(No Model.)

W. H. WINSLOW.

PROCESS OF ELECTROPLATING NON-METALLIC ARTICLES.

No. 423,101. Patented Mar. 11, 1890.

Fig. 1.

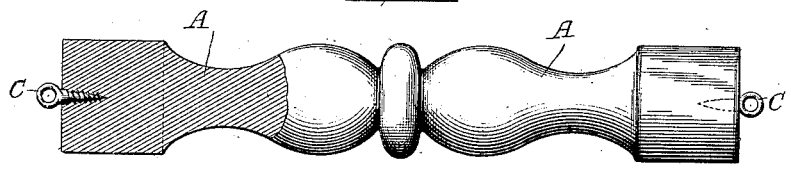


Fig. 2.

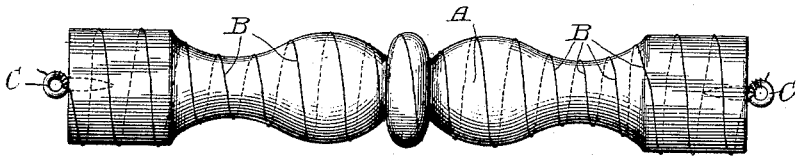


Fig. 3.

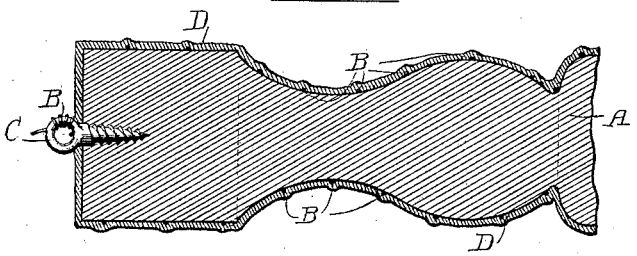
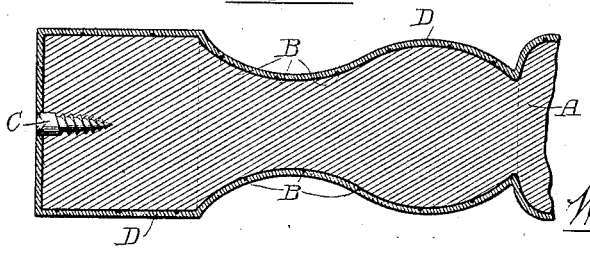


Fig. 4.



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UNITED STATES PATENT OFFICE.

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PROCESS OF ELECTROPLATING NON-METALLIC ARTICLES.

SPECIFICATION forming part of Letters Patent No. 423,101, dated March 11, 1890.

Application filed October 28, 1889. Serial No. 328,375. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. WINSLOW, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Process of Electroplating Non-Metallic Articles; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to a process of constructing articles of that kind, consisting of a base or form of wood or other non-metallic substance, and a coating or layer of metal applied thereto by electro-deposition.

My process consists in its main or essential feature in applying to or over the surface of the article to be coated with metal metallic strands or fine wires, which are connected with the electric conductors through which the current passes and which serve to produce a practically simultaneous and uniform deposit of metal on the surface of the article.

My process includes a certain method of treating a non-metallic base or form when the same is made of wood, to prevent the same being acted upon by the liquid of the bath and swelled or expanded thereby, to the injury of the finished article.

In carrying out my process when a wooden form or base is employed, such form is first treated with paraffine until thoroughly permeated or saturated with the same. The form is then inserted in a bath of electroplating-liquid composed of the same ingredients and having the same density as the bath into which it is immersed during the electroplating operation. The form is then varnished with a suitable waterproofing mixture—such as copal varnish or gutta-percha dissolved in naphtha. The surface of the form is then overlaid with a metallic strand or small wires arranged openly and connected with the electric conductor which is attached to the article. Commonly the wire will be applied by wrapping or winding it about the form and without any great precision, as it will suffice if the coils of wire are disposed with some degree of uniformity over the entire surface of the form. The surface of the form is then coated with graphite or other suitable conducting material, as common in electroplating articles which are themselves non-conductors, and the form is then in readiness to be suspended in the electroplating-bath and metal deposited thereon in the usual manner until a coating or layer of desired thickness is obtained.

