

# UNITED STATES PATENT OFFICE.

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PROCESS OF PRODUCING NITRO-CELLULOSE OR CELLULOID SURFACES.

SPECIFICATION forming part of Letters Patent No. 490,195, dated January 17, 1893.

Application filed February 28, 1890. Serial No. 342,133. (No specimens.)

*To all whom it may concern:*

Be it known that I, BYRON BENJAMIN GOLDSMITH, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in the Process of Producing Nitro-Cellulose or Celluloid Surfaces, of which the following is a specification.

My invention has reference to a new method of producing a gloss or finish upon articles of wood, or of other similar absorbent material, and while the same is more especially adapted for finishing small articles, such as brush and umbrella handles, smoking-pipe bowls, and other light, small and variously shaped articles, it is also applicable to larger articles made of wood, or other absorbent material, such as tables, chairs, book cases, and other kind of furniture.

Prior to my invention the production of the gloss or finish upon wooden articles by varnish was attended by considerable difficulties, and uncertainty of result; it required the exercise of trained judgment on the part of the operator and frequently the use of complicated machinery.

The general procedure in varnishing wooden surfaces and the phenomena incidental thereto are as follows: In a great number of cases the varnish is applied to the wooden surface before the same has been particularly prepared for the reception of the varnish. In such cases the first few coats of the varnishes in general use produce very little effect, so far as the gloss is concerned; the reason for it being that the varnish is absorbed by the wood, or as it is technically called, it sinks into the wood, very little of it remaining on the surface. The appearance of the article at this stage is rough and fibrous, generally dull, with small irregular patches, having a slight gloss. The wood is, as a rule, considerably and irregularly darkened greatly differing from the natural color of the wood, the peculiar ornamental characteristics of which are thus obliterated or disfigured; the fibers are raised by the varnish and give to the surface a woolly or cellular appearance. Any number of additional coats of varnish which may now be applied, does not remedy this defect, since, while by the same the gloss is

heightened, the fibrous, woolly or cellular appearance is only partly covered up, while the darkening of the wood cannot be remedied at all. With a view, however of rendering the appearance of the article smooth and the gloss as uniform as possible, the article is, before the application of additional coats of varnish, carefully smoothed either by pumice stone or by sand paper or by some other abrading agent. After this, the additional coats of varnish remain practically on the surface and give to the article the high gloss required. As a rule the sand-papering, or other abrading process has to be resorted to a number of times between several layers of varnish, in order to secure the best results, and after the final layer of varnish the latter is burnished or polished to secure the required uniformity and brilliancy of gloss. Thus it will be seen that by the old process of varnishing, a great number of layers of ordinary varnish have to be applied, several sand-papering or other abrading processes have to be resorted to, and hand or machine polishing has to be practiced in order to secure a high and uniform gloss; but notwithstanding all this, the darkening of the natural color of the wood and therefore the obliteration of the natural ornamental characteristics of the same cannot be avoided. By this old process, during the drying of the first layers of varnish in heated chambers, there is also observed the phenomenon which is known as the "foaming" of the varnish, which is the exudation of air from the wood, and the evaporation of the solvent from the first coats of varnish, and by which the outer varnish layers become more or less blistered or honeycombed.

Sometimes the wood is prepared for the reception of the first coats of varnish by the application of what is known as a wood filler, and such wood filler, while it partly prevents the absorption of the varnish by the wood, and consequently effects a slight saving of the amount of varnish used, does not prevent the raising of the fiber. In either case, however, a great number of coats of varnish must be used, and a great number of sand-papering operations have to be gone through in order to obtain the best results, and in most cases the final burnishing or polishing cannot be dispensed with; and it is well known, that



the highly ornamental effect of genuine Japan work is due to the great number of varnishings and sand-paperings.

It will be readily understood that for cheap articles this practice is prohibitory on account of the cost of the great amount of varnish consumed, and on account of the great amount of skilled labor required.

It is the object of my invention to overcome these difficulties and objections both as to the expense of the process and as to the results obtained, and I overcome these objections and secure an exceedingly high gloss, and preserve the natural color and grain of wooden articles, by producing upon the wooden surface a skin of pyroxyline, or of a compound of pyroxyline with resin or resins, before the varnish used for producing the gloss is applied; and I produce such skin, which is in the nature of, although not exactly a wood filler, by applying upon the wooden surfaces, one or more coats of a varnish containing pyroxyline, which when dry, leaves upon the surface of the wood an exceedingly thin and hard transparent film of pyroxyline or pyroxyline compound, without raising the fiber, without discoloring, and especially without darkening the wood. On the contrary, the application of a varnish containing a sufficient quantity of pyroxyline, upon wood instead of raising the fiber, depresses the same during the drying of the varnish and consequent contraction of the pyroxyline skin, so that after the application of a coat or coats of pyroxyline varnish, the surface of the wood is even smoother than before the application of that varnish. In this condition the wood surface has no perceptible gloss, but appears to the eye nearly as dull, and has exactly the same color as before the varnishing. This last feature is owing to the fact that pyroxyline does not sink into the wood, but remains practically on the surface, protecting the same against the attack of other varnishes, which may now be applied without in any way or manner disturbing the fiber, which it cannot now reach.

