No. 678,383. Patented July 16, 1901.

F. EPPLER.

PROCESS OF METAL ORNAMENTATION.

(No Model.) (Application filed June 25, 1900.) 2 Sheets—Sheet 1.

Fig. 1.

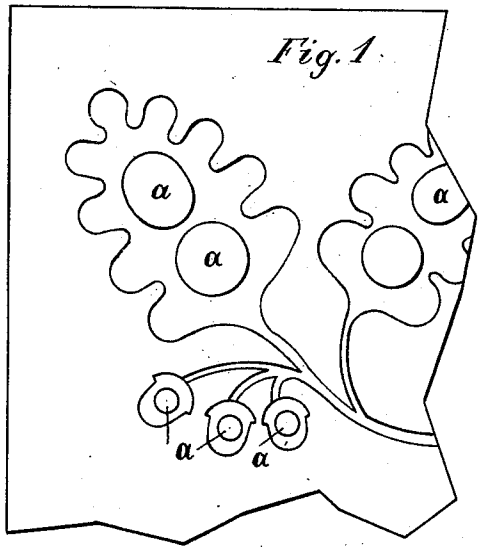


Fig. 2.

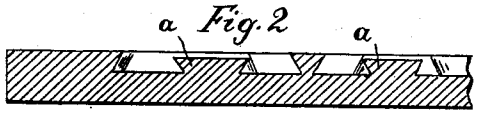


Fig. 3.

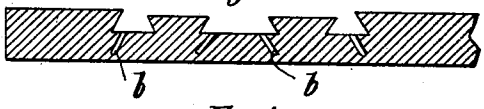


Fig. 4.

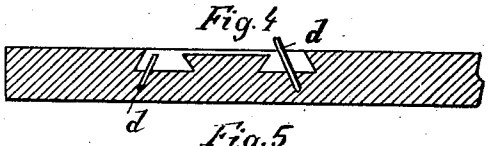


Fig. 5.

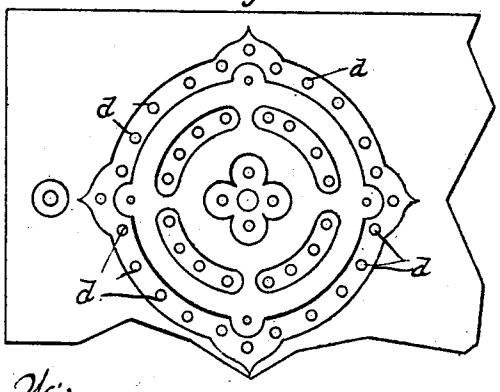


Fig. 6.

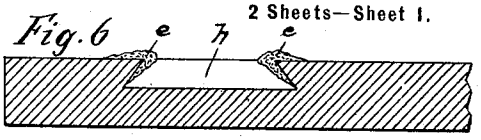


Fig. 7.

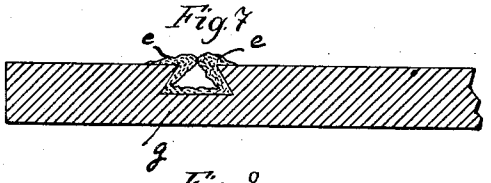


Fig. 8.



Fig. 9.

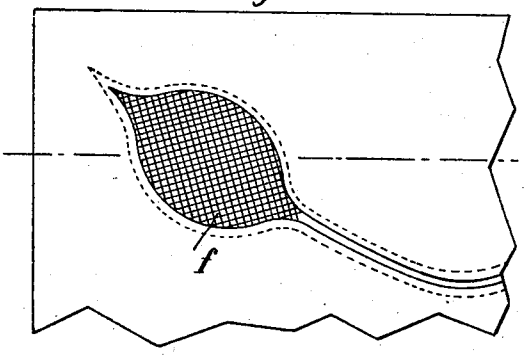


Fig. 10.

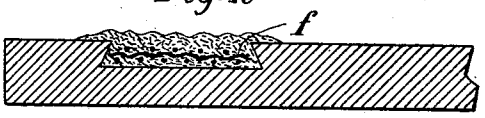


Fig. 11.

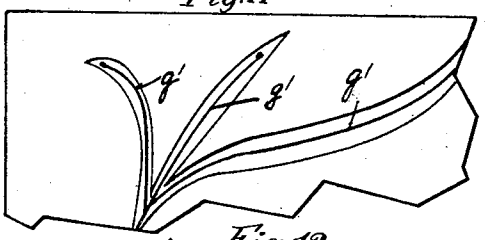


Fig. 12.