The object of the metallic strand or wire is to insure the even distribution of the metal over the form as the metal is deposited thereon, it being well known that in electroplating the metal is deposited more promptly and rapidly on the part of the article nearest the point at which the electric conductor is attached to the same, so that in the case of an article which is made of non-conducting material—such, for instance, as a wooden form—the deposition begins to take place on the portion of the article nearest the conductor and gradually spreads until the entire surface is covered. By reason of this fact in the case of a large article not only does it take a long time to completely cover the article; but the coating applied is much thicker in some parts than others. By overlaying the surface with fine wires, as above described, however, deposition begins along each wire and spreading out from the same soon covers the entire surface, thereby not only greatly shortening the process of plating but enabling, the coating to be applied with a much greater degree of uniformity than heretofore.

Upon the removal of the electroplated form from the bath it will be found that the metal deposited over the wires forms a series of ridges on the surface of the metal coating; but these ridges are removed by grinding or otherwise in the same manner that other inequalities are removed in smoothing and polishing the coating as common heretofore.

In the accompanying drawings I have shown an article as it appears during the several steps or operations of my process.

In said drawings, Figure 1 is a side view, partly in section, of a wooden form or base for forming a baluster. Fig. 2 is a side view of the same after being treated in accordance with my process and preparatory to being placed in the electroplating-bath. Fig. 3 is a longitudinal sectional view, on an enlarged scale, of a portion of a baluster after having the metal layer or coating applied thereto.

Fig. 4 is a similar view, partly in side elevation, of the finished article.

As illustrated in Fig. 1, A indicates the form, which is turned in the manner illustrated or otherwise brought to the desired shape, such form being preferably made of hard wood and given a smooth finish. The form illustrated is that of a turned spindle or baluster.

C C are metal screw-eyes, which are conveniently inserted in opposite ends of the wooden form, for the purpose of connecting with the same a wire or metal conductor by which the form is suspended in the bath of the electroplating apparatus, and by means of which the electric current is conveyed to the form.

I have found that the best results are produced by employing perfectly-dry wood for making the form, in order that the wood may be thoroughly saturated or permeated with the paraffine, and for this purpose I not only employ kiln-dried lumber, but I subject the form, after it has been shaped and finished, to a temperature sufficiently high to dry off all moisture, and I insert the form in a bath of melted paraffine when said form is taken from the heating apparatus, so that the latter is in condition most favorable for the entrance to its pores of the melted paraffine.

I have found in practice that by suitably heating and drying the wooden form the metal paraffine permeates the same throughout.

After the form A has been saturated with the paraffine in the manner described, and removed from the paraffine bath, it is allowed to cool and is then placed in a bath of the same character as that which is afterward employed in electroplating the same form—as, for instance, if the coating is to be of copper and a bath consisting of a saturated solution of sulphate of copper is employed in plating, the form will be immersed in a bath of the saturated solution of sulphate of copper. The form is allowed to remain in such bath a short time only, the object of this treatment being merely to saturate with sulphate of copper the exterior pores or interstices of the wood which are not completely filled by the paraffine. When a saturated solution of the plating material is used, as will ordinarily be the case, the surface of the form will contain a very slight coating of the crystallized material.

The treatment of the wooden form by soaking in the electroplating-bath appears to have the effect of filling the pores of the wood which would otherwise be filled by the entrance of the liquid of the bath in case of a break or rupture of the water-proof coating of the form at the time it is placed in the bath for plating, so that in case there is such a break or rupture in the water-proof coating employed the contact of the bath-liquid with the wooden form has no effect upon the latter.

The form is not usually allowed to become thoroughly dried before the application of the water-proof coating, but the latter is immediately applied thereto, so that while the water will quickly evaporate from the surface of the form, thereby leaving the same covered with a slight coating of the crystallized plating solution, (over which varnish or other water-proof coating may be applied without difficulty,) the interstices or pores of the wood remain filled with the solution, either in a crystallized or liquid state, or both, thereby preventing the solution from afterward penetrating such interstices or pores, with the result of expanding the form. In other words, the wood is expanded or swelled by being immersed in the solution, and not being dried before the water-proof coating is applied, no further expansion can take place during the plating operation.

