UNITED STATES PATENT OFFICE.

JAMES COCHRAN, OF BROOKLYN, ASSIGNOR TO THE LALANCE & GROSJEAN MANUFACTURING COMPANY, OF NEW YORK, N. Y.

ENAMELING METAL.

SPECIFICATION forming part of Letters Patent No. 533,945, dated February 12, 1895.

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To all whom it may concern:

Be it known that I, JAMES COCHRAN, a resident of Brooklyn, Kings county, State of New York, have invented certain new and useful Improvements in Enameling Metal, of which the following is a specification.

My invention relates to enameling metal, more particularly steel or analogous metal, to which enamel will not properly adhere, and has for its particular object to enamel such metal with one or more coats of enamel presenting a mottled effect, but I wish to have it understood that the invention is not limited to enameling steel or to the number or character of the coats.

My invention consists mainly in the process and article of manufacture hereinafter set forth and claimed, which is, broadly stated, interposing between the metallic vessel and the enamel (preferably by electro-deposition) of a metallic binder which will act as a bond between the metallic base and the enamel when fused.

My process may be practiced in various ways upon various metals and by the employment of various substances; so therefore I will describe one method of enameling which I practice, leaving it understood, however, that I do not limit myself to any particular metal, article or enameling composition.

One method of practicing my process, which I may state by way of example, is as follows: I first take the metal article and submit it to a proper cleaning process so as to present a clean surface to operate upon. I then take this article and immerse it in a suitable bath, which in the present instance will be a bath of a salt of cobalt, although other analogous metallic salts may be used, and for this reason whenever I use the term cobalt in this specification I wish thereby to be understood as also including other and analogous oxidizable metals and their salts; but the best substance for the purpose is a magnetic metal, such as cobalt. I then pass a current of electricity through the bath, from the bath to the metal article by the employment of a suitable anode. This has the effect of depositing the metal contained in the metallic salt solution of the bath upon the metal article. I can now give to this article so coated any desired form by stamping or otherwise, or I can proceed to enamel it at once. To enamel it I apply to the surface or surfaces having the electro-deposited coat a glaze or enameling mixture. One mixture which I have found suitable for the purpose is that given in the reissued Letters Patent of F. G. and W. F. Niedringhaus, No. 7,779, dated July 3, 1877, although it will be understood that other and analogous mixtures may be used. After coating the previously prepared article with the glaze or enamel, I proceed to dry the article and heat it in a muffle or other suitable place, according to the usual practice, and at the proper time which will be determined by practice the article is removed from the muffle and the coat of enamel will be found to have adhered firmly to the surface of the article. I thus produce a merchantable article of manufacture. This article, which I produce, will in the present instance be coated with a coat of enamel flecked because of the oxidizing nature of the enamel with mottles of a darker hue, which is ordinarily known in commerce as mottled enamel. This mottling will be due to the fact that during the drying of the glaze a metallic oxide is developed upon the metallic surface of the article, which oxidation may be produced either by the oxidizing ingredients contained in the enamel or in any other manner.

Whenever the mottled effect is desired, which, as already stated, is produced either by the use of acid on the steel or iron body, or by the use of an acid in the enamel, the effect of this acid is not resisted by the very thin film of electro-deposited metal. Hence, when the acid is applied to the iron or steel vessel direct, as described, it oxidizes it wherever applied and eats through or permeates a portion of the electro-deposited metallic film above it, so that the spot of oxidized steel or iron can be seen through the glaze coating of the vessel. When the acid is used in the enamel itself, it permeates the electro-deposited film and reaches the iron or steel and there produces the oxidizing effect, which is visible through the glaze. In either case, therefore, whenever my invention is used in the presence of an acid, the final result is that the film of electro-deposited metal becomes, so to say, porous, adhering firmly to the vessel and to the superposed enamel, and con-

stitutes a binder, but allowing the oxide of iron to be plainly perceived through it wherever the acid has taken effect. Hence, I produce, in substance, so far as mottling is concerned, an iron or steel vessel, or one of analogous material, which is covered with a porous or permeable film of electro-deposited metal and upon which film is placed the enamel.

I have found by experiments that if the electro-deposited metal, such as cobalt, is applied in too great a thickness, it will resist, to a greater or less extent, the action of the acid hereinabove described; and this has shown me the value of the very thin film of electro-deposited metal in connection with my process. Nevertheless, this part of my invention is applicable also to the employment of any porous or perforated metallic sheet between the metal to be glazed and the glaze itself for producing artistic or ornamental effects.

My understanding of the effect of the electro-deposited magnetic metal on a surface of metal which is not capable of properly retaining a direct coat of enamel is, that the electro-deposited metal enters into such an intimate contact with the steel or other vessel as not to be separable therefrom; and in turn the enamel or glaze enters into such an intimate contact with the electro-deposited coat as not to be separable therefrom. In other words the said electro-deposited coat forms a bond that ties or binds the enamel to the steel, where, without such a bond, the enamel would not properly adhere to the steel or analogous metal.

What I claim, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, an iron or steel article containing a binding-film of magnetic metal between the body and the enamel.

2. As a new article of manufacture, an enameled metallic article having a film of cobalt interposed between the metal body and the enamel.

3. As a new article of manufacture, a steel or iron vessel having thereon an electro-deposited coat of magnetic metal and superposed thereupon, a coat of mottled enamel, substantially as described.

4. In the art of enameling magnetic metals to which the enamel will not properly adhere, the interposition between the coat of enamel and the said metal or other article prior to fusing the enamel of a binder of magnetic metal which constitutes a bond between the metal or other article and the enamel when fused.

5. A metallic vessel or article carrying a perforate superposed film of another metal and upon said film the enamel or glaze, substantially as described.

6. A metallic vessel or article partly oxidized provided with a film of electro-deposited metal and a superposed layer of enamel or glaze, all arranged so that the enamel or glaze is mottled by the oxidation of the foundation metal, as specified.

7. As a new article of manufacture, a metallic vessel or article carrying a coat of mottled enamel on a perforate film of metal, as specified.

8. As a new article of manufacture, a metallic vessel or the like having a porous or perforate metallic sheet interposed between the metallic body and the enamel coating, as described.

9. As a new article of manufacture, a metallic vessel or the like having a permeable metallic sheet interposed between the metallic body and the enamel coating, as described.

10. In the art of enameling metallic articles to which enamel will not readily adhere, the process which consists in first placing upon such metallic article a coating of another metal and an acid which is capable of permeating said coating and oxidizing the body of the article, the resulting oxide in turn permeating said metal coating, and in applying an enamel to the surface of said coating, as described.

JAMES COCHRAN.

Witnesses:
GEO. E. MARCY,
HARRY M. TURK.