UNITED STATES PATENT OFFICE.

WILLIAM GEORGE WEBB, OF WORDSLEY, GREAT BRITAIN, ASSIGNOR TO WILLIAM LANGDON LIBBEY, OF NEW BEDFORD, MASSACHUSETTS.

IMPROVEMENT IN THE ORNAMENTATION OF GLASS.

Specification forming part of Letters Patent No. 121,696, dated December 5, 1871.

To all whom it may concern:

Be it known that I, WILLIAM GEORGE WEBB, of Wordsley, in the county of Stafford, in the Kingdom of Great Britain, Glass Manufacturer, have made a new and useful invention having reference to Engraving and Ornamenting Glass, of which the following is a specification:

My invention relates to a new and useful improvement in the art of embellishing and engraving upon glass; and consists in the combined processes of printing and etching, as hereinafter described.

I am aware that printing upon glass, in the abstract, is not new; neither is it new to etch or engrave glass by means of an acid; but the two processes as combined and carried out in my improved manner I believe to be novel, and the result attained thereby to be effected in a more simple, perfect, and expeditious manner than any heretofore adopted.

The impressions which are desired to be reproduced are in the first place to be made upon either steel, copper, or any other sufficiently-hard metal or stone, as may be desirable. The impressions are next printed upon paper and next transferred to the article to be engraved or etched, the engraving of the article being effected in manner as hereinafter described.

In preparing the said plates for carrying out my invention I proceed as follows: In case the outlines of the impression or design I desire to reproduce upon the glass (for instance, a glass globe) are to be intaglio, or formed below the surface of the "ground," and the body of the globe or parts surrounding the design, when finished, are to be transparent, I form the outlines of the design upon the impression-plate in cameo or relief by removing the parts of the plate outside and in close proximity to the design so as to form a shallow depressed border entirely around the latter, whereby, when the plate is used for printing or reproducing the design upon the paper tissue or transferring-paper, such depressed part shall produce an inked border completely circumscribing the design, and, when transferred to the surface of the glass, shall reproduce such inked border thereon, such inked border forming a most perfect outline and protection of the design, and thus enables the whole surface of the glass which is not to be acted on by the acid to be readily covered with a coating of varnish, as all that we have to do is to varnish the parts outside of the inked border, such requiring but little care or skill. Were it not for this inked border around the design it would be totally impracticable, if not impossible, even with the greatest care and skill, in delicate designs, to apply the varnish to the parts immediately around the design without covering more or less of the parts or delicate outlines of the design which are to be acted on by the acid, and thus counteract the harmony of the effect designed, the lines being often so fine and close that it would be impossible to apply the varnish between them, the artistic beauty and perfection of the design depending upon having every iota of the article not to be acted on by the acid protected, and leaving every portion to be acted on perfectly free of any impediment to the direct contact of the acid.

In preparing the plate to reproduce other designs on the glass, for instance, wreaths of leaves and flowers, in which the stem and ribs of the leaves and the flowers are to be in intaglio upon the finished glass, the borders of the leaves and petals of the flowers are to be made upon the plate in intaglio or sunken, so that an inked border shall be formed around such when printed and transferred to the glass, the coating of varnish being applied to the other parts, as before mentioned.

In case the design is to appear in cameo and transparent upon the finished glass, and the ground or body portion of the article is to be of a cloudy or semi-opaque appearance, the impression or design upon the plate is to be made in intaglio or in depression, so that when printed upon paper and transferred to the glass such parts shall be protected from the action of the acid, and thus be left clear and transparent and in cameo, the acid in such case being what I term a "dull acid," which, acting upon the unprotected portion, slightly decomposes such and gives a cloudy appearance thereto.

The etching of the glass when printed and the proper parts have been varnished is accomplished in the following manner: A tank of gutta-percha or other suitable substance is provided, containing within it a combination of hydro-fluoric acid and nitric acid in the proportion, by preference, of about one part of nitric acid to about fifty parts of hydro-fluoric acid. The articles of glass to be embellished and etched are to

be affixed to a revolving frame or shaft, which is caused by any convenient means to rotate within the tank in such manner that during each complete revolution of the shaft or frame the articles required to be operated on will have been submerged in the fluid and withdrawn from it, the object of such being to remove the silex or elements of the glass which have been decomposed by the action of the acid, and thus allow the more ready access of the acid to the parts of the glass to be etched; or the said articles may be placed upon a suitable frame and alternately submerging and elevating the same within the acid in the tank; or the articles may be placed over the tank and the acid poured upon them in intermittent streams.

That my invention may be fully understood and the manner of carrying it into effect may be clear I will now particularize the means employed. I will first describe what I call the cold process of printing upon glass. The ink employed for printing may be composed of equal parts of beeswax, resin, and white wax, (say about one pound of each,) one-third part of boiled linseed-oil, (say about five ounces,) together with one-third part (say about five ounces) of peroxide of iron, mixed together with one-half part (say about eight ounces) of turpentine, well boiled together. The varnish for protecting the glass may be composed of equal parts of bitumen, beeswax, resin, and white wax, and ten parts of turpentine, well boiled together.

As to the printing-plates, as before explained, the design may be engraved or etched upon either steel, copper, or stone. The ink is applied with a knife to the depressed portions of the plate with which the printing is done, the raised portions being cleaned; and the plate is next placed under the printing-press. The impression obtained is next transferred to the glass and is rubbed on with a flannel. To readily remove the printing-paper which has been used I take a weak solution of ammonia and water. The parts of the glass not to be acted on by the acid are next to be varnished, and the article is then ready to be engraved or etched, and is to be placed in the mixture of hydro-fluoric and nitric acid and manipulated, as before explained, until the acid has removed the unprotected portions of the glass to the desired depth.

I will next describe what I call the hot process of printing upon glass: The ink in this case should, by preference, consist of a compound composed of one quart of boiled linseed-oil, two ounces of resin, and two ounces of red lead, the whole to be boiled together to a thick consistency. Then I take one part of asphaltum and one part of gas-tar, which I boil to a proper consistency. Afterward I mix an equal part of the oil mixture with a corresponding quantity of this asphaltum, which produces an ink ready for use. The impression-plate, having been made as before explained, is to be warmed, and the ink is laid on with a leather boss; and after the projecting parts of the plate are cleared it is put under the printing-press, and the design transferred to the glass by means of a flannel rubber, as before. The paper employed may be removed from the glass by means of clean water; and it should be mentioned that the paper used for printing is "pottery tissue," and is to be damped, before being used, with a solution of soft soap and water. The process of etching is the same as that before explained as applicable to the cold process.

Sometimes, both in the cold and hot process, after being etched it is desirable to give the glass a cloudy appearance. In this case it is to be placed in a dull acid, which may be composed of four parts of water and one part of hydro-fluoric acid, the acid being neutralized by carbonate of soda, which produces fluoride of sodium. To five parts of the fluoride of sodium so formed add one part of acetic acid. The manipulation before described is also applied to the articles placed in the dull acid. Another dull acid may be produced by taking, say, sixteen ounces of hydro-fluoric acid and seven and three-fourths ounces of carbonate of ammonia, which should be mixed gradually.

Having described the nature of my invention and the manner in which the same is or may be carried into effect, what I claim is as follows:

1. For the purpose of engraving and ornamenting glass-ware, the combined processes of printing and etching, substantially as hereinbefore specified.

2. In the process of etching glass, submitting the latter to the intermittent action of the acid, substantially as and for the purpose set forth.

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