

# UNITED STATES PATENT OFFICE.

CARL H. ZIEME, OF NEW CASTLE, PENNSYLVANIA, ASSIGNOR OF ONE-THIRD TO GEORGE L. PATTERSON, ONE-SIXTH TO WILLIAM R. KINNEAR, AND ONE-SIXTH TO CHARLES W. JOHNSON, ALL OF NEW CASTLE, PENNSYLVANIA.

## PROCESS OF DEPOSITING METALS.

934,704.

Specification of Letters Patent.

Patented Sept. 21, 1909.

No Drawing.

Application filed May 21, 1908. Serial No. 434,147.

*To all whom it may concern:*

Be it known that I, CARL H. ZIEME, a citizen of the United States, residing at New Castle, in the county of Lawrence and State of Pennsylvania, have invented certain new and useful Improvements in Processes of Depositing Metals, of which the following is a specification.

My invention relates to that class of processes in which zinc or other metal to be applied to metallic objects, such as sheets of iron, to provide a coating or surface thereon is utilized in oxidized form and brought to and held in the presence of the metal to be coated, by mixing the coating metal with a suitable vehicle.

It is known that in the use of zinc in partially oxidized form, commercially known as zinc powder, the deposition is favored by the presence of carbon which takes up the oxygen from the zinc powder and favors vaporizing of the zinc.

In an application Serial No. 400,456, filed by me, jointly with George L. Patterson and Thomas L. Mornes, is described a process wherein a finely divided inert substance is used as a vehicle for the zinc dust, in a slip or bath which also contains finely divided carbon. In my application Serial No. 419,170, is described a process of depositing a plurality of metals, or an alloy thereof, by making a slip or bath containing the metals and a suitable vehicle.

My present invention has for its object to facilitate the application of the metal to be deposited as a coating and it consists in mixing the metal with a vehicle and giving to the mixture such physical form as will adapt it to be handled and laid upon or applied to the surface to be coated; or in loading the metal upon a vehicle that has been given such physical form as will adapt it for use in the manner stated.

My present invention also consists in utilizing as the vehicle or as the base from which the vehicle is constructed, a material, such as vegetable matter or cellulose, which will be decomposed by the heat of the process and supply the carbon necessary to favor the deoxidizing of the zinc.

In carrying out my present invention, I find that vegetable matter or cellulose that can be worked up into a pulp is suitable for the purpose. When the articles to be coated are in the form of sheets, as iron or steel, the pulp is preferably mixed with zinc in partially oxidized form or with zinc, a part of which is oxidized and a part in metallic form and the pulp is then rolled into a paper or felted or laid fabric that may be conveniently laid upon the surface of a plate to be coated or between the opposed faces of a plurality of plates to be coated; the paper, so called, being preferably of greater thickness when utilized to simultaneously coat two opposed faces than when employed merely for the purpose of coating a single surface. By thus producing a vehicle loaded with the proper proportion of coating metal in the physical form described, the coating material may be manufactured in quantity at any desired point of production and kept without deterioration or distributed to places of consumption at will.

The sheet form of combined vehicle, deoxidizing agent and coating metal is particularly advantageous for the economical surfacing of sheet metal because of the facility which it affords of compounding it with the sheets by stacking it and the sheets in alternate layers.

If the object or article or surface to be coated is of irregular form, the sheet material may be softened in a suitable liquid so as to adapt it to be laid on the irregular surface; or the pulp might be utilized for this purpose before rolling it into sheets, by laying on the pulp and pressing it into close contact.

That portion of the process which consists in subjecting the compounded coating material and the article to be coated, to a temperature sufficient to vaporize and free the zinc, should be carried on with the exclusion of atmospheric air, in order to avoid an excess of oxygen. This may be done by inclosing the sheet or stack of sheets or any other object to be coated, in a suitable retort; or in the case of irregular objects, if more convenient, they could be incased in a suitable



plastic inert substance that could be laid on and hardened to retain its form previous to the firing or application of heat.