I have found that when the form is treated with paraffine and then varnished with copal or given a surface of other water-proof substance before immersion in the bath the liquid of the bath is liable to find access to the surface of the wood and to expand or swell the same during the process of plating, so that the metal coating becomes cracked or split before it is thick or strong enough to withstand the expansion of the wood, and in practical work I have found that a large percentage of articles thus treated with paraffine and varnish alone are injured by the splitting of the metal coating in this manner. By soaking the wooden form after it is saturated with paraffine, but before varnishing, in the same solution as that composing the electroplating-bath, however, these results are entirely avoided and perfect results are in every instance obtained.

After treatment of the articles by immersion in the bath-liquid, as described, the form is then covered or coated with copal varnish or other water-proof substance. For small articles—such as ornamental spindles, slender balusters, and other small objects—the employment of copal varnish is sufficient; but in many of these articles it may be found desirable to coat those parts of the article at which the end of the grain of the wood is exposed with a solution of gutta-percha and naphtha or other heavy and impervious waterproofing substance, it being entirely obvious that the parts of the form at which the end of the grain of the wood is exposed are most likely to be entered by the liquid of the bath. In the case of larger articles it may be found desirable to coat the entire surface of the same with gutta-percha dissolved in naptha or other substance, giving a more solid and heavier coating than that afforded by copal varnish alone. After treatment with water-proof coating, as described, the form is then overlaid with fine wire, preferably by wrapping or coiling a wire spirally about the same, as indicated by B B. Commonly for this purpose the article will be placed in a lathe and revolved and the wire

wrapped around the same as it is rotated. When the form is provided at its ends with metal screw-eyes C, as shown, the wire B will be attached to the screw-eye at one end and at the beginning of the winding operation and will be fastened at the opposite end of the form by being wrapped about the other screw-eye, thereby establishing electric connection between both screw-eyes and the entire length of the wire B. In whatever manner the wire is disposed, however, it must be connected with the metal wires or conductors which afford passage for the electric current in plating. The size of the wire employed is immaterial, but it may be very fine, and preferably is so, in order that it may be easily applied to the surface of the form and will project slightly above the same. I have found it desirable to wrap the wire about the form before the varnish or other water-proof coating thereon has dried or become hard, so that the wire will adhere to or slightly sink into the surface of the varnish or coating, and will thereby be held in place and prevented from slipping off of the rounded or projecting parts of the form, it being obvious that it will be somewhat difficult to wrap the wire closely and tightly about an article of irregular shape without the wire slipping on the rounded, conical, or projecting parts of the form, and thereby becoming loose and getting out of place. By employing fine and flexible wire and applying the same while the coating or varnish is soft the disposal of the wire over the surface of the form can be easily and quickly accomplished by unskilled workmen.

After the form has been wrapped with wire the same is covered with a coating of graphite or other conducting material, as common heretofor in electroplating non-metallic substances. It is found that in electroplating large objects, when covered with a thin coating of graphite, as common heretofore, the deposition of the metal takes place very slowly, beginning at the points where the electric conductors are attached to the article and gradually spreading over the same until those parts of the surface most remote from the conductors are covered. In electroplating a large object, therefore—such as a newel-post for a stairway—a long time is required to procure a sufficient thickness of metal, while the parts of the article nearest the conductors receive a coating much thicker than is needed. When the surface of the article is overlaid with fine wire connected with the conductors, however, the deposition of the metal begins simultaneously throughout the entire length of the small wire, and spreading laterally therefrom soon meets in the space between the wires, and thus covers the entire surface of the form in a short time. The deposition of metal is thus caused to take place with practical uniformity over the entire surface of the form, so that the time required for plating is much reduced, while the resulting coating is practically uniform in thickness.

