

# UNITED STATES PATENT OFFICE.

CONSTANT A. LAVAL, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF HIS  
RIGHT TO JULIUS CLAUDE, OF SAME PLACE.

## IMPROVEMENT IN PROCESSES OF DEPOSITING ALLOYS AS A BACKING FOR MIRRORS.

Specification forming part of Letters Patent No. 184,632, dated November 21, 1876; application filed  
November 9, 1876.

*To all whom it may concern:*

Be it known that I, CONSTANT A. LAVAL, of St. Louis, in the county of St. Louis and State of Missouri, have invented certain new and useful Improvements in Process of Depositing Alloys as a Backing for Mirrors, of which the following is a specification:

This invention relates to a new and improved process for silvering glass, and is particularly designed for the manufacture of mirrors.

In mirrors as heretofore constructed, by depositing metal by chemical action upon glass, it has been found necessary to employ the silver in a state of the greatest purity; but the soft and brittle nature of the deposit, as well as the expensive nature of the metal, render such mirrors of comparatively little practical value. It is a well-known fact that a percentage of more or less copper, in alloy with silver, materially increases the hardness and ductility of silver, and for commercial purposes, such as the manufacture of silver-ware, coin, and the like, the metal is invariably alloyed with copper.

I have taken advantage of this property of the copper when alloyed with silver in the construction of my mirrors, and by depositing an alloy of copper and silver upon the surface of the glass I secure the requisite hardness of the coating to withstand all ordinary usage to which the mirror will be subjected, and at the same time materially reduce the cost of production, and by means of the improved solutions which I employ, and the process of preparing the same and depositing the alloy, I dispense with the heating processes usually employed in the depositing operation, which further reduces the expense of manufacture.

To this end my invention consists, first, in an improved process of depositing metals upon glass by reducing the same from solutions of their salts by the action of the arsenite or tartrate of copper in conjunction with potassa and alcohol, as more fully hereinafter set forth; second, in an improved process of coating glass with alloys of silver and copper, by the mutual reaction of a salt of silver and a salt

of copper combined with potassa or other alkaline salt and alcohol, as more fully hereinafter set forth; third, in an improved combination of ingredients and process of depositing the alloy from the solutions, as more fully hereinafter set forth.

In carrying out my invention I prepare the ingredients as follows, in about the proportions named: I first take eighty grams of nitrate of silver, (either lunar caustic or the crystallized salt,) and dissolve it in ten ounces of water, preferably distilled or rain water. To this I add two ounces of alcohol and two ounces of aqua-ammonia. The ammonia is added to the solution drop by drop, until the precipitate at first formed is dissolved. The solution is then allowed to settle for three or four hours, when it is ready for use, and forms solution No. 1. I then take six ounces of water and dissolve in it twenty-four grams of nitrate of silver, and add to the same thirty grams of arsenite or tartrate of copper, and then add, drop by drop, sufficient aqua-ammonia to dissolve the precipitate of oxide of silver at first formed and the arsenite or tartrate of copper, after which add two ounces of alcohol. I then make a separate solution of forty-eight grams of potassa in sixteen ounces of water. This last-mentioned solution is brought to a boiling temperature in an evaporating-dish, after which the solution of nitrate of silver and arsenite or tartrate of copper is added, drop by drop, to the boiling solution of potassa, and the boiling is continued for about an hour, or until a white film collects on the surface, after which it is allowed to cool and filtered, when it is ready for use, and forms solution No. 2.

In depositing the alloy upon the glass I take a suitable quantity of filtered water, preferably rain or distilled water, and add to it equal parts of solutions Nos. 1 and 2, and mix the whole thoroughly, and apply this solution in any convenient manner to the glass to be coated, and the deposition immediately commences, and is allowed to continue, say, for about ten minutes, until the metal in solution is entirely exhausted, when the glass

will be covered with a coating of the alloy, having a brilliant reflecting-surface adjoining the glass.

In order to increase the durability of the coating I prefer to deposit a second coating upon the first, which is done by repeating the operation before the first coating is dry, and after the coating is completed I generally cover the whole with a heavy coat of asphaltum varnish, although this is not absolutely necessary, as the metallic alloy is sufficiently hard to stand ordinary wear without it.

By the above-described process an alloy having all the qualities of hardness and durability of the ordinary alloys of copper and silver is deposited upon the glass, and the degree of hardness may be varied or modified by varying the proportions of the different ingredients employed, and, therefore, I wish it to be distinctly understood that I do not limit myself to the precise proportions above enumerated. Other salts of copper besides the arsenite or tartrate may be employed in conjunction with the nitrate of silver, and for this reason I do not limit myself to such salts alone.

It is evident, also, that my invention can be applied to innumerable other uses besides the backing of mirrors—such, for instance, as

the ornamentation of various articles of glass-ware—and I do not limit myself, therefore, to its application to the construction of mirrors alone.

What I claim, and desire to secure by Letters Patent, is—

1. The process herein described of depositing metals upon glass by the mutual reaction of solutions of silver and copper in conjunction with alcohol and potassa, substantially as herein described.

2. The process herein described of silvering glass by the mutual reaction of arsenite of copper upon the ammonio-nitrate of silver in conjunction with alcohol and potassa, substantially as herein described.

3. The process herein described of silvering glass by the reaction of a solution consisting of nitrate of silver, ammonia, and alcohol upon a solution consisting of nitrate of silver, arsenite of copper, alcohol, and potassa, combined and applied substantially as herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

CONSTANT A. LAVAL.

Witnesses:

• L. SUBIS,  
• W. E. WEBER.