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COATED METALLIC ARTICLES SUCH AS STEREOTYPIC PLATES AND METHOD OF PRODUCING SAME.

No Drawing.

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My invention relates to the art of metal coating and is adapted to a wide variety of applications. It is particularly useful, however, in the manufacture of stereotypic plates wherein it is desirable to give type metal or other alloys a hard durable face, such as a copper face, to increase the wearing qualities thereof and the definition and clearness of prints therefrom.

By means of my invention it is possible to produce a stereotypic printing plate or cut equal, if not superior, to any heretofore in use, and, at the same time, to do so more cheaply, and with far greater rapidity, than has heretofore been possible.

Various features of the invention will hereinafter be more particularly described, but it will be readily understood that these are set forth merely for illustrative purposes, and are not to be understood as limitations to the scope of the invention which, it will be understood, is to be limited only by the appended claims. For convenient illustration, the invention will now be described as applied to the manufacture of a stereotypic copper faced plate.

Heretofore, such plates have been produced by some such method as follows: A matrix of paper, pulp or similar substance is first impressed with the desired characters and is then dried. Molten type metal is then poured into this matrix and a casting in relief made therefrom. Thereafter a coating of copper is superimposed upon the face of the plate or casting by electro deposition after which the copper deposit is cleaned, burnished or otherwise treated to insure its clarity, definition and hardness.

Such processes have proven satisfactory except for their cost and comparative slowness, the cost including the labor involved as well as the current consumed in producing the deposit. It will be appreciated, however, that electro-deposition is a comparatively slow process, so that the proper coating or plating of the casting by this method requires several hours of time. In addition, various other factors and conditions are involved which may render the deposit uneven and not entirely satisfactory, in which case the entire plate is useless and must be discarded.

It has been found that, by the invention herein described, stereotypic plates of extreme uniformity, great hardness, definition and clearness can be produced with a sub-

stantial saving in labor and cost, and, what is of great importance, especially in the newspaper industry, is that several plates properly coated can be produced from a single matrix in a few moments time.

One method of practicing this invention which has been found satisfactory is, as follows:

A matrix blank having a comparatively large fibrous cellulose content is first prepared. One satisfactory form comprises a base of comparatively heavy blotting paper, two or more layers of absorbent material such as standard red rag absorbent paper, and a final surface sheet of thin stereotypic tissue. These are put together in the order mentioned. This matrix blank is then saturated with an emulsion of hydrous aluminum silicate, copper sulphate and water, with a gum such as gum arabic, utilized as an emulsifying or binding agent, and having a small quantity of slippery elm thoroughly mixed therethrough.

The emulsion may be prepared as follows:

Crystalline copper sulphate in powdered form is dissolved in boiling water and to this solution is added some previously dissolved gum arabic, and the mixture thoroughly stirred. To this is then added the proper proportion of hydrous aluminum silicate, and, if desired, a small portion of powdered slippery elm is also introduced into the mixture at this time. The proportions used may vary within reasonable limits, but one satisfactory formula is as follows:

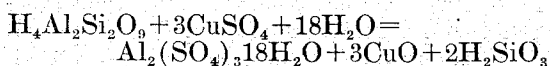
	Parts by weight.
Powdered crystalline copper sulphate	3
Powdered hydrous aluminum silicate	1
Boiling water	18
Powdered gum arabic	2
Powdered slippery elm	1/8

It would seem that a portion of the gum arabic unites with the copper sulphate to form a gum-copper precipitate which is held in suspension in the emulsion, as is also the hydrous aluminum silicate and the slippery elm.

It is preferable to form the mixture with the water approximating boiling temperature, and so formed, the emulsion is substantially stable and can be immediately used; or it may be allowed to cool and be reheated when desired for use. When used to saturate the matrix blank the emulsion should be,

however, at about boiling temperature and the blank submerged therein for a sufficient time to permit the emulsion to thoroughly penetrate the fibres.

- 5 Having been properly saturated, the matrix blank is now ready for impression by the cut or characters desired, and this operation is effected in any well known manner and with any satisfactory apparatus. It is preferable, however, that the pressing operation be performed at a substantially higher temperature, for instance, at about 240 degrees Fahrenheit, and that the pressure employed be several thousand pounds. This may be effected by means of hydraulic presses operating in super-heated steam chests, and when so performed, the heat and pressure are sufficient to cause an absorption of the emulsion by the matrix blank, and upon this absorption there appears to take place a partial chemical reaction between the cellulose and copper contents of the solution and probably between the copper and the clay. The reaction is probably as follows, although this is not certain because of the indefinite formula for kaolin.



- 30 or hydrous aluminum silicate plus cupric sulphate plus water equals hydrous aluminum sulphate (alunogen or concentrated alum) plus cupric oxide plus metasilicic acid. The three products resulting from the reaction are absorbed by the fibrous cellulose structure of the matrix blank, which acts as a medium or conveyor for these compounds for the further transposition, which occurs as will be hereafter described.

