

Enameling Iron.

Having had many inquiries respecting the art of enameling metals, we present the following specification of a patent granted a few years ago, to F. Walton, of Wolverhampton, Eng., a practical tin plate worker.

This process consists in covering and ornamenting the surfaces of articles made of wrought-iron or other metal, with successive coats of partially vitrified and earthy materials, for the purpose of forming a glazed enamel surface, resembling earthenware, which may be painted with various colors, gilded, &c. The metals required to stand the process, must be able to withstand a red heat, such as iron, brass, or copper. The articles to be treated are subjected for a short time to a full red heat in an annealing oven, and sand may be interposed between them, to enable them to keep their form. They are kept at a full red heat for half an hour. Small articles may be heated in a muffle. After this the articles must be allowed to cool slowly, and when taken out must have their surfaces scoured clean and bright, free from all scale and grease, when they are ready for the first coat of the enamel. This is made as follows:—Take six parts by weight of flint glass broken into small pieces, three parts of borax, one part of red lead, and one of the oxyd of tin. These ingredients are pounded together in a mortar, and then fritted by subjecting them to a strong red heat in a reverberating furnace for three or four hours, during which period they are frequently stirred and turned over, so as to mix them effectually, and expel all volatile matter. Towards the latter end of the process the heat is increased so as to produce partial vitrification, when the whole is withdrawn in a pasty state, and dropped at once into cold water, which renders them easily broken and ground, and is named "frit." With one part (by weight) of this frit is mixed two parts of calcined bone ground to powder, and the whole mixture is then ground with water in a porcelain or other mill until no grit can be detected by feeling when a portion is squeezed between the thumb and finger. It should be of the consistence of thick cream and strained through fine cloth.

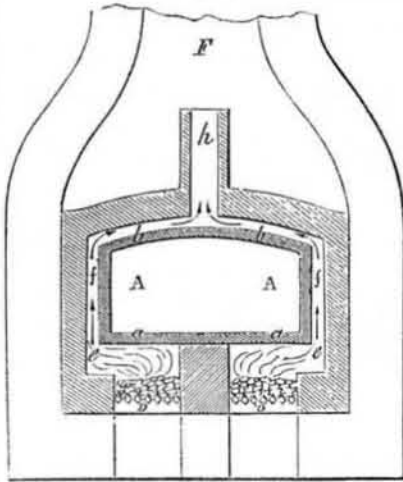
A suitable quantity of the semi-liquid is poured out with a spoon upon the surface of the article, which is held over the vessel containing the composition, and should be allowed to drain off the article upon which it is poured, by holding the article in a perpendicular position. Some articles may be dipped in the composition. The coating should be of uniform thickness, evenly spread, all air bubbles carefully displaced, and no defective places allowed. The coating will be better performed in a warm than in a cold room, and the article to be coated should be somewhat warmer than the enamel composition, which should be milk warm.

An article when coated—and the enamel is so dry as not to run—is laid upon three points of small supports made of earthenware, which stand upon a plate of iron, to carry it away to a japanner's stove oven, where it is kept at a heat of about 180°, until all the moisture is expelled. Defective places in the coating may be filled up by applying some enamel liquid with a brush. Great care must be exercised to have this—the first coat—carefully and well put on, as the success of all the subsequent coatings are dependent on this one. When the articles are perfectly dry they are placed in the vitrifying furnace illustrated in the annexed engravings, of which figure 1 is a transverse vertical section, and figure 2 a longitudinal vertical section; the same letters refer to like parts, A A, is the oven or muffle built of fire bricks (set with fine clay) and which oven or muffle is closed at all parts, except at the end B, fig 2, which end forms the open mouth for introducing and taking out the articles to be fired.

The open mouth, B, is closed when required, by letting down the iron door, *d*, which is suspended in the manner of a sluice, or so as to draw up and let down in vertical plane at pleasure. D, D, are the fire-grates, of which there are two, side by side; the fire-places above the grates being separated by a brick wall, E, which sustains the middle part of the flat floor, *a*, *a*. At F, are the fire-doors (being at the opposite end to the mouth of the muffle, see fig. 2.) and

