UNITED STATES PATENT OFFICE.

HENRY ABBOTT, OF NEWARK, NEW JERSEY, ASSIGNOR OF THREE-FOURTHS TO WINTON C. GARRISON, OF SAME PLACE, AND THE ELGIN NATIONAL WATCH COMPANY, OF CHICAGO, ILLINOIS.

PROCESS OF APPLYING COLORS TO ENAMEL DIALS FOR WATCHES AND CLOCKS.

SPECIFICATION forming part of Letters Patent No. 309,909, dated December 30, 1884.

Application filed March 10, 1883. (Specimens.)

To all whom it may concern:

Be it known that I, HENRY ABBOTT, of Newark, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in the Ornamenting of Enameled or Glazed Surfaces; and I do hereby declare that the following is a full, clear, and exact description thereof.

Heretofore colors have been applied to watch-dials and other enameled or glazed surfaces by hand with a brush or pencil, or by spreading the color over the surface to be ornamented, and after allowing said color to dry scraping away the surplus, so as to leave such only as formed the intended design. Each of the methods named is tedious and slow, and requires skilled, expensive labor, while the last-named method requires in addition the use of expensive and complicated machines especially constructed for such purpose, and applicable to but a very limited range of designs. By another method impressions upon transfer paper have been taken from engraved plates and lithographic stones, and such impressions, while the color is soft, offset upon the surface to be ornamented; or by sticking the paper, with the impression upon its face, down upon said surface and allowing said paper to burn away when the article being ornamented is fired, leaving said colored design upon said article. The first of said last-named methods is liable to produce ragged or broken lines, or to spread the color if applied when too soft, and it is very difficult to place the design with accuracy upon the object to be ornamented, as the paper is not transparent and must be placed face downward, while by the second method the surface being decorated is liable to become stained or discolored by the burning paper. Certain photographic processes have also been devised for the purpose of placing colored designs upon glazed or enameled surfaces, but as they are uncertain in results, tedious, and expensive, they have not been used to any extent.

The object of my invention is to place colored designs upon enameled or glazed surfaces with accuracy and rapidity and at a less expense than has heretofore been practicable; and to this end—

It consists, principally, in the method employed for applying to and permanently securing upon enameled or glazed surfaces designs in vitrifiable colors, substantially as hereinafter specified.

It consists, further, in the method of preparing colored designs for the ornamentation of enameled or glazed surfaces, substantially as hereinafter shown.

It consists, further, in the method of removing the transfer medium from a design during the operation of applying such design to and securing the same permanently upon a glazed or enameled surface, substantially as and for the purpose hereinafter shown.

It consists, further, in the method of producing transfer-films, substantially as and for the purpose hereinafter set forth.

It consists, finally, in the method of preparing designs in color for transfer to enameled or glazed surfaces, substantially as and for the purpose hereinafter set forth.

To carry my invention into effect I first have the required design engraved or etched upon a metal or glass plate, preferably a copper plate. The colors ordinarily employed in encaustic painting on enamel are then rubbed into the engraved or etched lines in the same manner as for printing upon paper, after which I flow over the plate thus prepared a liquid collodion or other substance having similar properties, allow the collodion to set by evaporation, then place the plate thus coated in water, which may be made slightly acid, until the film becomes loosened from the surface of said plate, when it will either float to the surface of the water or may be readily stripped from the plate. As the collodion while in the liquid state will penetrate all the lines and recesses upon the surface of the plate, the coloring-matter will become embedded in or absorbed by it, and will come away from said plate with the film. The design engraved upon the plate thus transferred to the collodion film is not only upon the surface of said film, but is embedded in it, and if the operation is carefully performed every particle of coloring-matter on the plate both in the finest and heaviest lines will be taken up. The collodion film may now be washed in clean water

and placed directly upon the enameled surface, either face down or reversed, and should be fastened in place by a thin varnish of gelatine—such as is used by photographers—or by a solution of sugar and water, or other colorless varnish, and then allowed to dry, after which the article being ornamented may be placed in the furnace and "fired" in the usual manner, the collodion quickly disappearing, being entirely consumed and leaving no trace, while the image or design is burned into the surface of the enamel in the same manner as if it had been applied by hand with a brush, or by any of the methods described. The finest lines that can be engraved upon a plate will appear sharp and clear upon the enamel surface, while the heavy and deep cuts will be equally prominent. A single design, if accurately made on the plate, can thus be as accurately reproduced an indefinite number of times, and as many designs may be engraved on a single plate as can be conveniently handled, in which event after the film is stripped from the plate it may be cut into as many pieces as required with a pair of shears. A convenient way to handle the film is to lay it upon a piece of wet paper and cut through both paper and film.

