

UNITED STATES PATENT OFFICE.

JOSEPH A. LUXHEIM, OF CHICAGO, ILLINOIS.

METHOD OF DECORATING GLASS.

SPECIFICATION forming part of Letters Patent No. 618,606, dated January 31, 1899.

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To all whom it may concern:

Be it known that I, JOSEPH A. LUXHEIM, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Methods of Decorating Glass; and I do hereby declare that the following is a full, clear, and exact description thereof.

This invention relates to a novel method or process of producing decorative or colored glass, such as is used for windows, transparencies, and the like.

The invention consists in the matters hereinafter described, and pointed out in the appended claims.

To first describe in detail the manner in which I have carried out my invention in practice, I will set forth the process employed by me as follows:

The first step is the preparation of an etched plate from which to print an outline drawing or design of a character to indicate the main features of the picture or ornament to be painted on the glass and which constitutes a guide in applying the colors and shading. In making such etched plate a piece of plate-glass is first covered with a coating of asphalt, which is allowed to dry, and the drawing is then made by a point or stylus, which removes the asphalt along the lines of the drawing, and the glass is etched with fluoric acid, so as to remove the exposed surface of the glass a depth of about one-sixteenth of an inch. The asphalt is then removed from the surface of the glass plate, which latter then forms, in effect, an engraved or etched plate, from which prints may be made on paper.

The next step is the printing of the design on thin paper known as "transfer-paper." The printing on the transfer-paper is done with a transfer ink or composition in the nature of varnish. The composition which I have used as suitable for the purpose consists of Venetian turpentine, paraffin, beeswax, asphalt, and lampblack, these ingredients being mixed under heat or boiled about thirty minutes. The lampblack is used in this composition to give it color, so that the design may be seen when printed on the transfer-paper and the operator may judge of the clearness and uniformity of the print. The transfer-ink, after being allowed to cool off,

is pressed into the lines of the etched glass plate with a palette-knife and then scraped or cleaned from the smooth surface of the plate, so as to leave the etched lines filled with the ink.

The next step is the taking of a print on tissue or transfer paper from the etched plate. For this purpose the sheet of tissue-paper is laid on the glass plate and passed through a hand-press with rubber rollers, by which an impression is made of the design on the tissue-paper by the adherence thereto of the compound held in the engraved lines on the glass plate. The glass used for ornamentation is plain or transparent and preferably a piece of double-thick French glass. On this sheet of glass is applied a uniform coating of metallic coloring-matter or pigment, such as is used in painting on glass, the tint being such as is suitable for the outline of the picture or design. The color used for preparing the first coating is a metallic color ground in oil and mixed with balsam copaiba and a small quantity of turpentine. This coating is applied uniformly to the glass and permitted to dry hard. Over this color coating is applied a coating consisting of a mixture of dextrine with a very little glycerin, and this coating is also allowed to dry hard. After the sheet of glass has thus been prepared with a coat of a single color and a superposed coat of dextrine the design is transferred thereto from the transfer-paper, which latter is lifted from the etched plate before referred to and laid over the coated glass, after which it is rubbed on with a soft brush, so as to cause all parts of the transfer-ink upon the transfer-paper to adhere to the dextrine coating. An admixture of caustic soda and water is then poured over the paper, and the latter is then lifted instantly from the plate, leaving the lines of the design imprinted thereon in the transfer-ink. Cold water is then poured over the plate to remove the dextrine, so that nothing is left but the color coating and the parts of the dextrine coating, which remains along the lines of design because protected in the washing process by the transfer-ink, which is of an oily nature. After the washing process the transfer-ink is left to dry. After the transfer of the design has been made, as described, the lines of the

design appear on the glass plate in the form of the dry transfer-ink and a layer of dextrine beneath the same, both of which are superposed upon the color coating.

