate more clearly the method of carrying out the plating operations.

The crucibles are preferably formed with a semi-circular wall G which is provided with a slot H at the bottom thereof in which slot is located a roller I which is held beneath the surface of the plating metals J, K and L, respectively, by a bifurcated element M, the ends of which rest at each end of one of the rollers I, the said rollers being made of a material having less specific gravity than the plating metals, so that they tend to float upward therein and are held in position by the said elements M, as will be readily understood.

In order to prevent the plating metal from being oxidized by contact with the atmosphere, we use a suitable flux indicated by N, O and P respectively, which floats on the surface of the plating metal. The flux which we prefer to use consists of boron tri-oxid (B₂O₃). When plating with some metals, for instance tin, we may use a flux such as is commonly employed, to which boron trioxid (B₂O₃) is added in sufficient quantities to prevent oxidation of the metal plated or the plating metal, as well as to dissolve any oxids present in the melted plating metal.

In carrying out our process, if we desire to plate successively with different metals we would place one of each of said plating metals in each of said crucibles respectively, and then pass the sheet of metal to be plated successively through the respective baths in said crucibles, the said sheet in passing

through said metals thereby being coated successively with the metals contained in said crucibles as arranged in their respective order, and said crucibles being heated at the proper temperatures for plating with the respective plating metals.

We have discovered that in order to plate a sheet of iron or steel with copper or brass to secure a plating surface of variable thicknesses suitable for different purposes required in the metal arts, that it is necessary to perfectly clean the surfaces of the metal to be plated before introducing same into the bath of molten plating metal. This we prefer to do by first thoroughly sand papering or otherwise mechanically removing all oxids or other foreign matter from the surfaces of said sheet. By then preparing the plating metal in the crucibles and coating the surfaces of same with boron trioxid reduced to a fluid condition by heat, the article to be plated is passed through the boron trioxid in the crucible A which thoroughly removes any remaining oxids or grease that may have remained on the surface of the sheet and the sheet is then passed through the plating metal J beneath the roller I which rollers prevent the metal which has been deposited on the sheet from coming in contact with the dividing wall G which would tend to scrape the plating metal from the sheet, and then out through the flux in the opposite end of the crucible A to cause the flux at this end to coat the sheet of metal and the plating thereon with the said flux to protect the plating from oxidation during its passage from the flux into the next bath of flux and metal in the crucible B. The flux in the crucible B removes the coating flux that had been deposited thereon in the crucible A due to its heat and the sheet then passing through the plating metal in the crucible B and again being plated with metal therein which will increase the thickness of the plate as will be readily understood, and the sheet again being coated with the flux as it leaves the crucible B and passes over the roller E into the next bath of plating metal in the crucible C and through said crucible to the atmosphere, the plating being protected by the flux in the crucible C being deposited thereon as it leaves the crucible and the flux after the metal is cooled becomes dry and brittle and may easily be removed from the sheet after the plating has become cold.

We prefer to have the temperature of the metal in the crucible A at a somewhat higher temperature than that in the crucible B and the temperature in crucible C of less temperature than that in crucible B, so that each succeeding coat of metal that is deposited on the base metal will be a heavier plating than the preceding one.

It is obvious that if we first wish to plate

a sheet of metal with copper or brass, and subsequently plate in the second crucible with tin or some other metal which requires a less temperature than the melting point of copper, that the second metal could be plated on the surface of the first plating metal, but that the sheet could not be plated with tin first and then with a plating of copper, since the tin would melt under the higher temperature of the copper, and, therefore, in plating with successive metals, a sheet must be plated first with the metal having the highest melting point and successively through the metals having a lower melting point as the sheet passes from crucible to crucible. It is also important to remember that the flux in the crucible A through which the sheet is first introduced must be renewed from time to time as fast as it becomes charged with oxids or impurities, and that the flux in the opposite side of the chamber must be kept clean and free from oxids to prevent oxids from being deposited on the surface of the plated metal since such a deposition of oxid would cause the plating metal to appear spotted and would mar the brightness and beauty of the finished product.

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

1. The method of plating a ferrous metal with copper or its alloys, consisting in passing said ferrous metal through a flux of boron trioxid into a molten bath of said copper and from said copper through a suitable flux comprising boron trioxid to coat the same with said last named flux, and thence through a second bath of said last named flux and said molten plating metal, the temperature of which is less than that of said first body of plating metal, and removing same therefrom through a second body of said flux to coat said metal with said flux to protect it from oxidation during its cooling period.

2. The method of plating a ferrous metal with copper or its alloys, consisting in passing said ferrous metal through a flux containing boron trioxid into a molten bath of said copper and from said copper through a flux of boron trioxid to coat the same, and thence into a second bath of said molten plating metal, and removing same therefrom through a second body of said flux to coat said metal with said flux to protect it from oxidation during its cooling period.

3. The process of coating a sheet of metal consisting in passing the sheet through a bath of molten boron trioxid, then through a bath of molten plating metal heated slightly above its melting point, then through a bath of molten boron trioxid to coat said plating, then through a second bath of molten plating metal heated to its melting point,

then removing said sheet from the second bath through a bath of molten boron trioxid to coat said last named plating and protect the same from the atmosphere during its cooling period.

4. The process of plating ferrous metal consisting in first passing the metal to be plated through a flux of boron trioxid into a bath of metal having a copper base which is maintained at a temperature near its melting point and then withdrawing the ferrous metal from said bath through a flux of boron trioxid to coat said plating with said flux, then carrying said metal into a second bath of plating metal which removes said

flux from said plating and deposits a coating of plating metal on said first coating of plating metal and then withdrawing said metal plated article from said bath through a flux of boron trioxid to coat said plating metal with said flux to protect the plating during its cooling period.

In testimony whereof, we affix our signatures, in presence of two witnesses.

WALTER S. ROCKEY.
HILLIARY ELDRIDGE.

Witnesses:

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G. F. QUACKINBUSH.