Witnesses.
Robt. Aiton.
Maude E. Aiton

Inventor.
Ferdinand Eppler
by Thos. A. Aiton Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 678,383. Patented July 16, 1901.

F. EPPLER.

PROCESS OF METAL ORNAMENTATION.

(Application filed June 25, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 13.

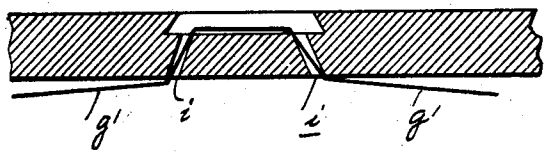


Fig. 14.

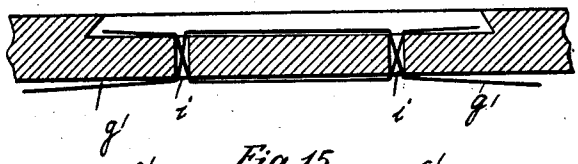


Fig. 15.

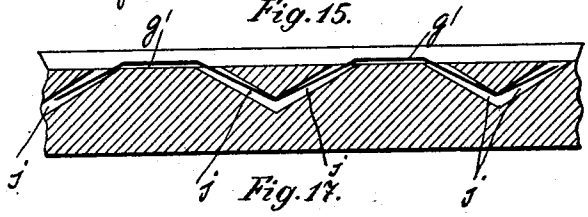
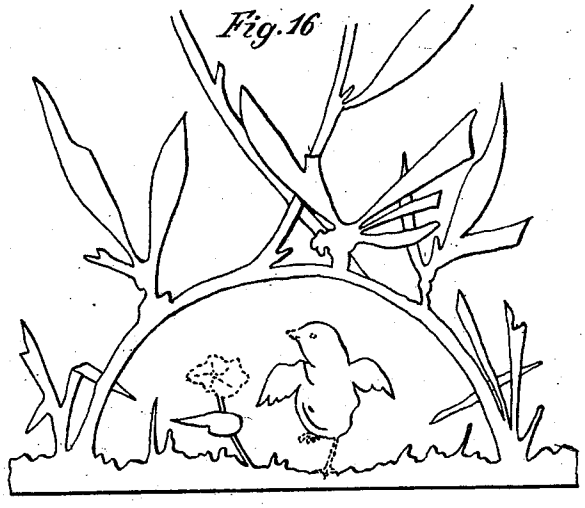


Fig. 17.



Fig. 16



Witnesses.
Robt. Aiton
Maude E. Aiton

Inventor.
Ferdinand Eppler
by Thos. A. Aiton
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FERDINAND EPPLER, OF BERLIN, GERMANY.

PROCESS OF METAL ORNAMENTATION.

SPECIFICATION forming part of Letters Patent No. 678,383, dated July 16, 1901.

Application filed June 25, 1900. Serial No. 21,409. (No specimens.)

To all whom it may concern:

Be it known that I, FERDINAND EPPLER, a subject of the German Emperor, residing at Berlin, Germany, have invented a certain new and useful Process of Metal Ornamentation in Any Kind of Material by the Electrolytic or Galvanic Method, of which the following is a specification.

This invention is intended to devise means for producing inlaid work of any kind of metal, such as is used for decorative and other purposes, by the use of the electrolytic or galvanic method, irrespective of the material wherein the decoration is to be executed.

My invention insures absolutely accurate and reliable results independently of the skill of the workman, combined with a great variety of effects it has been impossible to produce heretofore in this perfection, thus very considerably lessening the cost of production and improving the product itself.

In carrying out my invention I entirely do away with the use of hand labor and have the whole work done by the electric current without in any way detracting from the beauty of the product, which in exactness of outline and neat appearance is greatly superior to the product of hand labor and produces effects which it was not possible to attain heretofore.

The invention is illustrated by way of example in the accompanying drawings, in which—

Figure 1 is a plan view. Fig. 2 is a vertical cross-section of Fig. 1. Fig. 3 is a vertical section of a somewhat different form. Fig. 4 is a view in section of the form shown in Fig. 3 with studs therein. Fig. 5 is a plan of the form seen in Fig. 4. Fig. 6 is a section showing another slight modification. Fig. 7 is a cross-section showing an advanced step. Fig. 8 is a like view of another form. Fig. 9 is a plan showing the wire-cloth. Fig. 10 is a section through Fig. 9. Fig. 11 is a plan of another form. Fig. 12 is a section through Fig. 11. Figs. 13, 14, 15, and 17 are sections of modifications. Fig. 16 is a plan of another design.

