

UNITED STATES PATENT OFFICE.

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ENAMELING.

No. 804,010.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JULIUS F. KENKEL, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Enameling, of which the following is a specification.

This invention relates to the art of enameling metal, and more particularly to the production of ware having a mottled or variegated enamel-finish; and it consists in both the process and the characteristic product resulting from such process, as hereinafter particularly set forth and claimed.

Heretofore a mottled effect in enameled metal ware has been obtained by dusting or sprinkling on a moist coat of enamel metallic salts, such as sulfate of copper, sulfate of iron, hypomanganate of potassium, either separately or mixed together, as described in United States Letters Patent No. 527,361, dated October 9, 1894, or by sprinkling or spraying a moist coat of enamel with non-metallic hydroxids, such as ammonium hydroxid or phenyl hydrozin, as described in United States Letters Patent No. 758,325, dated April 26, 1904, or by sprinkling upon a moist coat of enamel applied to a priming film of alkali carbonate, or mixing with the enamel a free acid or the acid sulfate of an alkali metal, (preferably potash,) as described in United States Letters Patent No. 691,268, dated January 14, 1902.

The process comprehended within my present invention differs from the processes hitherto used, including those above referred to, for producing mottled enameled ware in the employment of two coats, as distinguished from a single coat, a fundamental coat of kaolin, clay, or the like, containing an acid or oxidizing agent, and forming the basis of the mottled appearance given to the finished ware, and a glaze or cover coat which is fused upon and with the fundamental mottling-coat and which brings out and fixes the mottled effect imparted thereto by the fundamental coat. It also differs from processes of the character above mentioned in which oxidizing agents are sprinkled, sprayed, or dusted upon the moist coat of enamel, as it eliminates such operations, the oxidizing agent in my process being mixed with the fundamental mottling-coat before it is applied and working out-

wardly from the surface of the metallic base of the enameled ware instead of inwardly from the glaze or cover coat of enamel, as in the cases above cited.

With my improved process iron, steel, and other metals may be enameled either in the form of sheets or manufactured articles of various shapes, and enamel of any desired color or shade may be employed. I have obtained excellent results with light as well as dark colors, and particularly with gray.

In carrying out my process I proceed as follows: The metal sheets or articles to be enameled are prepared in the usual manner by annealing, pickling, and cleaning; but after being subjected to the customary alkali-bath they are treated in a bath of a specially-prepared mixture of kaolin, acetic, or similar acid and water, thus giving them a fundamental mottling-coat. It should be understood, however, that while I prefer kaolin and acid for producing this fundamental coat I do not confine myself to the use of these particular ingredients, but may employ any other clay or similar substance in place of the kaolin and any other suitable oxidizing agent in place of the acid. This first coat is an important and distinctive feature of my invention, as it forms the foundation for the grotesque or fantastic figures which give the peculiar mottled appearance to the finished ware. The acid, which does not intimately mix with the kaolin, but tends to separate therefrom as soon as the articles are coated with and removed from the mixture, causes the kaolin to stiffen and set in patches of varied shapes and sizes, more or less defined and separated from each other by streaks or veins of the acid or more strongly acid portions of the mixture, and attacks the metal foundation of the ware, starting a chemical action, by which the darker mottled markings of the finished ware are ultimately produced. The shape and size of the mottled figures or markings can be varied at will by varying the density of the mixture for this fundamental mottling-coat and by withdrawing the articles quietly from the bath or giving them as they are being withdrawn therefrom a shaking or vibratory motion to change the direction and extent of the streaks or veins, and hence the shape and size of the figures which they define. After this fundamental mottling-coat has been ap-

plied it is covered with a glaze-coat, which may be made substantially according to any of the well-known formulæ employed for enameling metals. For this second coat I prefer
 5 the following ingredients, mixed, by weight, in about the following proportions: borax, one hundred pounds; quartz, ninety pounds; feldspar, fifty pounds; fluorspar, twenty pounds; soda, fifteen pounds; coloring agents,
 10 four pounds.

I do not wish, however, to be understood as limiting my invention to the particular ingredients or proportions above specified, since other substances may be employed and
 15 the proportions varied without materially affecting the result.

The ingredients of this mixture having been melted and ground together with clay are mixed with water to form a bath of the
 20 desired consistency, and into this second bath the articles to which the fundamental mottling-coat has been applied, as above explained, are now dipped.

