UNITED STATES PATENT OFFICE.

LÉON CHARMANTIER AND SIMON DE CAZENAVE, OF PARIS, FRANCE.

MANUFACTURE OF STAINED-GLASS WINDOWS.

SPECIFICATION forming part of Letters Patent No. 346,984, dated August 10, 1886.

Application filed June 1, 1886. Serial No. 203,773. (No specimens.) Patented in France February 27, 1886; in Belgium March 3, 1886, No. 72,218, and in England March 8, 1886, No. 3,252.

To all whom it may concern:

Be it known that we, LÉON CHARMANTIER and SIMON DE CAZENAVE, both citizens of France, residing at Paris, in the French Republic, have invented new and useful Improvements in the Manufacture of Stained-Glass Windows, (for which we have obtained a patent in Great Britain, No. 3,252, bearing date March 8, 1886; in France, number not yet given, dated February 27, 1886, and in Belgium, No. 72,218, dated March 3, 1886,) of which the following is a specification.

The improvements in the construction of stained-glass windows, the subject of the present invention, are characterized by their mode of manufacture, which is as simple as it is inexpensive, with the advantage of great transparency, the employment of transparent vitrescent pigments composed of coloring oxides or salts combined with a vitro-metallic solvent—that is, a vitreous substance mixed with metal, as, for example, a solvent, such as crystal or glass, in combination with a metal, such as lead or minium, or quartz mixed with lead or minium. These vitrifiable and transparent colors have the property of recovering their transparency after they have been reduced to powder and subjected to a second fusion at a suitable heat.

The old method of cutting the stained glass from the sheet, the lead ribs, and the shading and outlining with the brush are done away with in this new method.

A stained window can by the novel mode of manufacture be made either in a single piece or in several parts.

The process is equally applicable to all kinds of glass, and to crystal or flint-glass, either one or other of which is molded or pressed by aid of molds, dies, or blocks bearing raised and sunk parts for reproducing on the glass or crystal the design required. This mold, die, or block consists of a metal plate or some equivalent substance, on which the design to be produced is executed in relief, or sunk, either by casting or cutting it thereon. These sunk or raised parts are specially studied in accordance with the design desired. Therefore, supposing a design produced on glass or crystal by this means, it is then coated with a semi-liquid transparent vitrescent color. This liquid paste will appear thicker in the hollows than on the prominent parts of the design, and consequently the tones will be deeper in the cavities than the projecting parts. A gradual diminution of the inclination to the cavities or hollows, suitably arranged for the purpose desired, will produce effects of light and shade exquisitely graduated, so much so that no hand-painting could produce it, however expert the artist.

In molding a window or parts thereof, the block or die being made with the design required, the operative places it near him, takes from the pot the molten metal (glass or crystal) in sufficient quantity of the vitreous paste to amply cover the mold or die. Two assistants, furnished with a metal roller of suitable form and weight, then quickly spread the malleable vitreous mass in all directions over the surface of the block, mold, or die, which is then immediately placed beneath a press or rolling-machine, the action of which causes the mass to penetrate while still malleable into the minutest lines of the block, at the same time leaving the glass or crystal the desired thickness and suitably smooth on the unmolded surface.

In casting, a certain quantity of the vitreous mass in fusion (either glass or crystal) is spread on a rigid metal table or plane, and the molding is effected either by the action of the rolling-machine or press acting on the free surface of the block while the vitreous mass is still malleable.

In stamping the design on sheets of glass or crystal as procured from the works, this can be effected by using the block as a die and producing the same result as is effected in striking coin, taking care to first soften the glass or crystal in a furnace. A rolling-machine or press is then made to act quickly on the block, pressing the face of the block bearing the design onto the malleable mass supported by a rigid surface, the results obtained being identical with the molding and casting. When the impression of the block is produced on the glass or crystal by either of the operations enumerated, and the vitreous mass has been properly cooled in the usual manner, the transparent vitrifiable colors are applied. These, as already described, consist of color-

ing oxides or salts in combination with a transparent vitro-metallic solvent. These matters fused and refined are placed and quickly cooled in a basin containing cold water, where they are steeped and separated. They are then ground in the usual manner, and are then ready for use, and are when required reduced into a semi-liquid state, and in this condition are poured into cans with spouts, so that any one can easily deposit them on or in the various parts of the design they should occupy. When all the colors of the design are thus deposited, the sunk lines of the design made in the block, which form the dark lines marking out the design with vitrifiable opaque black, these latter lines, if desired, may be left out when the design is intended for the decoration of articles other than windows. When all the colors have been applied, as stated, the piece or pieces of stained glass or crystal are left to dry, either in the open air or in a heated chamber or stove. The design is then retouched, if so required, and it is fired, the temperature being gradually increased till a suitable degree of heat is reached for revitrifying the colors and returning them their transparency, and causing them to adhere intimately to the glass. They are then gradually cooled down, as is the usual custom. It may happen that the unstained side or surface of the glass is not sufficiently smooth, or not sufficiently polished. It is then polished on this, or on both sides, if necessary, and the work is completed, and the transparency and execution of the design are perfect, showing all the exquisite play of light seen in the ancient works.

We claim as our invention—

The process herein described of manufacturing transparent colored glass or crystal, which consists in first molding or shaping the glass so that it will be thickest wherever the color is to appear lightest, in then depositing the vitrescent and transparent colors on the glass or crystals, so that the sunk and raised parts of the colored glass or crystal will produce effects of light and shade without interfering with the general transparency of the whole, and in finally firing the said glass or crystal, substantially as specified.

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Witnesses:
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