In some cases where the base material has the required firmness and composition the pattern or drawing may be directly engraved therein. For the same purpose I preferably make use of the sand-blast, which heretofore has not been employed in this connection. The use of the sand-blast shows the great advantage, as compared with the former methods of engraving and chiseling, that the grooves become of uniform depth throughout, and as compared with the processes of etching it is superior, inasmuch as the outlines of the drawing become as neat and of such absolute sharpness and accuracy as though they were produced by engraving. Furthermore, in using the sand-blast it will be found that the bottom of each groove becomes perfectly even irrespective of the kind of material used, while, on the contrary, the various materials—such as marble, syenite, granite, and the like—show a very different behavior when treated by the etching methods, thus making a very deficient base for the electrolytic precipitation and causing broken uneven-looking outlines. The grooves produced in the various manners just described are subsequently worked out so that the galvanic or electric precipitate may better and more securely be retained therein.

The object first alluded to is attained by carefully going over the edges of the grooves corresponding to the outlines of the drawings and also so modeling the edges attained by so forming the edges of the grooves representing the outlines of the pattern, as well as the edges of the patches of base material remaining in the interior of the pattern, as shown at *a* in Fig. 1 of the accompanying drawings, so that the grooves themselves present a trapezoidal cross-section, as shown in Fig. 2 of the drawings, while the remaining patches of the ground material acquire the form of a truncated cone or of the frustum of a pyramid.

The durability of the inlaid work and its remaining in the grooves may be greatly increased by not only undercutting the base material, as shown in Fig. 2, but also by providing indentations in the bottom of the grooves corresponding to the engravings, such indentations diverging into different directions, as shown at *b* in Fig. 3 of the drawings, these indentations likewise filling up with the electrolytic precipitate and in consequence of their diverging position preventing the accidental loosening of the inlaid work. As these indentations in the case of

precious metals—such as gold, silver, or platinum—being used would considerably increase the expense of the process, as they would have to be filled by this precious metal, I attach pins or studs of any metal or of any other suitable material within these indentations, as shown at *d* in Fig. 4. Care has to be taken, however, that the tops of these pins do not project beyond the tops of the material forming the base, provided that the pattern is to be represented by the precipitated metal exclusively. On the other hand, these pins can be used for the production of novel and varied effects. In using, for instance, silver as the material for the inlaid work, in combination with pins of brass or copper, the latter may be so arranged that even after the precipitation is effected the extremities of the pins will show at the top of the work and in such places in particular where different-colored points or a whole series of such points is shown in the original pattern, as represented in Fig. 5 of the accompanying drawings, the projecting ends of course to be filed off or ground off in such cases after the precipitation is completed, so as to become flush with the surface of the work.

It is obvious that in the case of material such as marble, syenite, granite, and the like there is no necessity of undercutting the edges if perforations such as shown in Fig. 3 or the pins disclosed in Figs. 4 and 5 of the drawings are used. The durability of the inlaid work and the retaining properties of the grooves for its reception may be further increased by inserting into the grooves wires or whole pieces of wire-woven cloth. This practice not only results in a considerable economy in precipitated metal, but it also avoids the several other difficulties frequently met with in the employment of galvanic precipitates.

To those skilled in the art it is well known that perfectly even galvanic precipitates of uniform thickness can only be produced by the ordinary galvanoplastic methods upon perfectly plain surfaces of the object to be so treated where no projections are shown on the whole extent of the surface. Upon objects of different and varied shape, however, the precipitation commences, as found by practical experience, from the edges, points, and projections of the object and then gradually grows, as shown in Fig. 6 of the drawings, forming protuberances *e*, which after the formation of the precipitate being finished show a cross-section somewhat in the manner of that represented in Fig. 7 of the drawings. It is apparent that by proceeding in this manner it becomes necessary to remove a considerable quantity of the precipitated material by grinding or otherwise, if a perfectly smooth surface is required, this material being simply wasted, for it is necessary to let the protuberances that are forming at the edges of the grooves grow until the opposite ones touch each other in order to avoid breaks and spots in the outlines of the pattern. From this it is apparent that this inconvenience will greatly increase if grooves *h* of a somewhat larger diameter have to be filled by the galvanic or electrolytic method, the precipitation upon such grooves still showing a depression from the reasons just stated, as shown in Fig. 8 of the drawings, while the narrower grooves *e* have long been filled completely. By now inserting pieces of wire-cloth, as shown at *f* in Figs. 9 and 10 of the drawings, the former a plan and the latter a cross-section, or by inserting wires into the narrower grooves, as represented at *g'* in Fig. 11 in plan view and in Fig. 12 in cross-section, the said wires or wire-cloth being of any kind of metal, the formation of the precipitate is greatly accelerated and becomes far more uniform, the growth of the precipitate ensuing gradually and uniformly from all points of the inserted material, so that the formation of breaks or fissures with narrower grooves or the formation of trough-like depressions in the case of grooves of larger diameter is entirely obviated, inasmuch as the grooves being for the greater part already filled by the wires or pieces of wire-cloth therein inserted only very thin hardly-perceptible protuberances can form, as will be seen from an inspection of the sections in Figs. 10 and 12 of the drawings, the latter, if desired, being ground off with a minimum waste of material. By employing such pieces of wires and wire-cloth the durability of the precipitate is greatly enhanced, as has already been explained, and it is still further increased by making the pieces of wire-cloth of approximately the same width as the bottom of the grooves, the said pieces being forcibly thrust or pressed down into the grooves, so as to be held in position by the inclined undercut of the edges thereof. (See the section in Fig. 10.)