In grinding this mixture for the second
 25 bath I use less than the ordinary percentage of clay, according to the quantity employed in the fundamental coat, and make the bath of a thin and milky consistency, so that it will flow freely over and readily unite with the
 30 fundamental coat.

The acid or oxidizing agent still present in the first coat, which forms the basis of the mottled figures or markings of the finished ware, reacts on the second coat where it is not un-
 35 derlaid by the kaolin patches of the first coat, working its way outward toward the surface and reproducing therein while the articles are drying the mottled figures or markings, which are brought out more clearly and are
 40 made permanent by fusing in a muffle-furnace. Thus the two separately-applied coats coacting to produce the peculiar mottled figures or markings which give the ware its distinctive appearance require but one fusing,
 45 and this is an important and distinctive feature of my process.

Although a finished product may be made by my process with but one fusing for two separately-applied coats, to give the desired
 50 mottled appearance to the ware one or more glaze or cover coats, each separately fused, may, if desired, be added to the ware without materially affecting its appearance, and I do not wish to be understood as precluding
 55 myself from the use of such additional coats in connection with my invention.

I claim—

1. As a new article of manufacture, a steel or iron article having a fundamental mottling-coat composed solely of acid and a suitable vehicle therefor, such as clay, and a separately-applied glaze-coat fused with the fundamental coat upon the metal base, substantially as described.

2. As a new article of manufacture, a steel or iron article having a fundamental coat composed solely of clay and an oxidizing agent, and a separately-applied glaze-coat covering the fundamental coat and forming therewith a mottled finish, substantially as described.

3. As a new article of manufacture, a steel or iron article having a fundamental coat composed solely of clay and acid, and a separately-applied glaze-coat forming therewith a mottled finish, substantially as described.

4. The process of enameling which consists in coating a steel or iron article after annealing, pickling and cleaning, with a mottle-producing mixture composed solely of acid, and of a suitable vehicle, such as clay preparatory to applying a glaze-coat thereto, substantially as described.

5. The process of enameling which consists in coating a steel or iron article after annealing, pickling and cleaning, with clay containing an oxidizing agent, whereby the foundation for a mottled finish is produced, preparatory to the application of a glaze-coat, substantially as described.

6. The process of enameling which consists in applying to a steel or iron article after annealing, pickling and cleaning, clay containing an oxidizing agent and forming therewith a fundamental mottling-coat, and covering the fundamental coat with a glaze-coat in a milky condition, substantially as described.

7. The process of enameling which consists in applying to a steel or iron article after annealing, pickling and cleaning, clay containing an oxidizing agent and forming therewith a fundamental mottling-coat, covering the fundamental coat with a glaze-coat and fusing the glaze-coat with the fundamental coat, substantially as described.

8. The process of enameling which consists in applying to a steel or iron article a mixture composed solely of clay and acid forming a fundamental mottling-coat, covering said fundamental coat with a glaze-coat in a milky condition, and drying and finally fusing the glaze-coat with the fundamental coat, thereby causing the oxidizing agent of the fundamental coat to react on the glaze-coat and to produce a permanent mottled effect therein, substantially as described.

9. The process of enameling metal which consists in subjecting the article to be enameled to a primary bath containing clay and an oxidizing agent such as acid, which does not intimately mix with the clay and causes the same to settle and set in patches upon the article when it is removed from said bath, thereby forming a fundamental mottling-coat upon the article, then covering the fundamental coat with a glaze-coat which is allowed to dry thereon, and finally fusing the glaze-coat with the fundamental coat, substantially as described.

10. The process of enameling metal which

consists in applying to the article to be enam-
eled a fundamental coat consisting of clay con-
taining an oxidizing agent such as an acid,
which does not intimately mix with the clay
5 and causes it to set into patches upon the ar-
ticle, shaking or agitating the article while the
fundamental coat thereon is in a moist condi-
tion, to produce the desired mottled effect, cov-
ering said fundamental coat with a glaze-coat,

and finally fusing said glaze-coat upon the fun- 10
damental coat, substantially as described.

In witness whereof I hereto affix my signa-
ture in presence of two witnesses.

JULIUS F. KENKEL.

Witnesses:

CHAS. L. GOSS,

CHAS. A. PAESCHKE.