

(Specimens.)

H. CLAUS.
ENAMELING METAL WARE.

No. 527,361.

Patented Oct. 9, 1894.

Fig. 1.

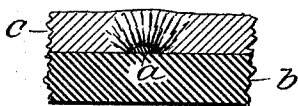


Fig. 2.



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ENAMELING METAL-WARE.

SPECIFICATION forming part of Letters Patent No. 527,361, dated October 9, 1894.

Application filed November 18, 1893. Serial No. 491,335. (Specimens.)

To all whom it may concern:

Be it known that I, HUBERT CLAUS, a resident of Thale-am-Harz, Germany, have invented an Improvement in Enameling Metal-Ware, of which the following is a specification.

My invention relates to enameling metal ware, and has for its object to coat steel or other analogous homogeneous metallic surfaces, such as the Siemens, Martin and Thomas products, with a single coat of enamel exhibiting mottled effects.

To this end my invention consists in the process of enameling, and the article of manufacture hereinafter set forth and claimed.

Heretofore it has been customary to coat iron, meaning fibrous iron, with a mottled enamel by oxidizing the surface with free acid contained in or applied to the enamel. This process has been found unavailable for coating steel or other homogeneous metallic surfaces with a mottled enamel on account of the density and homogeneity of the metal and for other reasons.

According to my invention I prepare an intensely alkaline enamel, preferably by mixing various more or less vitrifiable substances, some of which are alkaline, the alkaline constituents of the mass being in great preponderance. This alkaline enamel may, however, be variously compounded, the essential feature being to obtain as a preliminary step an enamel which will give a strongly alkaline reaction. This enamel may be brought to the proper condition for applying to the surface to be coated in any suitable manner, such as by the common process of melting, grinding, and mixing with water. This intensely alkaline enamel is very refractory, and the high melting point increases the power of resistance of the enamel against chemical influences, and also brings about the intimate union of the metal and the enamel during the process of burning. The surface to be coated is cleaned and the alkaline enamel applied in a thin layer in any suitable manner. The metallic salts are now applied to the enamel coating by dusting or by sprinkling, or the salts may be mixed with the enamel before it is applied to the surface to be coated. The reactions between the alkaline constituents of the enamel coating and the metallic

salts bring about oxidation, the oxides permeating the coating and producing when burned a beautiful mottled effect closely resembling coarse grained broken granite. The oxide in certain cases may be directly produced by the reactions between the alkaline enamel and the metallic salts.

Having thus set forth my process, I will now describe specifically one mode of enameling under that process, giving proportions and ingredients, it being expressly understood that I in no manner limit myself to the proportions nor to the ingredients thus set forth in this specific process, as it is only one of the many forms in which my invention may be clothed.

I prepare an enamel by mixing the following ingredients in about the proportions specified, viz: one hundred and thirty parts by weight feldspar; one hundred and twenty-five parts by weight borax; seventy parts by weight quartz; twenty-five parts by weight soda; seventeen parts by weight saltpeter. To these I may add a small proportion of fluorspar and cobalt, or either.

Various other ingredients may be used instead of the ingredients specified, it being merely necessary to preserve to the enamel an intensely alkaline characteristic. In this instance it will be observed that certain alkaline ingredients, notably feldspar are greatly in preponderance, thus imparting to the mass an intensely alkaline characteristic, which, as above pointed out, is essential. The ingredients having been intimately mixed, are molten together and ground with water, which is most conveniently done, as is well known, by adding fatty clay while grinding, until the enamel can be spread out in a thin coherent layer. This enamel is applied to the clean steel surface, and while still moist a mixture of equal parts of pulverized sulphate of copper (CuO, SO_3) and pulverized sulphate of iron ($\text{Fe}_3\text{O}_4, \text{SO}_3$) is applied thereto, as by sprinkling or dusting. I prefer to use both these metallic salts, but may use either alone, or equivalent metallic salts. By the dissolution of these metallic salts, which begins the moment they touch the enamel, the enamel is coagulated, that is to say, watery masses are formed in proximity to more coherent masses. The watery masses are pro-

duced by the sulphate of copper, and the tough or more coherent masses by the sulphate of iron. The solution of sulphate of copper descends through the watery masses until it reaches the metallic surface, where the copper is deposited on the steel surface and a ferrous sulphate produced by the contact of the liberated acid with the steel. This ferrous sulphate is changed by the alkaline enamel into oxide of iron, which grows crystal-like from the metallic surface outward and produces a spotting or mottling appearance on the surface.