In order to better secure the inserted wire material within the grooves, the ground or base material is perforated at suitable places *i* and the wires drawn through these perforations. (See Figs. 13 and 14.) If the base of the work is of considerable depth, I prefer to make these perforations in the manner shown in Fig. 15 in section by making them inclined and have the various inclined perforations *j* meet.

It will be apparent that the expedients for fastening the metallic precipitate just described may also be used to obtain varigated effects in the drawings. I may, for instance, use differently-colored wires, which on drawing them through the stitching-holes in the walls of the grooves may be so bent or may be laid over suitable projections of the bottom of the said grooves, that the wires will show at the surface in some places. This end may of course also be attained by making the engraved or etched grooves so shallow or by using wire of such thickness that the latter has to show at the surface, and it can easily

be arranged to have the wire show in the work only at the desired places, as in a work of embroidery. It is obvious that the wire can have a polygonal or other cross-section, and it is further apparent that the said wire or several of them may be so arranged that the parts which it is intended to show in the drawing itself form other designs in the interior of the original pattern, as illustrated in Fig. 16, which are intended to represent a different color from that used in other parts of the design.

I have also found in connection with my invention that the variety of the effects produced can be still further increased by substituting for the patches of ground material remaining in the pattern in the ordinary methods pieces of enamel or of other material, as mother-of-pearl, &c., or I may insert pieces of such material in several places of the engraving by mechanical means. In order to cause the material thus inserted to more firmly and securely remain in the ground material or in the precipitated material, I prefer to so shape these pieces of inserted material as to make it present projecting edges, as distinctly shown in Fig. 17 of the drawings in cross-section.

After having prepared the ground material for the reception of the galvanic precipitate in the manner before described the process of electrolytic precipitation can of course only then be immediately carried out in case the said ground material is a good conductor of electricity. If, however, a non or a bad conconductor of electricity has been used as a material for the base, it is first to be rendered conducting. This may be effected in the manner usually employed with the molds for the reception of galvanic precipitates by covering the surface with graphite, with the difference, however, that in my invention the precipitate is intended to be retained within the base-plate, while in the usual galvanic plastic methods it is removed from the molds after being formed. In the case of my invention it is therefore necessary to use a covering for the walls of the grooves serving as molds, which not only produces conductivity for the electric current, but increases the adhesive or retaining properties of the ground-plate instead of interfering therewith, as in the ordinary methods. I therefore prefer to use as a conducting-cover a coating of metallic silver produced by any well-known chemical means which enters all the cavities and pores of the material of the ground plate.

I have also devised another novel and efficient method to produce the conductivity of the ground material, which consists in rubbing over all the surfaces of the non-conducting material to which the galvanic precipitate is to adhere by a pencil of soft metal—such as aluminium, zinc, tin, or the like—thereby producing conductivity in a very simple way and in a very inexpensive manner, which is even more suitable for the purpose intended than any other method. By the application of the treatment just described the thin metal covering forms a carrier for the galvanic precipitate subsequently deposited thereon. It is obvious that the precipitate may be worked out, chiseled, or engraved after the whole surface has been made even and smoothed in any well-known manner. It is also evident that my invention is capable of many other modifications in the formation of the ground plate and the depositing of the precipitate without, however, departing from the spirit of the invention.

Having now described my invention, what I claim as new, and desire to protect by Letters Patent, is—

Process for the manufacture of inlaid metal-work in a ground plate of any form or description, consisting in forming grooves in the said ground plate, inserting wires into the small grooves and pieces of wire-cloth into the larger grooves fastening said wires, wire-cloth or the like to the ground plate by drawing the same through existing perforations or by forcing them into the grooves and finally filling the grooves with a metallic deposit by electrolytic action, substantially as described.

In testimony whereof I have hereunto set my hand this 18th day of December, 1899.

FERDINAND EPPLER.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.