

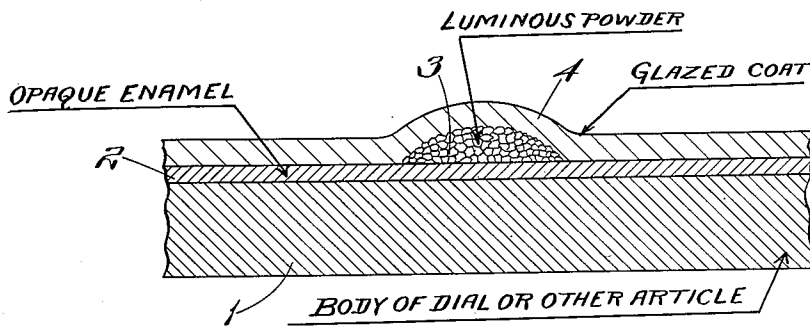
E. O'HARA.

RADIUM LUMINOUS ARTICLE AND METHOD OF PRODUCING SAME.

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1,364,950.

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UNITED STATES PATENT OFFICE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ELIOT O'HARA, a citizen of the United States, residing at Waltham, county of Middlesex, State of Massachusetts, have invented a certain new and useful Improvement in Radium Luminous Articles and Methods of Producing Same, of which the following is a specification, reference being had therein to the accompanying drawings.

It has heretofore been common to coat surfaces of dials or other articles with radium luminous material in order to render self-luminous certain figures or other special markings on the article. As heretofore done, however, the self-luminous coating is removed by the action of the weather, such as moisture or ice, or by cleaning agents. Also as heretofore done, the crystals which the compound usually contains disintegrate through the bombardment of the alpha rays of the radium. Furthermore the exposed radium luminous surface collects dust and dirt. Attempts have been made to protect the radium luminous surface by glazing it. The ordinary glaze however, contains lead which destroys or at least diminishes the luminosity of the coating or at any rate prevents the light from the radium luminous material from showing in substantially its full strength through the glaze. Some of the previous methods of attempting to protect the luminous coating have been by covering the surface with sheets of glass or mica, or coating it with lacquer or varnish. None of these methods have so far as I am aware been successful in accomplishing the result desired, namely of fully protecting the radium luminous compound and at the same time in not materially diminishing the luminosity, nor have they delayed disintegration of the crystals.

The object of the present invention is to provide the radium luminous surface with a protective coating which will permit the light emanating from the radium luminous material to pass through the coating in substantially its full strength and which shall protect the radium luminous material against disintegration and render it weather proof and of such character that it will not readily collect dust and dirt, and which can be easily cleaned without detriment to the radium luminous surface or to the protective coating.

The invention will be fully understood

from the following description when taken in connection with the accompanying drawings, and the novel features thereof will be pointed out and clearly defined in the claims at the close of this specification.

The drawing is a view showing on a greatly exaggerated scale a portion of an article treated in accordance with the invention.

In practising my invention the article 1 to be treated is first coated with opaque enamel 2 which contains no lead. This coating is then fired on as is commonly done with any enamel name-plate, dial or sign.

After the coating has been fired on there is applied to the portions which are intended to be made luminous, a coating of luminous powder 3 which is commercially sold under the name of radium luminous material, radium luminous compound, etc. One kind of radium luminous compound suitable for such purposes consists of crystallized zinc sulfid mixed in proper proportions with radium bromid; another suitable compound consists of zinc sulfid mixed with mesothorium. A suitable proportion is two parts of radium bromid or mesothorium to ten thousand parts of zinc sulfid, but these proportions may be varied considerably if desired. There are, however, numerous other compounds which may be employed with good results and which contain radio-active and radio-responsive material which will stand the temperature of glazing, and I consider any such compound as coming within the scope of my invention. In order to cause the luminous powder to adhere to the portion which is to be rendered luminous there is preferably employed as a vehicle or adhesive, a gum or other adhesive material which will turn to a gas and leave as small as possible residue in the heat afterward to be applied. I have successfully used for this purpose a very fine solution of gum arabic in water, or a very thin solution of gun cotton in amylacetate or acetone, also Venice turpentine in oil of thyme or alcohol, but other materials may be used and the process is not confined to any one of these.