The particles of sulphate of iron are confined to the surface of the coagulated enamel by the tougher portions thereof, and are transformed by the alkaline enamel into ferrous silicate or borate. The unstable ferrous combinations quickly become ferric and result in a growth of rust spots from the surface of the enamel downward. These various oxide spots produced by the metallic salts impart to the enamel when burned a beautiful mottled appearance.

The character of the mottling may be varied by varying the size of the particles of the salts, and the effect can be materially enhanced by adding hypo-manganate of potassium ($\text{KO}, \text{Mn}_2\text{O}_7$) to the salts that are sprinkled on or by previously mixing it together with the said salts, or either of them, or alone with the enamel mixture. The enamel when sprinkled is dried by mere exposure to the air, and then burned. A single coat of this enamel is effective for all practical purposes; but of course nothing herein stated is to be understood as precluding the application of several coats.

The effect of the process is to produce an article wherein the steel or homogeneous iron surface upon which the coat of mottled enamel is superposed is partly oxidized.

In the accompanying drawings, I have indicated the manner in which the oxides are propagated in and through the enamel upon the steel or homogeneous iron surface; although, it will, of course, be understood that the illustration is necessarily on a highly exaggerated scale and is intended merely to show the general effect.

Figure 1 represents the distribution of the crystals growing from the metal outward after the copper has been deposited. Fig. 2 represents the crystals growing from the surface of the enamel inward.

In the drawings *b* indicates the steel or homogeneous iron ware provided with the enamel coating *c*.

In Fig. 1, *a* indicates one of the places upon which the copper is deposited as hereinbefore described, and the upwardly radiating lines therefrom indicate the upwardly extending crystals.

In Fig. 2 the downwardly radiating lines indicate the downwardly extending crystals.

Having now described my invention, what

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

1. As a new article of manufacture, a steel or homogeneous iron article having one coat of mottled enamel.

2. As a new article of manufacture, a steel or homogeneous iron article having one enamel coat having therein a preponderance of alkaline constituents.

3. As a new article of manufacture, a steel or homogeneous iron article having a single enamel coat of an intensely alkaline nature.

4. As a new article of manufacture, a metallic article having a coat of enamel of an intensely alkaline nature permeated by metallic oxides, substantially as described.

5. As a new article of manufacture, a steel or homogeneous iron article having a single coat of mottled enamel on a partly oxidized metallic surface, substantially as described.

6. As a new article of manufacture, a metallic article having a mottled coat of alkaline enamel and within said enamel metallic oxides extending from the outer surface of the enamel inwardly, substantially as described.

7. As a new article of manufacture, a steel or homogeneous iron article having a mottled coat on a partly oxidized metallic surface and having metallic oxides extending from the outer surface of the enamel inwardly, substantially as described.

8. An enamel for surfaces having therein a preponderance of alkaline constituents together with metallic oxides, substantially as described.

9. The process of enameling which consists in coating an article with an alkaline enamel and in applying thereto while still moist, a metallic salt or salts, substantially as described.

10. The process of enameling which consists in coating an article with an alkaline enamel, and in applying thereto while still moist, sulphate of iron and sulphate of copper, substantially as described.

11. The process of enameling which consists in coating an article with an alkaline enamel, and in applying thereto, while still moist, sulphate of iron, substantially as described.

12. The process of enameling which consists in coating an article with an alkaline enamel and in applying thereto, while still moist, sulphate of copper, substantially as described.

13. The process of enameling which consists in coating an article with an alkaline enamel and in applying thereto, while still moist, sulphate of iron, sulphate of copper and super-manganate of potassium, substantially as described.

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Witnesses:

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