- 40 The matrix so prepared comes from the press in a substantially dry condition. It is now ready for use in producing the stereotypic plate. This is done in any well known manner and with any well known apparatus. That is, by pouring molten stereotypic metal upon it. This casting or plate is allowed to cool and then removed, and will be found to possess upon the face which was in contact with the matrix, a complete surface layer or coating of copper. This coating will be found to be in part pure metallic copper, in part an alloy or mixture of copper and the stereotypic metal and some copper oxide will be present, as will be seen from the pronounced malachite green appearance of the surface of the plate upon its removal from the matrix. After the plate cools, this oxide should be removed by brushing or rubbing the surface with diluted oxalic acid, the resulting surface being bright and clean with great definition and clearness.

- 65 It will be understood that the alunogen as well as the metasilicic acid lessens the heat radiation when the molten metal is cast against the matrix, and in addition, they pro-

vide a glutinous covering for the fibres of the paper and serve as mordants or possibly as catalytic agents, in causing or aiding the leaf metal to adhere to or unite with the metal of the casting. The slippery elm adds smoothness to the cellulose fibres, assists in preventing double printing, and increases the clearness of the impression made.

It is desirable that the stereotypic or casting metal used be one having a melting point approximating between 600 and 700 degrees Fahrenheit, as such metals seem to work best.

It would seem that when the molten type metal is cast against the matrix, the heat draws the three compounds to the surface of the matrix mold, the cupric oxide is reduced to pure metallic copper leaf, the oxygen being driven off, and, aided by the presence of the mordants, (or catalytic agents), this copper leaf is transferred to and adheres to the surface of the stereotypic plate. While the fusing point of copper is considerably higher than that of the type metal, the copper does not completely blend with the type-metal alloys, a portion of it, at least, remaining on the surface. Nevertheless, some of the copper seems to unite with the type-metal in the form of an intimate mixture or alloy, so that the plating or facing consists in part of pure copper, and in part of a copper type-metal mixture or alloy varying in composition from the surface inward, which alloy possesses a high degree of hardness and durability. In fact, plates made in accordance with this invention appear to have much greater durability than those produced by the electro-deposition metals of manufacture.

In the foregoing, I have attempted to describe as accurately as possible the chemical and physical reactions occurring during the operation of my process. It will be understood, however, that from the very nature of the invention, it is at this time impossible to be certain that they occur in the form, sequence and in the manner set forth. I wish it to be understood, therefore, that these explanations are tentative merely, although based upon my best observations and experimentation, but a careful following of the procedure above outlined cannot fail to result in the production of a plate of the superior character described.

In describing the operation or function of certain of the ingredients above named, I have used the word "mordant" as to some extent approximating the affect of the substances named. It is quite possible that their action is more in the nature of a catalyst, so that wherever the word "mordant" is used herein, it is intended to mean a substance having substantially the same effect in producing enumerated. As previously stated, the copper content of the emulsion can be varied from the proportion set forth in the specific for-

mula given. Generally speaking, the greater the copper content, the thicker will be the plate or coating imparted to the stereotypic casting. On the other hand, I have found that an increase in the copper content, while increasing the thickness of the plating does so at some sacrifice to the hardness, durability and definition of the characters, so that an excessive copper content should be avoided.

In the foregoing I have referred only to copper sulphate as the copper salt employed, but it will be understood that other salts, such as copper acetate may be used, if desired. Further, the process is by no means restricted to the production of copper plating as other metals may be used, for instance, nickel, in which case nickel salts may be employed, such for instance, as nickel sulphate or nickel ammonium-sulphate.

It is obvious that many modifications and changes may be made in the process and materials used in practicing my invention, as above set forth, without departing from the spirit and scope thereof. I do not mean to limit myself other than as is indicated in the appended claims.

What I claim is:

1. The method of uniting a plurality of metals having different fusing points, comprising bringing a metal and a metallic salt into intimate association in the presence of a mordant.

2. The method of uniting a plurality of metals having different fusing points, comprising bringing a metal and a metallic salt into intimate association in the presence of a mordant at a temperature approximating the fusing point of the metal having the lower fusing point.

3. The method of producing a metallic coating on a metallic body, which comprises bringing the metal of said body and a metallic salt for providing a coating metal into intimate association in the presence of a plurality of mordants.

4. The method of producing a metallic coating on a metallic body, which comprises bringing together the metal of said body and a metallic salt for providing the coating metal into intimate association in the presence of a mordant at a temperature approximating the fusing point of the metal of said body.

5. The method of producing metallic coating on a metallic body, which comprises saturating a matrix with a mordant and bringing the metal of said body and a salt of the coating metal into intimate association in the presence of the mordant.

6. The method of producing a metallic coating on a metallic body, which comprises saturating a matrix with a mordant and bringing the metal of said body and a salt of the coating metal into intimate association on the matrix in the presence of a plurality of mordants.

7. The method of producing a metallic coating on a metallic body, which comprises saturating a matrix with a mordant and bringing the metal of said body and a salt of the coating metal into intimate association in the presence of the mordant on the matrix at a temperature approximating the fusing point of the metal having the lower fusing point.