Fig. 3 shows the wooden form after the coating D has been applied thereto and illustrates the manner in which the metal is deposited over the fine wires, thereby forming narrow ridges on the exterior surface of the coating. These ridges are, however, removed in the subsequent smoothing or polishing of the article in the manner clearly shown in Fig. 4. When the coating is of considerable thickness and the wire is very fine, the said wires will be embedded in the metal coating or shell D, as illustrated in Fig. 4. It is, however, not necessary that the metal coating should be thicker than the wires, and in some instances the coating will be removed in smoothing or polishing, so as to cut into or expose the wires. This will make no difference in the general result, however, inasmuch as the wires may be made of the same metal as the electro-deposit coating, in which case they will not be visible, or if they are of a slightly-different color the oxidization or other treatment of the surface of the metal coating commonly employed in finishing ornamental articles will prevent the wires from being seen.

Commonly in carrying out the process above described the wooden form will first be covered with a relatively-thick coating of copper, and after this coating has been smoothed and polished a final coating of nickel, silver, bronze, or other metal will be applied to give a suitable exterior finish to the same.

As a separate improvement without restriction to the other steps, my invention consists in the process of electroplating articles composed of non-metallic material, which embraces the step of overlaying such article with wire connected with the electric conductors in the manner described for the purpose of facilitating the deposition of the metal thereon, it being entirely obvious that the use of wire or wires in the manner described is applicable to substances other than wood, and that as far as the use of wire is concerned wooden articles may be rendered water-proof otherwise than in the particular manner herein described, and that articles other than wood may not require any treatment to make them water-proof, or if they do require such treatment they may be rendered water-proof otherwise than in the particular manner herein described.

The invention comprises as another separate improvement the process herein set forth, by which a wooden form may be protected from the action of the electroplating-bath on the wood, it being obvious that this step can be used without restriction to the use of paraffine for saturating the wood, the wire, or the coating of water-proof material, for the reason that such treatment of the wood may sometimes be employed on articles so small that their use will not be necessary or of

practical benefit. But it is to be understood that the foregoing steps can be used separately as well as collectively in connection with the process of protecting the wood from the action of the electroplating-bath. For instance, the saturation of the wood with paraffine only, or the coating of the same with a water-proof material only, or both, may be used with the step of treating with the bath-liquid to protect the wood against the action of the bath in electroplating, according to the size or shape of the article, the character of the wood, and other circumstances.

I claim as my invention—

1. The process of coating non-metallic articles with metal, which includes the overlaying of the surface of the same with metallic strands or wires connected in the electric circuit of the electroplating apparatus and afterward electroplating the article.

2. The process of coating articles of wood with metal, which includes the steps of applying to the surface of the same a liquid similar to that used in the electroplating-bath, coating the same with an electric conducting material, and finally electroplating the article.

3. The process of coating articles of wood with metal, which includes the steps of saturating the wooden article with paraffine, applying to the surface of the same a liquid similar to that used in the electroplating-bath, coating the same with an electric conducting material, and finally electroplating the article.

4. The process of coating articles of wood with metal, which includes the steps of applying to the surface of the same a liquid similar to that used in the electroplating-bath, coating the same with water-proof material, coating the same with an electric conducting material, and finally electroplating the article.

5. The process of coating articles of wood with metal, which includes the steps of saturating the wooden article with paraffine, applying to the surface of the same a liquid similar to that used in the electroplating-bath, coating the same with water-proof material, coating the same with an electric conducting material, and finally electroplating the article.

6. The process of coating articles of wood with metal, which includes the steps of saturating the wooden article with paraffine, applying to the surface of the same a liquid similar to that used in the electroplating-bath, coating the same with water-proof material and overlaying the surface of the same with metallic strands or wires, and finally electroplating the same.

7. The process of coating articles of wood with metal, which includes the steps of heating the wooden articles, immersing the same while heated in hot melted paraffine, applying to the surface of the same a liquid similar to that used in the electroplating-bath, coating the same with water-proof material, overlaying the surface of the same with metallic strands or wires, applying a coating of graphite or other conducting material, and finally electroplating the article.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

WILLIAM H. WINSLOW.

Witnesses:
C. CLARENCE POOLE,
HARRY COBB KENNEDY.