5 The next step in the process consists in submitting the prepared surface of the glass to the action of a sand-blast apparatus of any usual form, with the result that all the color coating, except that along the lines formed
10 by the transfer-ink and dextrine, is removed, while at the same time the surface of the glass is cut away or roughened by the action of the sand-blast, giving it a grained or pitted surface and leaving the parts of the glass unaffected by the sand-blast in slight relief. During
15 the operation of the sand-blast the transfer ink or composition covering the lines of the design will be removed by the action of such sand-blast; but the coating of dextrine
20 beneath such ink or composition is of sufficient hardness to resist the action of the sand-blast, so that after the glass has been subject to the sand-blast process that part of the coloring-matter along the lines of the design
25 which is protected or covered by the dextrine, together with the coating or covering of dextrine over the same, will remain upon the glass, the parts of the glass beneath the oil-color and dextrine coating being left smooth
30 because unaffected by the action of the sand-blast. After the glass has been subjected to the sand-blast process the dextrine covering the lines of the design will then be removed by washing the plate with water, thereby
35 leaving upon the glass the lines of the design in oil-colors only. The lines forming the design will not only be left smooth, as above stated, but will also be in slight relief by reason of the fact that the sand-blast will remove
40 or cut away the surface of the glass to a slight extent in all of the parts of its surface, excepting along the lines of the design which are protected by the coating of dextrine in the manner above stated.
45 The plate is now in readiness for the completion of the operation of coloring. Other colors used to complete the decoration are water-colors or metallic pigments, such as are used in glass-painting, mixed with a sufficient
50 quantity of glue size or dextrine to cause their adherence to the surface of the glass. Usually several foundation-tints are washed and blended over the entire surface of the glass to form a tinted base, three colors
55 commonly being used for this purpose. In this application of water-colors to the surface of the glass the lines of the original design will not be washed out, blurred, or affected in any way, because an oil-color is
60 used for the first coating by which said lines are formed. After the base-tints have been applied the high lights are taken out with a bristle brush and additional tints applied to constitute the shading of the design or picture,
65 the artist being of course guided in the application of the tints as well as in the finishing or shading by the oil-color outline,

which in many instances will form lines of separation or demarcation between differently-colored parts of the picture or design. 70 Commonly the lines or surface defined by the etched design, as described, will form not only the outline of the design or picture, but also serve to define the darker or more strongly-
75 accentuated parts of the design or picture and for line-shading where the latter is desirable. After the painting is completed and the colors allowed to dry the sheet of glass is placed in a glass-kiln and properly fired or
80 burned to fix the colors.

The decorated glass prepared as above described possesses novel and striking characteristics, the outlines and the stronger and more deeply-shaded parts of the design appearing in one color and on surfaces which
85 have been unaffected by the sand-blast process and which are therefore smooth and in relief, whereby they have a certain clearness, brilliancy, or distinctness whether they be painted in transparent or partially-opaque
90 colors. The coloring of the main surfaces of the design or picture made as described possesses great softness or delicacy or tone or tint by reason of the roughened surface produced by the sand-blast upon which the color
95 is applied.

Obviously in carrying out the process above outlined an etched or engraved plate may be prepared otherwise than by the use of glass, as the printing of the transfer-paper may be
100 accomplished from an etched metal plate or in any other well-known or desirable manner. By the use of a transfer from an engraved plate the process is made of much greater commercial value, because as many
105 similar pictures can be prepared from the same plate as may be desired.

It will be obvious that in carrying out the process as above set forth in place of the coating of dextrine or other substance which is
110 soluble in water a coating may be used which is soluble in some other solvent, such as alcohol, and that the transfer may be made of some material which is not soluble in alcohol—as, for instance, an admixture containing glue
115 or the like. In carrying out the process in this manner the foundation-color coating would be covered by a layer of a substance which is soluble in alcohol, and the transfer would then be made by the use of a transfer-
120 ink which is not soluble in alcohol. The soluble coating could then be removed in the same manner as before described, leaving the design in the hardened material, which would be unaffected by the action of the sand-blast.
125 It will be further noted that the transfer ink or compound itself may be made of such substances or admixture as to be sufficiently hard to resist the action of the sand-blast, and in case such transfer-ink be employed it would
130 not be necessary to apply a coating over the foundation-color, but the transfer could be made directly upon the foundation-color, and when the transfer-ink has dried or hardened

the sand-blast can then be applied in the same manner and with the same result as in the particular process set forth. A compound which may be used when carrying out the process as last described may be composed of glue with a small quantity of glycerin and lampblack, the glue giving sufficient hardness when dry to resist the action of the sand-blast and the compound being easily removed by the use of water after the sand-blast process is completed. It will be further noted that the main steps in the process described may be carried out without making any etched plate or transfer therefrom by merely drawing by hand in ink of a suitable character the desired design or outline upon the glass plate. Where a coating of dextrine or the like is used, the design will be so drawn in a water-proof ink, and when the coating of dextrine is omitted the design will be drawn by the use of an ink which when dry or hard will be capable of resisting the action of the sand-blast.

The main or essential steps in the process described obviously consist in first applying to the sheet of glass to be decorated a foundation-coating of color, then applying over the color coating the desired design by the use of a substance or compound hard enough to resist the action of a sand-blast, then subjecting the surface to the action of a sand-blast, so as to remove the surplus coloring and roughen the glass in all parts, except on the lines of the design, where the same is protected by the substance or compound applied for the purpose, then finishing the coloring by the application to the ground-surface of the glass of colors mixed with a vehicle which will not disturb the color left on the lines of the design from the first color coating, and thereafter firing to fix the color of the etched design and of the final tinting.

It will be seen, moreover, from the above description of the process employed that an essential feature thereof is the placing over the foundation-color coating of lines corresponding with the design applied over the foundation-coating by the use of some material which will not be affected by the sand-blast or which is hard enough to resist the action of the same.