8. The method of producing a metallic coating on a metallic body, which comprises bringing the metal of said body into intimate association with a fibrous matrix impregnated with a salt of the coating metal and a mordant, at a temperature approximating the fusing point of the metal of the body.

9. The method of producing a metallic coating on a stereotypic plate, which includes casting molten type metal upon a fibrous matrix impregnated with a salt of the coating metal and a mordant.

10. The method of producing a metallic coating on a stereotypic plate, which includes casting molten type metal upon a fibrous matrix impregnated with a salt of the coating metal and a plurality of mordants.

11. The method of producing a coated stereotypic plate comprising casting molten type metal upon a fibrous matrix impregnated with an emulsion containing a salt of the coating metal and one or more mordants.

12. The method of producing a copper-surfaced stereotypic plate which includes casting molten type metal upon a fibrous matrix previously impregnated with an emulsion containing a copper salt, an emulsifying agent and a mordant.

13. The method of producing a copper-surfaced stereotypic plate which includes casting molten type metal upon a fibrous matrix impregnated with an emulsion, including powdered copper sulphate, hydrous aluminum silicate and gum arabic in water.

14. The method of producing a copper-surfaced stereotypic plate which includes casting molten type metal upon a fibrous matrix impregnated with an emulsion formed from powdered copper sulphate by weight 3 parts, hydrous aluminum silicate 1 part, water 18 parts, and gum arabic 2 parts.

15. The method of producing a copper-coated stereotypic plate comprising casting molten type metal upon a fibrous matrix impregnated with an emulsion containing a salt of the coating metal, an emulsifying agent and a mordant, and impressed at a temperature approximating 240° F.

16. The method of producing a copper coating upon a stereotypic plate which includes impregnating a fibrous blank with an emulsion containing copper sulphate, hydrous aluminum silicate, boiling water and powdered gum arabic, impressing said matrix with the desired characters at a temperature approximating 240° F., casting molten type

metal against said matrix, removing said casting and cleaning the surface thereof.

17. The method of producing a metallic coating on a metallic body, which process includes impregnating a fibrous matrix with a mordant and bringing the metal of said body and the coating metal into intimate association on the matrix in the presence of the mordant.

18. The method of producing a metallic coating on a metallic body, which includes impregnating a fibrous matrix with an aluminum-sulphate and bringing the metal of said body and the coating metal into intimate association on the matrix under the application of heat in the presence of said aluminum-sulphate.

19. The process of producing a metallic coating on a metallic body, which process includes impregnating a fibrous matrix with aluminum-sulphate, and bringing the metal of said body, and a salt of the coating metal into intimate association on the matrix under heat and in the presence of the aluminum-sulphate.

20. The process of producing a metallic coating on a metallic body, which process includes bringing the metal of said body into intimate association with a fibrous matrix impregnated with a salt of the coating-metal and a mordant.

21. The process of producing a metallic coating on a metallic body, which process includes bringing the metal of said body into intimate association under heat with a fibrous matrix impregnated with a salt of the coating-metal and a mordant such as aluminum-sulphate.

22. The method of producing a metallic coating on a body of type-metal, which process includes bringing the type-metal into intimate association under heat with a fibrous matrix impregnated with a salt of copper and a mordant.

23. The process of producing a stereotype plate, which process comprises, firstly, impregnating a fibrous matrix with a mixture

containing a salt of copper and a suitable mordant and a suitable emulsifier, secondly, impressing into said impregnated matrix the desired characters, and, thirdly, casting type-metal against said matrix.

24. A matrix blank adapted for use in coating metal comprising a fibrous base impregnated with a salt of the coating metal and one or more mordants.

25. A matrix adapted for use in forming stereotypic plates, comprising a fibrous base impregnated with a metallic salt and one or more mordants and impressed with the characters to be reproduced.

26. The process of producing a metallic plate, which process comprises, firstly, impregnating a fibrous blank with an emulsion containing a salt of some metal and a catalyst agent and an emulsifier, secondly, converting said impregnated blank into a matrix by impressing the desired characters into it, thirdly, melting some other metal or mixture of metals other than the first-named metal and casting the same against said matrix.

27. The process of producing a stereotype plate, which process comprises, firstly, impregnating a fibrous blank with an emulsion at a temperature of about 212° F. and containing the following ingredients in substantially the following proportions by weight, viz: 18 parts of water, 3 parts of copper-sulphate, 1 part of hydrous aluminum-silicate, 2 parts of gum-arabic, and one-eighth of 1 part of slippery-elm, secondly, converting said impregnated blank into a matrix by impressing the desired characters into it at a temperature of about 212° F., and thirdly, melting type-metal and casting it against said matrix, whereby a surface of pure copper adheres to the casting and beneath said surface other copper in ever-diminishing proportions is alloyed with the type-metal, the body of the cast type-metal and the intermediate alloy and the copper surface being united integrally, and the alloy being harder than the copper and the type-metal.

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