

# UNITED STATES PATENT OFFICE.

EUGÈNE AMÉDÉE BILLAULT, OF PARIS, FRANCE.

## MANUFACTURE OF JEWELRY.

SPECIFICATION forming part of Letters Patent No. 440,258, dated November 11, 1890.

Application filed September 17, 1889. Serial No. 324,243. (No model.) Patented in France December 4, 1888. No. 194,566, and December 27, 1888, No. 195,026.

*To all whom it may concern:*

Be it known that I, EUGÈNE AMÉDÉE BILLAULT, a citizen of the Republic of France, residing at Paris, in said Republic, have invented a new and useful Improvement in the Manufacture of Jewelry and other Ornamental Articles, (for which I have obtained patents of the Republic of France, No. 194,566, dated December 4, 1888, and No. 195,026, dated December 27, 1888,) of which the following is a specification.

This invention relates to the manufacture of jewelry and all other articles of ornamentation for dress and furniture of sulphuret of silver.

I have observed that sulphuret of silver may be worked as easily and in the same manner as metals ordinarily employed in the arts—notably as gold and silver—by subjecting it to a preliminary softening by a heat lower than its point of fusion, taking care at the same time to prevent its oxidation, before subjecting it to the operations of rolling, hammering, stamping, chasing, engraving, bending, &c.; and the present invention consists in the manufacture in sulphuret of silver, as hereinafter described, of all ornamental objects for personal wear, furniture, &c., such as jewelry, buttons, and ornaments to be placed upon silver-ware, furniture, bronzes, &c. The softening by heat is indispensable in order that the sulphuret shall cease to be brittle and shall acquire such malleability as to allow it to be subjected to all the operations hereinbefore mentioned, and also to facilitate some of them—for example, the stamping. After they have been cooled the pieces manufactured may be finished with the file and polished in the same manner as gold and other metals, besides having the faculty of being retouched, if that is necessary, after again softening by heat the spots which it is desired to retouch. As is well known, the sulphuret of silver takes a fine polish. It possesses a considerable hardness and much solidity, and it has a blackish color peculiar to itself which renders it particularly suitable to the manufacture of either mourning or fantastic jewelry and to that of articles of ornament of all kinds, either when employed alone or when objects made of it have in-

crusted upon them ornaments made of any other metal—such, for example, as gold or silver—such objects being entirely new and only rendered possible of manufacture by the extreme plasticity of the sulphuret after it has been softened by heat.

To make jewelry or ornaments of sulphuret of silver, I commence by melting this substance and casting it in ingots, which, after reheating to soften them, may be perfectly laminated in the form of plates, sheets, or bars of any suitable dimension. These plates, sheets, or bars, when it is desired to work them, should first be reheated to the point of softening them without melting, and should in this state be subjected to all of the operations of cutting, stamping, bending, turning, punching, &c., such as are performed upon metals. Owing to the property which this material possesses of being softened by heat, fine stones may be easily set in the pieces of jewelry which are formed of it. It is sufficient for this purpose to bore a hole in the piece after softening, to place the stone in the hole, and afterward to soften the sulphuret at the edge of the hole and close the latter over the stone by pressure. Owing to the facility with which the sulphuret of silver oxidizes when it is melted, its fusion and the casting of the ingots should be performed under protection from contact with the air to avoid the production of metallic silver on the surface. The same may be said of the soldering of pieces of sulphuret of silver, which it is easier to perform by the blow-pipe if it be done in the reducing portion of the flame. By observing the above precaution at the moment of casting the ingots I obtain for the operations of cutting, &c., pieces perfectly sound, homogeneous, solid, and of uniform tint in all their parts.