An important feature of the process is the use in applying the first or foundation color coating of a vehicle for the color pigment of such character that it will not be dissolved in the application of the final or finishing tint or tints, it being obvious that if such foundation-tint were of water-color it would be dissolved or removed by the subsequent application of water-color in the finishing or final work on the painting. This feature of the process may, however, be reversed and water-color used for the original or foundation coat and oil-colors for the final coat; but in such case if the process be carried out in the particular manner first above described a substance which is not soluble in water would

have to be used for the second coating and the design would need to be transferred in an ink which would not be dissolved by the solvent used to remove such second coating. I prefer to use an oil-color for the first coating, and have found it desirable to mix the color with balsam copaiba or other like substance, which will dry hard and will not boil or bubble, and thus destroy the evenness or uniformity of the tint when subjected to heat in firing.

The advantage arising from the application of a transfer or design in a resisting or hard substance in connection with a sand-blast in the manner described will be made more apparent by consideration of the fact that if an attempt were made to draw or print a design in oil-color on a piece of glass roughened over its entire surface by a sand-blast the more liquid portions of the vehicle forming the body of the oil-color would spread or run at the edges of the parts to which the color was applied, so that in an effort to subsequently apply water-color tints in finishing the picture the water-color would fail to properly adhere to the glass along the margins of the parts colored in oil-color and a blurred or unsightly effect would be produced throughout the picture. When, however, the oil-color foundation-tint is covered along the lines of the design by dextrine or other substances capable of hardening after its application and the plate is then subjected to the sand-blast, the margins of the design are defined with the utmost sharpness and accuracy, so that the outlines appear with great clearness and precision in the finished picture.

A further advantage gained by the process described is that the coloring-matter used in tinting adheres better to the glass, because when applied in a liquid state it enters by capillary action into the minute pits or depressions formed in the surface of the glass by the sand-blast process, and in the firing process the coloring-matter adheres more strongly to the rough glass and may be made to sufficiently adhere by the use of less heat in firing.

A further advantage gained by the use of the process described is that the glass on which the painting is done is rendered obscure or translucent through the roughness produced by the sand-blast process, so that the use of white coloring or pigments adapted to give obscure or translucent effects, such as are required for artistic results, is rendered unnecessary, the final result being a tint or color that is much more uniform, soft, and delicate than can be produced by the coloring processes heretofore used.

The process described has the further and important advantage of enabling a number of colors to be applied by one firing, it being necessary in the process commonly used to fire the glass to fix the outline of the design and to subsequently fire the same one or more times to fix the subsequently-applied surface-tints.

While I have specified certain substances or ingredients as used in carrying out the process as above described, yet it will be understood that other substances or ingredients may be substituted therefor—as, for instance, in carrying out the process in the particular manner first above set forth instead of dextrine other soluble substances hard enough to resist the action of a sand-blast may be employed in its place. Similarly, the vehicles used for the oil and water colors may be different from those specifically named.

I claim as my invention—

1. The process of decorating glass which embraces the steps of first applying to the surface of the glass a coating of color, then applying over said color coating a design by the use of a substance or compound of sufficient hardness to resist the action of a sand-blast, then subjecting the surface of the glass to the action of a sand-blast, and finally firing the glass to fix the color.

2. The process of decorating glass which embraces the steps of first applying to the surface of the glass a coating of color, then applying over said color coating a design by the use of a substance or compound of sufficient hardness to resist the action of a sand-blast, then subjecting the surface of the glass to the action of a sand-blast, then coloring the roughened surface of the glass by the use of a color of a kind which will not dissolve or remove the color first applied and finally firing the glass to fix all the colors.

3. The process of decorating glass which embraces the steps of first applying to the surface of the glass a coating of color, then ap-

plying thereto a coating of a soluble substance then transferring or applying to the glass over said coating a design by means of ink which is not soluble in a liquid which is a solvent of said coating, then removing the soluble coating, then subjecting the glass to the action of a sand-blast, then removing the soluble substance from the lines of the design, then coloring the roughened surface of the glass by the use of coloring material of a kind which will not dissolve or remove the color first applied and then firing the glass to fix all the colors.

4. The process of decorating glass which embraces the steps of first applying to the surface of the glass a coating of oil-color mixed with balsam copaiba or the like, then applying thereto a coating of dextrine or like soluble substance then transferring or applying to the glass over said coating a design by means of waterproof ink, then removing the dextrine or soluble substance by a suitable solvent, then subjecting the glass to the action of a sand-blast, then removing the dextrine from the lines of the design, then coloring the roughened surface of the glass by the use of water-colors and finally firing the glass to fix all of the colors.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 2d day of June, A. D. 1898.

JOSEPH A. LUXHEIM.

Witnesses:

FRANK LUXHEIM,
C. CLARENCE POOLE.