After the application of the luminous powder in the manner above specified, the luminous powder and its vehicle by which it is applied to the markings are allowed to dry thoroughly. This usually takes from three hours to forty-eight hours, depending on the adhesive or vehicle used. Whatever

the length of time required it should be allowed to dry thoroughly.

After it has thoroughly dried I sift on the face of the article to be treated a thin coat or film of flux, sometimes commercially known as glaze or fondant, having previously reduced this flux to powder of suitable degree of fineness. I have successfully used a size grain which will pass through number thirty-eight bolting cloth, but it may be coarser or finer without having a detrimental effect on the result of the process. It is quite important that in selecting the flux a material should be used which contains no lead. Any one of certain types of potash-lime glass which is free from lead makes a suitable flux or glaze for this purpose; such for instance, as a glass made according to the following formula:— 100 SO_2 , $34 \text{ K}_2\text{CO}_3$, $15 \text{ CaO} \cdot \text{H}_2$ and $.33 \text{ MnO}_2$, or other formulæ given in Thorpe's *Dictionary of Applied Chemistry* under the caption of Potash lime glass. I do not intend to limit myself, however, to the particular flux above mentioned or those referred to, as there are numerous other leadless fluxes suitable for the purpose. Those above mentioned are merely given as illustrative specimens which are suitable. As an alternative to sifting on a coating of dry powder the powder can be mixed with water or volatile oil and spread on the article with an air brush. If the latter method is used the coat of flux should be allowed to dry thoroughly before the next operation.

After the coat of flux is thoroughly dry it should be fired or vitrified in any suitable manner. The preferred method is to place the article in a muffle furnace for a suitable length of time. The space inside the muffle should be kept at a temperature just sufficient to fuse or vitrify the flux. I have found in practice a temperature of 1000° to 1200° Fahrenheit for a period of from two to four minutes to be very satisfactory, but good results are possible with other temperatures and with other periods of time in the muffle.

This produces a transparent, hard glazed coat 4 which will allow the light from the radium luminous compound 3 to show in substantially full strength through the glaze and will be very durable. The adhesive substance which was employed when the

luminous compound was applied to the article will have substantially disappeared.

What I claim is:—

1. An article having an opaque enamel coating, radium luminous markings applied to the surface of said enamel coating, and a transparent vitrified coating over said luminous markings.

2. The method of giving a transparent protective coating to radium luminous markings on an article, consisting of treating the face of the article with a thin coat of finely powdered flux, which is free from lead and consequently will not discolor the radium compound, and allowing the same to thoroughly dry, then vitrifying the coat of flux by placing the article to be treated in a muffle furnace and allowing the same to remain in the furnace for a period of time at a high temperature.

3. The method of treating an article to produce a radium luminous marking with transparent protective coating consisting of coating the article with opaque enamel which contains no lead, then firing the coated article, then applying to the article radium luminous material, and making the same adhesive to the portions which are to be made luminous, using as a vehicle an adhesive of a character which will turn to gas when heat is applied, then applying to the face of the article containing the markings and previous coatings a thin coat of flux which has previously been reduced to a powder, then vitrifying the coat of flux in a muffle furnace at a high temperature.

4. An article having a radium luminous marking thereon provided with a transparent protective coating consisting of a flux free from lead and vitrified on the radium luminous surface.

5. An article having a radium luminous marking thereon, and a transparent protective coating therefor consisting of a flux free from lead and vitrified on the radium luminous surface.

6. An article having a coating of opaque enamel free from lead, a radium luminous marking thereon, and a transparent protective coating therefor consisting of a flux free from lead and vitrified on the radium luminous surface at a high temperature.

In testimony whereof I affix my signature.

ELIOT O'HARA.