As I have above mentioned, it is easy for me to obtain pieces with incrustations of another material—for example, of gold or silver—and by a simple stamping operation after softening the blank of sulphuret of silver I place for this purpose in the bottom of a matrix or die the ornament cut out in silver, for example, which is intended to form the incrustation—that is to say, of which the face should appear at the surface of the



object flush with this surface. Then I place upon said ornament a blank of sulphuret of silver which has been, after softening, cut in the desired contour, and I soften it anew by directing upon it the reducing part of the flame of the blow-pipe. Then by means of a punch corresponding with the die, and operated, for example, by a powerful fly-press, I subject the thus softened blank of sulphuret of silver to pressure, and the ornament is thus pressed forcibly into the latter with the greatest solidity, the sulphuret, which is very plastic, being caused by the effect of the pressure to penetrate into all the spaces which remain in the die. At the same time the blank takes on both sides the relief which it should have and which may be determined by the engraving of the punch and the die. I obtain by this means a very economical incrustation of great perfection and of a perfect solidity. The piece after having been removed from the die may be retouched by the file, if that is necessary, and polished while cold. A stroke of the file may be given to the surface to clear the sulphuret from any part of the incrustation which may have been covered by it.

Instead of the fly-press, a hydraulic press may be employed, or the pressure might be obtained by rolling or by hammering. If I manufacture by this system an object—a brooch, for instance—which is intended to have upon it projecting from its back the eyes of a hinge, I solder, by preference, the eyes upon the metal ornament before putting it in the die, and I make in the blank of sulphuret of silver holes corresponding with these eyes. The punch also contains corresponding cavities in order that the eyes should not be flattened during stamping. In this manner during the stamping operation the sulphuret of silver is pressed around the eyes and made to hold them solid.

I will here mention that for certain purposes the pieces made of sulphuret of silver with incrustations of metallic silver, as I have above described, may be found too heavy. In this case, on the contrary, the body of the piece may be of silver, which is lighter, and the softened sulphuret of silver afterward by pressure forced into the holes or cavity made in the metallic surface to receive it.

In place of incrusting in one piece of jewelry or silver-ware, &c., an ornament made of a different material, as is above described, I may also have recourse to another mode of ornamentation, which I effect by analogous means completed by the action of an acid or other solvent. This mode of ornamentation consists in embedding into the piece an ornament intended to remain there to form an incrustation or embedding temporarily into the piece a cut-out core, which will be afterward so eaten out by an acid or other solvent as to leave in relief the sulphuret of silver, which fills its cavities. It is hardly necessary to say that the cut-out piece of metal employed

as a core to produce finally an ornament in relief, which may be its counterpart, will never be of precious metal. In practice it will ordinarily be of copper, and nitric acid will be employed to destroy or eat it away.

To obtain the reliefs in question, it will be sufficient to place in the bottom of the die such a core or piece of copper cut out in such manner that the spaces which it leaves both in its interior, if it have any, and between its outline and the inner wall of the die represent the ornament which it is desired to obtain in relief. Afterward there is placed upon it a blank of sulphuret of silver. This is then softened with the blow-pipe, observing the precautions above described. Then the whole is compressed forcibly to cause the sulphuret to penetrate into the spaces, after which the piece is plunged into a bath of nitric acid, which takes away all the copper, thus leaving in relief the parts of the sulphuret which filled the spaces.

It will be understood that the form and exterior size of the copper core may vary according as it is desired to obtain a relief in the center only of the manufactured piece, in which case the core will fill the whole breadth of the die, its interior openings varying according to the design to be obtained and of which they are the counterpart, or according as it is desired to form a sort of frame, in which case the copper core should, for the purpose of producing the openings of the frame, be smaller than the die with a contour of the desired form. In a word, the relief may be obtained in such points as are desired by cutting the copper core according to the desired internal and external configuration of the relief, so that the sulphuret of silver may be lodged in all the spaces which the core leaves in the die. The face of the several parts of the relief need not be all in the same plane. Nothing is easier, on the contrary, than to produce a variation in the projection of the different parts of the ornament. It suffices for that purpose, instead of giving to the core a plain surface, a surface presenting the desired convexity or irregularity, to give corresponding irregularity to both the punch and the die.

