

# UNITED STATES PATENT OFFICE.

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## PROCESS OF ENAMELING.

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*To all whom it may concern:*

Be it known that I, CHESTER COMSTOCK, a citizen of the United States, residing in Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Processes of Enameling, of which the following is a specification.

This invention relates to the art of enameling metal or articles of iron or steel or of other suitable material upon the surface of which a vitrifiable coating is applied, and to the mottling, marking, or ornamentation of the same.

The object of the invention is to produce an article of enameled ware coated with an enamel which is pure, substantial, and durable in its texture and composition, and which is pleasing and attractive in its appearance, so far as the color and the mottlings, markings, or ornamentations thereof are concerned, and to avoid in the process of manufacture the losses arising from delays and from defective pieces of goods heretofore found to be incidental to the manufacture of enameled goods as made by the processes ordinarily employed, and likewise to reduce to a minimum, consistent with the production of a reliable, serviceable, and attractive article, the cost of manufacture thereof.

As a preface to a description of this improved process I desire to state that I do not confine myself to an article having but one coating of enameling material, as it will be understood that one or more coats of enamel may be applied to the article desired in order to obtain the varying effects in color and finish, although the process is especially adapted to secure superior results in goods or wares having but one coating of enamel. It will also be understood that the process herein-after described for applying a solution of metallic salt to a vitrifiable surface-coating is one which is capable of a wide range of application, and I do not limit myself, therefore, to articles manufactured of iron or steel, although articles of this character are preferably described herein to illustrate the process, and therefore within the scope of this invention is included any article of any suitable material on which a vitrifiable surface may be obtained which will receive the solu-

tion and reveal the characteristic color of the salt when fused or vitrified.

This improved art or process contemplates in a general way the coating of the material to be treated or the article formed therefrom with some suitable enameling material or composition analogous thereto, then applying thereto a solution of metallic salt or compound, and then placing the material or article so treated in a muffle and fusing the same in the ordinary manner, whereby a durable product having an attractive and highly ornamental appearance is obtained.

In carrying out this improved process, when used in connection with enameled iron or steel ware, the article or ware to be enameled is first cleansed in the usual way such as is common among enamellers—as, for instance, by being pickled and scoured—and when thus prepared is dipped into or coated with an enamel-paste previously prepared. This enameling material or composition may be prepared in accordance with any of the well-known formulas by which enamel is compounded and prepared for use in the ordinary processes of enameling, except that in the preparation of the enamel for dipping after it has been ground it is not necessary to add acids or other deleterious ingredients to the enamel-paste to induce mottling, as is the case when the mottling is secured by the oxidizing of the metallic base during the process of drying the glaze, and therefore it will be understood that I do not confine myself to any particular formula in preparing and compounding the enamel coating, nor do I confine myself to any particular color or colors, or tints of the same, in the enamel which forms the coating to which the solution of metallic salts is applied. The article so coated with enameling material is then dried in a suitable drying room or oven, and when this operation of drying is nearly or quite completed there is applied to the coating a solution of metallic salt, preferably by spraying or sprinkling or by means of a stamp, although it may be applied in any desired manner and by any suitable instrumentality.

Any soluble metallic salt may be used which will not injure the enamel coating when the fusion is completed, but the metallic salt to



be used in this process should be one which will give the desired color to the mottles, marks, or ornamentations which are to appear in the coating when the process is completed. Wherever the solution of metallic salt has been applied to the unfused enamel coating, it will be found when fused that the characteristic color corresponding to the salt used will appear in the shape of mottles, marks, or ornamentations, varying in number, size, and configuration according to the manner in which the solution was applied. If a blue color is desired, then one of the salts of the metal cobalt is used, and the intensity of the color will depend upon the strength or weakness of the solution employed. Soluble salts of manganese, nickel, or copper may also be used, when desired, or a solution may be made of a combination of two or more of these salts, which will give a modified color, varying in shade according to the proportions used. When this coating of enamel to which the solution of metallic salt has been applied is somewhat dry or dried, it is placed in a muffle and fused in the ordinary way, and if the work has been done with proper care an article will be produced covered with a coating of enamel which is mottled, marked, or ornamented, the color or style of mottles, marks, or ornamentations varying according to the metallic salt used and to the method, device, or instrumentality employed for applying the same, this mottling or ornamentation being secured by the decomposition of the metallic salt after it is applied to the enamel coating, and which decomposition of the metallic salt takes place during the subsequent drying and firing of the article, with the result that the oxid of the metal, which is present in the salt as a constituent, is left in a very finely-divided condition, intimately mixed with the porous coating, which in the fusion is vitrified with such coating, thereby forming a solid surface and giving its characteristic color to the glaze.

When the dried enameling material, which is more or less porous, owing to the evaporation of water previously held mechanically therein, has been treated with a solution of metallic salt, such metallic salt thoroughly permeates the outer or surface portion of the body of the enamel coating and becomes diffused and disseminated therein, whereby after the coating has been vitrified the resultant mottles, marks, or ornamentations form a permeated part of such coating, as contradistinguished from a mere superimposition of such mottles, marks, or ornamentations on the enamel, whereby an article or vessel having an even and perfect enamel surface or finish is obtained, and it is found in practice that the distribution over the area of the mottle is very uniform and even and quite free of any accumulation either along the border

or in the central portion of such mottle, and that consequently on submitting the prepared article to vitrification the article comes out of the muffle with a smooth and even mottle surface of beautiful color and appearance.

By the term "drying the coating" as used herein I mean such a drying of the same as is required in practice for qualifying the coat to receive and hold in place the solution when it is applied thereon; but I prefer to apply the solution to the surface of the coating of enameling material when this has been dried to the extent of nearly or quite freeing it of water held mechanically therein, since I find better results are thus obtained.

By means of my present improvement I am able to produce high-class articles of enameled ware at a comparatively low cost, and produce these improved articles of great uniformity in quality and of the even and perfect surface or finish which is much desired by the trade and is not readily obtainable by the old processes of manufacture.

Having thus described my invention, I claim—

1. The process which consists in applying to an article having a vitrifiable surface, a solution of metallic salt to produce a color in said surface, and then subjecting the surface so treated to heat to develop and fix the color.

2. The process which consists in first coating a surface with enamel or analogous material, then applying to such surface a solution of metallic salt to produce a color in the enamel, and finally subjecting the surface so treated to heat to vitrify the coating and develop and fix the color.

3. The improvement in the art of enameling metal which consists in first coating the metal with enamel or analogous composition, then drying said coating and applying thereon a solution of metallic salt to produce a color in the enamel, and then subjecting the metal to heat to vitrify the coating and develop and fix the color.

4. An article of manufacture provided with a vitrified surface having fused in said surface a mottling material decomposed from a metallic salt applied in solution thereon to produce a color in the surface, and constituting, after fusion, the fixed ornamentation of the article.

5. Enameled ware with a coating of enamel vitrified thereon and having fused in the surface of said coating a mottling material decomposed from a metallic salt applied in solution thereon to produce a color in said coating, and constituting, after fusion, the fixed ornamentation of the ware.

CHESTER COMSTOCK.

Witnesses:

C. A. WEED,  
EDWARD A. MEAD.