Two or more colors may be used in the same transfer by rubbing the several colors in the parts of the plate where they are required, care being taken not to mix them.

The collodion used should be transparent and entirely free from coloring-matter, so that the operator can see the design distinctly, and can place it accurately upon the enameled surface whether placed face down or reversed, and in order that no stains may be left upon the surface of the enamel after firing.

The collodion may be made in a variety of ways, but should be tougher than that ordinarily used by photographers. This is accomplished by using less alcohol and more ether and pyroxyline in the compound, which should be carefully filtered before using.

I find the following proportions to work satisfactorily: one ounce alcohol, four ounces ether, and one dram of pyroxyline. Gelatine and some other substances may also be used for making the transfer, in the same manner as the collodion, but the latter is preferable. The transfer may also be made in the same manner from lithographic stones or photo-relief plates. When the liquid is flowed on the plate, the latter should either be placed in a perfectly level position or made to revolve horizontally to insure an even distribution of the liquid over its surface. A single operator may manipulate a number of plates at once by having the same arranged on a series of revolving stands operated by machinery.

After fixing the design upon the enameled surface with the varnish or glue and allowing it to dry, the collodion film may be dissolved away by soaking in a solution of ether and alcohol, leaving the image or design adhering to the varnish, after which other transfers in different colors may be added in the same manner as before; but in this case the film must always be placed face down upon the enameled surface or the design will be carried away with the dissolving film. The best result can usually be obtained by dissolving away the film before firing, even in a single transfer.

A striking advantage of my process over any heretofore employed for the same purpose is the fact that every detail of the original design is reproduced upon the enamel surface very sharp and distinct.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. The method of placing figures or ornamental designs upon enameled or glazed surfaces, the same consisting in applying thereto a film of collodion or other similar material, having upon its surface and within its body the desired figures, numerals, or designs, and causing said figures to adhere to and become a part of the enameled surface by the application of heat or otherwise, substantially as specified.

2. The method of applying to and permanently securing upon enameled dials and other vitrified or vitrifiable surfaces designs in vitrifiable colors, consisting, first, in filling the sunk portions of a plate containing an engraved or etched design with the colored material, then flowing over said plate liquid collodion, and causing the same to permeate and become incorporated with said colored material, then removing from said plate the hardened film of collodion with its adhering and incorporated design, then securing said film upon the surface of the article to be ornamented, and, lastly, subjecting said article to heat, whereby said vitrifiable colored material is fused and incorporated into the underlying surface, substantially as shown.

3. The method of applying to and permanently securing upon enameled dials and other vitrified or vitrifiable surfaces designs in vitrifiable colors, consisting, first, in filling the sunk portions of a plate containing an engraved or etched design with the colored material, then flowing over said plate liquid collodion, and causing the same to permeate and become incorporated with said colored material, then removing from said plate the hardened film of collodion with its adhering and incorporated design, then, by means of varnish or other adhesive substance, securing said film upon the surface of the article to be ornamented, and, lastly, subjecting said article to heat, whereby said vitrifiable colored material is fused and incorporated into the underlying surface, substantially as set forth.

4. The method of preparing designs in colors for ornamenting enameled, vitrified, or vitrifiable surfaces, which consists in causing said colors to adhere to and become incorporated with a film of collodion or other like

material, in substantially the manner and by the means herein described.

5. The method of applying to and permanently securing upon enameled dials or other vitrified or vitrifiable surfaces designs in vitrefiable colors, consisting, first, in securing upon the surface to be ornamented a film of collodion having upon or within the same the desired design in vitrifiable color, then removing the collodion by means of a solvent, leaving said design upon said surface, and, lastly, subjecting the article thus ornamented to the action of heat, whereby said vitrifiable color is fused and incorporated into the underlying surface, substantially as specified.

6. The method of producing transfer-films, consisting, first, in filling the lines of an engraved or etched plate with colored material, then flowing over said plate liquid collodion and causing the same to permeate and become incorporated with said colored material, and, lastly, immersing said plate thus coated in acidulated water, whereby the film of collodion with its adhering or incorporated design is loosened and may be separated, substantially as shown.

7. The method of preparing transfer-films of collodion or other like material with figures or ornamental designs thereon, the same consisting in placing the colors on a plate of metal or other material having the characters, letters, designs, &c., engraved or etched thereon or therein, then flowing over the plate and over the colors contained on or within the engraved or etched portions of the plate a film of collodion or other similar material, and then allowing or causing the collodion to harden by evaporation, whereby the letters, figures, &c., are caused to adhere to the collodion film, substantially as shown and described.

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Witnesses:
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