UNITED STATES PATENT OFFICE.

ALEXANDER NIEDRINGHAUS, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE ST. LOUIS STAMPING COMPANY, OF SAME PLACE.

MANUFACTURE OF ENAMELED WARE.

SPECIFICATION forming part of Letters Patent No. 568,366, dated September 29, 1896.

Application filed March 16, 1896. Serial No. 583,440. (No specimens.)

To all whom it may concern:

Be it known that I, ALEXANDER NIEDRINGHAUS, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in the Manufacture of Enameled Ware, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which the invention appertains to make and use the same.

This invention relates to a new and useful improvement in the manufacture of enameled ware; and it consists, essentially, in the method of treating the base or that part which is to be enameled.

Heretofore in the manufacture of enameled ware iron has generally been used as a base. Steel has been used to a greater or less extent for some wares, but with the result generally that pinholes, flecks, and chips occur to such an extent as to constitute a serious objection to its use, destroying the beauty and impairing the usefulness of the enameled ware. "Pinholes," as they are called, appear irregularly over the enameled surface and are the result of the development of a gas or gases beneath the enamel coating during the fusion of the glaze, forming bubbles which, bursting, expose the black metal beneath. "Flecks," as they are called, also appear irregularly over the enameled surface, but are apparently produced by different or modified causes from that ascribed to pinholes. These flecks, or scale-like chips, differ in depth and size. Some of them extend down to and expose the surface of the base, while others are more shallow and show the dark color of the glaze near the base. In many instances the enamel is not entirely flecked off, but is loosely attached, appearing white where the rupture of the fleck extends beneath the surface of the enamel. Moreover, it is known that these fleckings occur after the ware has been removed from the muffle, and it may be some time before they appear. "Chips" or "chippings," as they are called, are generally found at corners of the ware and expose the surface of the base to a considerable extent. This is supposed to be the result of insufficient attachment of the enamel to the base, aggravated by the strain of gases in some cases, causing it to flake or chip off in large pieces and expose the base.

I am aware that colored enamel, consisting of two or more coats, has been applied to steel. This is accomplished by burning the first coat, which is usually colored with cobalt or manganese, into the steel under excessive heat. If any of the defects to which I have heretofore referred are present in this first coat, they are cured or covered by the second coat of soft and easy-fusing glaze, which is generally opaque, so as to hide the first coat.

I will now describe my invention, and, in the beginning, desire to be understood as not limiting myself to the exact ingredients herein named, the proportion of such ingredients as I have found by experiment desirable to use, nor the particular manner herein described of using the ingredients, as it is obvious that there are many equivalents which could be employed with more or less success.

To begin with, in the manufacture of mottled enameled ware having steel for its base, the same general steps are employed to convert the raw material into a finished article, with such exceptions as I will note, as are employed in making mottled enameled ware with iron for its base. The base, either steel or iron, having been rolled into sheets, is stamped or seamed into form and enameled.

This invention is based upon the discovery that saltpeter introduced into the annealing-pot will vaporize at a low temperature and generate gases, which, attacking the surface of the metal, will cleanse it, at the same time slightly etching said surface, rendering the metal sensitive to a superior glaze of enamel.

Saltpeter may be used alone in the annealing-pot in about the proportions hereinafter stated, or it may be used in conjunction with chlorid of calcium or some other chlorid or salt with satisfactory results. Instead of chlorid of calcium other chlorids, a salt of ammonia, or analogous salt may be used with the saltpeter and good results produced. Hence this invention, which, broadly considered, consists in placing saltpeter in the annealing-pot by itself or with other ingredients named, so that a gas or gases will be generated in the annealing-pot, in the presence of which the metal base will be annealed, will

not be avoided by so changing the ingredients or the proportions thereof that their equivalents will accomplish the same result.

In practicing this present invention the saltpeter is placed in the annealing-pot with the metal to be annealed, preferably in about the proportion of two pounds of saltpeter to one hundred pounds of steel, and the pot then exposed to the ordinary annealing-heat for about three to six hours. I prefer to so treat the steel in what is known as the "first annealing," that is, before the metal is shaped into vessels by stamping or otherwise, but instead of practicing my invention in this first annealing it may be used with equal success after the metal has been shaped, after which the metal ware thus treated can be enameled with beneficial results, wherein the pinholes will not be present and the flecking or chipping will be reduced. It will be further found that the enamel will have a close adhesion to the metal base, which thereby makes a superior article of enameled ware.

If chlorid of calcium or any of the other ingredients named are used in conjunction with the saltpeter in the annealing-pot, I have found that about three-quarters of a pound of such ingredients in addition to the two pounds of saltpeter to one hundred pounds of metal will produce satisfactory results.

Having thus described my invention, what I claim, and desire to secure by United States Letters Patent, is—

1. The herein-described process of preparing steel for enameling, which consists in placing the steel and saltpeter in the annealing-pot and subjecting the same to an ordinary annealing-heat; substantially as described.

2. The herein-described process of preparing steel for enameling, which consists in placing the steel, a chlorid and saltpeter in the annealing-pot and subjecting the same to an ordinary annealing-heat; substantially as described.

3. The herein-described process of making enameled ware, which consists in placing the metal base in an annealing-pot, placing saltpeter in said pot with the base, applying the annealing-heat, and then applying the enamel to the base and fusing the same thereon; substantially as described.

4. The herein-described process of making enameled ware, which consists in placing the metal base in an annealing-pot, placing a chlorid and saltpeter in said pot with the base in about the proportions set forth, applying the annealing-heat, and then enameling the base; substantially as described.

In testimony whereof I hereunto affix my signature, in presence of two witnesses, this 14th day of March, 1896.

ALEXANDER NIEDRINGHAUS.

Witnesses:
HUGH K. WAGNER,
F. R. CORNWALL.