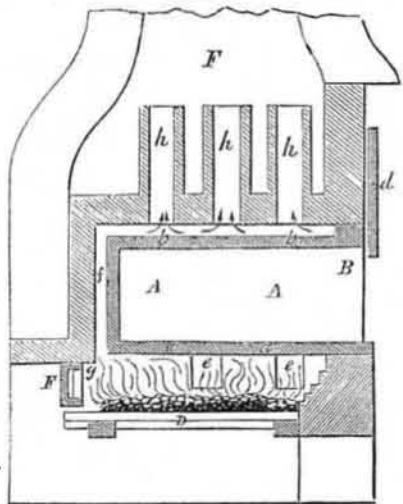
which fire-doors, as well as the openings into the ash-pits beneath the fire-grates, are carefully excluded from the apartment into which the end, B, or mouth of the muffle opens, for the purpose of preventing any dust, or ashes, or smoke, which may at times rise from the fire-doors, and ash-pits, and which would otherwise affect the articles in such apartment, or during their introduction or taking out from the muffle. The heat of the burning coals on the fire-grate acts immediately beneath the flat floor, *a*, *a*, and the currents of heated smoke, flame, or gas, which proceed from the fire, pass away lateral-

FIG. 1.



ly from each fire-place, through flues, *e*, *e*, which conduct the current into a narrow space, *f*, *f*, by which the muffle is surrounded at each side, also at the remote end, and over its arched roof, *b*, *b*; and finally the said currents ascend through the three vertical flues, *h*, *h*, *h*, and from the upper end thereof, into the large chimney, F, the size of which is diminished at its upper part above the flues, so that the interior aperture is about eighteen inches square at the top, which should be about twenty-five feet high above the level of the fire-grates, D, D.—There is also a direct ascent from the upper part of each fire-place, at *g*, fig. 2, into the space, *f*, *f*, and the remote end around the muffle, and strong fires have to be kept up in the two fire-places, the heat ascending therefrom giving heat to all parts of the muffle, which is to be kept at a glowing red-heat, the uniformity of that heat over all parts of the flat bottom, or floor, *a*, *a*, on which the articles have

FIG. 2.



to be placed, or to as great an extent as possible, being of much importance. Small slabs cut out of fire stone, or otherwise of fire-bricks, or of fire-clay burnt, and of a suitable size and form, are employed to serve as supports, and care must be taken that when an article is placed on a stand on the flat bottom, *a*, *a*, it shall not be interfered with by any other, or adjacent article; and after the whole of the muffle and the stands alluded to have attained a full glowing red-heat, the articles are to be introduced and not before, being carried to the muffle upon a flat slice, or otherwise an iron fork, with a long handle, is used for that purpose, so as to take up and deposit the articles with as little injury as possible, the sliding door, *d*, being raised as little as possible upon each occasion, and immediately afterwards closed.

The articles are exposed to heat in this muffle until the coating is partially fused and adheres firmly to the metal, when they are withdrawn and laid on a flat iron bench to cool.

When cold they have the dead whitish appearance of earthen (biscuit) ware, that has received its first firing. The time required for the articles to be in the furnace will be from a few minutes to half an hour, depending upon the size and number of the articles and upon the heat of the muffle. The operator will soon find out the precise time required for each article, and also the best heat to be used.

When the articles are cooled, after being first fired, they are dipped in water or wet with a sponge, and a second coating is applied as before described, then dried and fired in the same furnace, as has been described, only a different composition is used for the coating. This consists of 32 parts (by weight) of calcined bone; 16 parts of China clay, 14 parts of Cornwall stone, and 8 parts of the carbonate of potash; the latter is dissolved in water; the other ingredients are ground to powder, and the whole made into a thick paste, which is burned for three hours in a reverberatory furnace until it assumes the appearance of biscuit china, which is then to be ground down to a fine powder. Five parts (by weight) of such powder are then to be mixed with 16 parts of flint glass, broken into small pieces, 5½ parts of calcined bone, ground, and 3 parts of calcined flint, ground. This mixture is afterwards ground in a mill until it is very fine, and of a creamy consistency, after which it is carefully strained through lawn sieves, the same as has been explained in describing the first coating. In firing the articles after the second coating, they must be kept long enough in the furnace until the second coat is thoroughly incorporated with the first. The color of the articles, after the second coating and firing, is whiter than they were after the first firing and resemble good earthenware biscuit.

The articles having been twice coated and fired in order to be made to resemble the very finest white earthenware or porcelain, must be treated with another composition which is as follows:—Take 4 parts (by weight) of feldspar in powder, 4 of white sand, 4 of the carbonate of potash, 1 of arsenic, 6 of borax, 1 of the oxyd of tin, 1 of nitre, and 1 of whiting. These materials are to be mixed together and fritted in a crucible under a high heat in a furnace, until they are partly fused, and when cold have the appearance of a whitish enamel. They are then reduced to fine powder, and 16 parts by weight of it, are substituted for the 16 parts of flint glass used in the second coating composition. The flint glass is as good as this, excepting in color. The third coating is therefore the same as the second, excepting the 16 parts of glass; it is put on like the second, only it should be somewhat thinner. In firing the articles in the muffle for the third time, they must be subjected to such a heat as to cause the glass to be thoroughly vitrified, and to spread over the surface of the second coat, and become incorporated with it, so as to glaze its surface like that of the best earthenware. Another coating of the same kind, making four coats and firings, may be given to the articles to make a full and rich covering.