In general it is not well that the bottom of the die upon which the relief of the sulphuret of silver is produced should be smooth, but preferably that it should be dotted or grained, which may be obtained by an operation performed on the bottom of the die by a graver or other instrument exactly as it is practiced in the jewelry and silversmith trades, the said dotted or grained effect being caused to mold itself into the relief-surface of the sulphuret during the pressure on the die. This same dotted, grained or roughened effect may be produced on the field or intagliated surface, from which rises the relief of sulphuret of silver in a piece of work consisting entirely of that material by giving the inner or upper surface of the copper core a corresponding



surface which will be caused to mold itself into the sulphuret of silver by the same application of pressure which serves to force the sulphuret of silver into the spaces within or around the core.

A very simple means of producing upon the copper core, before placing it in the die, the grain or roughness in question consists in causing it to pass along with a sheet of glass-paper or emery-paper through a rolling-mill or to press the core in any manner against such a roughened surface.

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

1. In the manufacture of jewelry and other ornamental articles from sulphuret of silver, subjecting the ingots of silver well sheltered from contact with air to a heat just sufficient to bring them into a plastic state and subsequently reducing said plastic material into bars and subjecting them to the operation of cutting, stamping, bending, chasing, &c., as commonly practiced in the arts, substantially as set forth.

2. The improvement in the manufacture of jewelry and other articles of ornament for dress, furniture, &c., which consists, first, in melting sulphuret of silver and casting it in ingots while excluded from contact with air, next subjecting these ingots to sufficient heat to soften and render them plastic and in this condition reducing them to plates, sheets, or bars, next subjecting these bars to heat for the purpose of softening them, and in this heated state subjecting them to the operation of cutting, stamping, bending, punching, chasing as commonly practiced in the arts on metals, the pieces thus produced being capable of being made into jewelry or other ornamental articles, substantially as herein described.

3. In the manufacture of jewelry and other ornamental articles of sulphuret of silver, the process herein described of incrusting a blank or piece of that material with an ornament of silver or other metal, consisting in first placing the said ornament in a die, then placing upon the said ornament in the die the said blank or piece, next subjecting the said blank or piece in the die to the heat of a non-oxidizing flame, and afterward subjecting the said blank or piece and ornament together to pressure, whereby the sulphuret of silver

is forced into all the spaces left in the die with and around the said ornament, substantially as herein described.

4. In the manufacture of jewelry and other ornamental articles of sulphuret of silver, the production of ornaments in relief formed of the sulphuret itself by placing in a die a core of copper or other metal capable of being reduced by an acid or solvent, then placing upon this core in a die a blank or piece of sulphuret of silver, next subjecting the sulphuret of silver in the die to the heat of a non-oxidizing flame, next subjecting the said blank or piece to pressure which causes it to penetrate the spaces which the said core leaves in the die, then removing the said blank or piece and the said core together from the die, and placing them in a bath of acid or solvent which destroys the core and thereby leaving in relief upon the blank or piece of sulphuret of silver an ornament the exact counterpart of the core, substantially as herein described.

5. In the manufacture of a piece of jewelry or other ornamental article of sulphuret of silver, having an ornament in relief formed of the said material, the method herein described of producing a dotted, grained, or roughened surface upon the field or intagliated surface from which the relief ornament rises, consisting in first placing in a die a core of copper or soluble metal which is the counterpart of the intagliated portions of the work and which has its upper or outer surface dotted, grained, or roughened, then placing upon the said core the blank or piece of sulphuret of silver, next heating the said blank or piece to soften it, next subjecting the core and blank or piece together in the die to pressure, whereby the sulphuret is forced into the spaces within and around the core and at the same time caused to impress its dotted, grained, or roughened surface into the blank, and finally dissolving or eating away the metal of the core by an acid or solvent, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EUGÈNE AMÉDÉE BILLAULT.

Witnesses:

LOUIS GEÑES,  
R. J. PRESTON.