

# UNITED STATES PATENT OFFICE.

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## PROCESS OF COATING FIBROUS MATERIAL WITH METAL.

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*To all whom it may concern:*

Be it known that I, JAMES HART ROBERTSON, a citizen of the United States, residing in the borough of Brooklyn, in the city and State of New York, have invented certain new and useful Improvements in Processes of Coating Fibrous Material with Metal, of which the following is a full and true description.

The object of my present invention is to coat fibrous material with metal, giving it the general surface appearance in metal of the material which is so coated, and to obtain the metal-coated product resulting from the process described.

My novel process consists in treating a body or base of fibrous material either in the form of a single thread or of a woven, knitted, or knotted fabric, which may bear any configuration or ornamentation, with metallic salts, (preferably by saturation,) then reducing the salts to conductive state and depositing a surface coating of metal thereon by electrolysis.

In carrying out my invention I treat the fibrous material with the metallic salts—preferably nitrate of silver—and reduce the salts to a conductive state by bringing them in contact with an alkaline reducing solution, with the result that the fibrous material becomes an electrical conductor throughout its body. The fibrous material is then in condition to receive a surface coating of metal, which may be deposited thereon by electrolysis in any suitable way.

Nitrate of silver I have found to give the best results in practice.

For the purpose of reducing the salts to a conductive state I prefer to employ an alkaline reducing solution, which may be applied to the fibrous material either before or after the metallic salts are applied thereto. In the first case the fibrous material may be immersed in the reducing solution (which may also contain a binding material, as hereinafter described) and the metallic salts then applied to the fibrous material by immersing the latter therein or otherwise. In the second case the fibrous material may be first dipped in the metallic salts and then dipped in the alkaline reducing solution.

In order to protect the fibrous material—lace, for instance—during the electroplating operations and to hold the reduced metallic

salts to the fabric until the surface coating of metal has been deposited thereon, I treat the fibrous material with dissolved binding material, such as dissolved gum-shellac. This binding material may be applied to the fibrous material either alone (when the metallic salts are applied before the reducing agent) or with the reducing agent when the fibrous material is treated with the reducing agent before the salts are applied to it.

Any alkaline reducing solution may be employed. I have, however, attained good results when I use a solution made as follows: First, dissolve one ounce of pure metallic silver in a solution composed of one and one-half ounces of nitric acid and one ounce of water; second, evaporate the fluid and crystallize the residuum; third, dissolve the crystals in one quart of distilled water; fourth, add common salt thereto, precipitating the silver in the form of chlorid of silver; fifth, thoroughly wash the chlorid; sixth, add thereto sufficient concentrated solution of cyanid of potassium to dissolve the chlorid, and, seventh, filter the solution through chemical paper and add to the filtered liquid three quarts of distilled water.

The method of preparation and proportions of ingredients given may be varied to meet the requirements of any particular case or the custom of the operator.

For producing a flexible or semiflexible metal-coated lace or fabric I prefer to practice the following method: First, saturate the lace or fabric with a solution consisting of an alkaline reducing solution, preferably the solution hereinbefore described, to which has been added a quantity of gum-shellac dissolved in alcohol. Then treat the lace or fabric with nitrate of silver, which is quickly decomposed on being brought in contact with the reducing solution. The three mixtures above mentioned (gum-shellac, alkaline reducing solution, and nitrate of silver) can be applied to the lace or other fibrous material in other ways than before described. For instance, the lace or fabric can be first saturated with the gum-shellac, then treated with nitrate of silver, and then treated with the alkaline reducing solution, which serves the purpose of not only decomposing the silver, but also of incorporating the three mixtures



into one and causing this mixture to permeate the entire body of the lace or fabric. The fibrous material, impregnated with the reduced metallic salts, is then immersed in the electrodepositing solution and left therein, or slowly carried through it, until a sufficient electrically-deposited metallic covering is secured. The final electrodepositing solution which I prefer to employ and have found to be practicable is composed of the following-named ingredients mixed in the proportions specified: To one gallon of distilled water add three pounds of sulfate of copper and one-half pound of sulfuric acid. The strength of current which I prefer to employ is approximately fifteen amperes to each square foot of the electrodepositing bath.

I have ascertained by microscopical examination that the metallic salts after subjection to the alkaline reducing agent are reduced to a highly-conductive condition when dry and apparently more or less converted into a metallic state.

While it may be true (strictly and technically considered) that the salts are not reduced to a metallic state, yet they are certainly reduced to a highly-conductive condition, having a surface appearance strongly resembling under the microscope a metallic surface.

The result is a product metallic in surface coating and appearance and embodying the exact configuration or ornamentation of the original fibrous material and reproducing in the metal-coated fabric the interstices or openings of the original fabric. These metallized fabrics or fibers are produced very cheaply and rapidly by the employment of my new process as above set forth and are far more accurate in delineation of the minute details of the original fabric than is possible by the most expert die-cutting, which has been the method hitherto practiced.

When precious metals, as gold or silver, are to be deposited on the fibrous base, a coating of an inexpensive metal, as copper, may be deposited on the fabric by electrolysis before the final metal-plating.

What I claim is—

1. The process of producing metal-coated fibrous material, consisting in saturating the fibrous material with an alkaline solution capable of precipitating the metal contained in nitrate of silver, and containing dissolved binding material, then treating the fibrous material with nitrate of silver and permitting the metal in said salt to precipitate and become conductive, and depositing thereon a metallic surface coating by electrolysis, substantially as and for the purpose described.

2. The process of producing metal-coated fibrous material, consisting in saturating the fibrous material with an alkaline solution capable of precipitating the metal contained in nitrate of silver, and containing dissolved gum-shellac, then treating the fibrous material with nitrate of silver and permitting the metal in said salt to precipitate and become conductive, and depositing thereon a metallic surface coating by electrolysis, substantially as and for the purpose described.

3. The process of producing metal-coated fibrous material, consisting in treating the fibrous material with dissolved gum-shellac, with nitrate of silver and with a solution of silver chlorid dissolved in potassium cyanid, permitting the metal in said salt to precipitate and become conductive, and depositing thereon a metallic surface coating by electrolysis, substantially as and for the purpose described.

4. The process of producing metal-coated fibrous material, consisting in treating the fibrous material with nitrate of silver and with a solution of silver chlorid dissolved in potassium cyanid, permitting the metal in said salt to precipitate and become conductive and depositing thereon a metallic surface coating by electrolysis, substantially as and for the purpose described.

In witness whereof I have hereunto signed my name this 5th day of January, 1900.

JAMES HART ROBERTSON.

In presence of—

WM. TALLMAN,

WM. H. BERRIGAN, Jr.