It would occupy too much space in our columns, at present, to give a full description of the different colors, and the mode of applying them for ornamenting enamelled metal articles. Suffice it to say, they are the same processes and materials, which are employed to ornament porcelain and fine earthenware. Any work therefore, which describes those materials and processes, either for the painting, of flowers, or gilding, affords information for beautifying and ornamenting enamelled iron.

Irish Potato.

On page 138, Vol. 9, Scientific American, it is said that the Irish potato was first brought to America by some Scotch immigrants from Ireland. Grimshaw informs us, in his History of the United States, that the Irish potato is a native of Mexico, and was first taken to Ireland about 200 years ago, by John Hawkins. We want the "true light" on this subject.

B. W. WHITE.

[The Irish potato is a native of America, and was introduced into Ireland by Sir Walter Raleigh, but the described manner by which it was introduced into New England, to which our correspondents refers, is no doubt correct.

Our Prize Awards.

MESSRS. MUNN & Co.—I merely write to inform you that I have drawn on you for the amount awarded me for one of the Prize Lists to your invaluable paper. I was satisfied with your first award, and have only to say ditto to your second. I cannot refrain from adding my testimony to the value of the "Scientific American," and hope that its circulation may be commensurate with its merits. Among the 78 subscribers here I have heard no complaints, whilst many have said they were getting more than the worth of the subscription price.

Truly yours, D. M. SECHLER.

Ironton, Ohio., Feb. 1, 1854.

MESSRS. MUNN & Co.—It is with extreme pleasure I find my name among the fortunate competitors for your list of Prizes, and that pleasure is the more enhanced by the short time I have been in this city, having only been here since the 17th of last May. On inquiring how many took your paper here, I found that there was only about sixteen, and when I commenced my club I had no trouble in getting the list I forwarded you, as your paper only had to be made known either to mechanics, farmers, and artists—in fact it never came wrong to any class. I hope the small effort I have made may be the means of giving your paper a still wider circulation. I will in a few days draw on you for the amount. Yours,

CHARLES COLLIER.

Indianapolis, Ind., Feb. 16, 1854.

[The amount due Mr. Collier is \$45, and it will be seen by his own statement how easy a matter it is for any one to raise clubs of subscribers for the "Scientific American," who are so disposed. An inference may be derived from reading all the letters we have published from the recipients of Prizes, and it is this—that the "Scientific American" is a popular paper with all its patrons, and that but little exertion is required to obtain large subscription lists from every town and hamlet. We hope our friends will not forget these letters from our successful competitors, when the time arrives for offering prizes on a new volume.—Ed.

Ear Instruments for Deaf Persons.

Since we published a short extract—a few months since—taken from one of our foreign exchanges, respecting a small ear instrument (said to be invented by two Professors in London), by which deaf persons are enabled to hear with distinctness and accuracy, we have received a great number of communications on the subject. These communications are from persons afflicted with deafness, and they reveal to us the important and sorrowful fact that their number in our country, is far greater than we had supposed it to be. We are not acquainted with the London inventors of the instrument referred to, and cannot give any more information about it or its authors than what has already been presented through our columns. We take this occasion, however, to request our foreign scientific cotemporaries to give us some more information about it. If it possesses the good qualities with which it has been represented to be endowed, it will be of great benefit to many of our fellow creatures, and will find an extensive sale.

Financial Affairs of the Crystal Palace.

The report of the receipts and expenditures of the Crystal Palace Association made by the directors exhibits a heavy deficiency in their accounts. The association is now in debt over and above its capital stock, and the receipts from all sources to the sum of \$125,000. We are prevented from saying anything regarding the matter this week, for the want of room, except to remark that this furnishes unimpeachable testimony to the improper management of the exhibition, and the result is just what we predicted before it opened, vide Vol. 8. Next week, we shall have more to say in reference to this matter.

A correspondent of the Philadelphia "Register," writing from Paris, states that cotton is now very extensively cultivated in Algeria, and that in a few years France will grow on its own soil cotton enough for its own manufacturing wants.