While I do not intend to limit myself to particular proportions or temperatures in carrying out my process, and am not prepared to explain in detail the chemistry of the process, the following specific application of the invention and the description of the reactions, so far as known to me, may be taken as one illustrative application of the invention. Take three parts by weight of the article commercially known as zinc dust, or any other metal or combination of metals which it is desired to deposit, together with one part of paper pulp, mix well and work the mixture into thin sheets resembling rough paper. Then lay a sheet of paper upon a surface or between two surfaces to be coated or between each pair of opposed faces in a stack of metallic sheets, inclose the compounded article and coating material under conditions suitable to exclude the atmosphere, and then subject the same to, say, 800 to 1200 degrees temperature Fahrenheit, the temperature to be varied according to the nature of the deposit desired. This temperature is to be continued for a period varying, ordinarily, from one hour to twenty-four hours, according to the mass of metal to be heated through. A stack of sheets with intermediate facing material, say four feet in height, would naturally require a longer time to heat it through and complete the process than 1, 2, 3 or a few sheets. After the necessary heating has been accomplished, the work is allowed to cool to a comparatively low temperature before again permitting access of atmosphere thereto. The cellulose or vegetable matter of the paper, when subjected to heat, partly breaks down or decomposes and produces a distillate of wood smoke or creosote, which escapes, and free carbon which is left. The carbon acts as a reducing agent, taking up the oxygen from any zinc oxid which is present in the mixture so as to leave metallic zinc which then deposits upon the surface to be coated.

It will be seen from the foregoing description that the combined vehicle, and metal to be deposited, constitutes a carbonizing and metalliferous facing material suitable for application to the surface to be coated.

It is not necessary that the fiber which forms the base of the vehicle or facing material shall be made up entirely of vegetable fiber or carbonizing material. So long as there is a sufficient proportion of carbonizing material in it, to support the described reaction, the remainder may be of any other suitable pulping or felting material, such as mineral fiber or asbestos. Or if a suitable carbonaceous material is held in the vehicle or surfacing material, the physical structure of the latter may be made up entirely of such

mineral fiber or other felting or pulping material. Experimentally it is found that the material of the vehicle, or paper-like facing material is better for being made up in part of mineral fiber for this prevents cracking and shrinkage incident to the carbonizing of the vegetable fiber which leaves exposed lines or areas on the surface to be coated which is thus prevented from receiving uniform treatment throughout.

#### Claims:

1. The process of coating with metals which consists in laying on the surface to be coated, a coherent sheet of fabric containing carbonizing material and loaded with the metal to be deposited, and then subjecting to heat.

2. The process of coating with metals which consists in laying on the surface to be coated, a coherent sheet of fabric containing carbonizing material and loaded with metal to be deposited in partially oxidized form, and then subjecting to heat.

3. The process of coating with metal which consists in laying on the surface to be coated, a coherent sheet of fabric containing carbonizing material and loaded with zinc, in the form of flue dust to be deposited and then subjecting to heat.

4. The process of coating a surface with metal, which consists in applying between said surface and an adjacent surface, a sheet of fabric containing a carbonizing material comprising a suitable vehicle and loaded with metal to be deposited and then subjecting to heat sufficient to carbonize the carbonizing material and deposit the metal mingled therewith.

5. The process of depositing metal upon a plurality of surfaces which consists in interposing between said surfaces a coherent fabric containing a carbonizing material, comprising a suitable vehicle and the metal to be deposited, and then subjecting to heat.

6. The process of depositing metal upon a plurality of sheets of material, which consists in stacking the sheets of material to be coated, with their surfaces to be coated, opposed in pairs, interposing between said opposed faces coherent sheets of fabric containing carbonizing material, comprising a suitable vehicle and loaded with the metal to be deposited, and then subjecting the pile to heat.

7. The process of depositing metal upon a plurality of sheets of material, which consists in stacking the sheets with their surfaces to be coated in opposed relation, interposing between the said opposed faces, coherent sheets of fabric containing carbonizing material, comprising a vehicle and metal to be deposited, the said vehicle and metal being mixed in finely divided form and then subjecting the pile to the action of heat.

8. The process of depositing metal upon



a plurality of sheets of material, which consists in stacking the sheets with their surfaces to be coated in opposed relation, interposing between said opposed faces, coherent  
5 sheets of fabric, containing carbonizing material and the metal to be deposited and then subjecting the pile to the action of heat with the exclusion of air.

The foregoing specification signed at Washington, District of Columbia, this 21st 10 day of May, 1908.

CARL H. ZIEME.

In presence of—

HERVEY S. KNIGHT,  
EDWIN S. CLARKSON.