The characteristic of pyroxyline in solution to remain on the surface of articles of wood or of other absorbent material, that is to say, the characteristic not to sink into the pores and not to raise the fiber, I have found by experiment to be a reality; I have convinced myself of this by the fact that when perfectly dry the coat of pyroxyline can be peeled off as a very smooth film, while if it had entered the pores it could either not be peeled off at all, or, if peeled off it would necessarily be rough in appearance, since it would in that case have followed and adapted itself to the irregularities of the pores.

It will now be understood that the first step in my novel process of varnishing articles of wood or of other absorbent material, is the application upon the bare surface of the wood of a coat or coats of pyroxyline varnish; and while the best results are obtained by using

varnish containing only pyroxyline dissolved in any one of its known solvents, such as ether and alcohol or amyl acetate, or in benzine and alcohol, I have found that an addition of small quantities of resin does not destroy the property of the pyroxyline to lay down the fiber, and in fact it adds a little gloss, which in the case of pyroxyline pure and simple is almost imperceptible. It will therefore be understood that when speaking of pyroxyline varnish, I mean to comprise by that term varnishes containing pyroxyline in considerable quantities; nor am I confined to the use of the solvents above enumerated. Thus, pyroxyline may be dissolved in alcohol and camphor, and other well known solvents may be used. The drying of the coat of pyroxyline varnish may be allowed to take place at ordinary temperatures and without the use of artificially heated drying chambers, and the solvents used being highly volatile, the first coat or coats will be found to be perfectly dry within a couple of hours.

The second step in my improved process is to apply upon the article one or more coats of resin varnish, which is now absolutely prevented from sinking into the wood, and flows upon the pyroxyline surface as upon metal, giving an exceedingly high gloss to the article and adhering very tenaciously to the same; since the ordinary solvents of resin only very slightly attack the pyroxyline. I may use any ordinary or preferred resin varnish, and I may apply one or more coats of the same, without sand-papering or pumicing, either the pyroxyline surface or any of the superimposed layers of resin. A single coat of resin varnish gives very brilliant effects, but one or more additional coats may be applied, whereby the gloss is slightly heightened; in most cases a single coat of resin varnish is all sufficient, and I have found that the base of pyroxyline prevents the escape of air from the wood through the resin varnish, and consequently the formation of blisters upon the same, even when it is dried at a comparatively high temperature.

If my process is stopped at this stage the immediate results obtained are very brilliant; but I have found by experience, that articles, the exposed surfaces of which are resin, become easily scratched and disfigured by handling and when packed together for shipment and sale, in hot weather, the surfaces become softened and frequently stick together, rendering the article unsalable. By reason of the softening of resins in hot weather, or when artificially heated, as is the case with smoking pipe bowls, or when the articles are used in heated rooms, they receive and retain the impression of objects with which they come in contact, and thus become dull and disfigured.

Another great disadvantage of an exposed resin surface is that it is injuriously affected by the moisture, the carbonic acid and the ammonia of the atmosphere, whereby most



resins become partially saponified, so that in course of time the surfaces become dull and unsightly, and even articles which are not ordinarily handled, as stationary pieces of furniture, lose their gloss within a short time of exposure, and have to be re-varnished, as is well known. These defects are overcome by a third step of my process, which consists in the application of a coat of pyroxyline varnish upon the resin varnish. By this, the gloss of the resin varnish is not affected, and the hard outer skin of pyroxyline effectually prevents scratching and sticking, and protects the resin from the deteriorating effects of the atmosphere. It is preserved with its original brilliancy between two impermeable skins of pyroxyline an indefinite time, both against chemical attack from its absorbent base and from the atmosphere, and against mechanical injury by handling.

By my improved process, therefore, the article receives upon its surface: First—a layer or layers of pyroxyline. Second—a layer or layers of resin, and if desirable, third—a layer of pyroxyline.

I am aware that pyroxyline varnish has been used for coating articles, and more especially, articles of metal; but when used on wood, or other absorbent material, it was so used, mainly for the purpose of water-proofing. I do not therefore, lay claim to the coating of wooden articles with pyroxyline, since my invention has only reference to the preparation of such articles with pyroxyline or pyroxyline compounds for the application thereto of further coats of a varnish containing resin. One or more coats of pyroxyline directly applied upon wood, in order to have a gloss, must be buffed and burnished, and this buffing and burnishing I can dispense with. It will therefore be understood that the high luster of the articles treated by my process, is not due to the pyroxyline varnish by itself, but is due to the resin varnish, superimposed upon the pyroxyline varnish.

I have above explained that the pyroxyline varnish used may contain a slight admixture of resin, and I have found that, similarly, the resin varnish used may contain a slight admixture of pyroxyline. It is therefore within the scope of my invention to coat wooden articles, with varnishes which contain both pyroxyline and resin; with this restriction, that the first varnish applied contains more pyroxyline than resin, in order that the all important effect of compression of the fiber be secured. The succeeding coats may then contain pyroxyline in gradually diminishing

proportions, and resin in gradually increasing proportions, until the desired gloss is obtained. After this, a single coat of a varnish containing pyroxyline alone, or containing pyroxyline in excess may be applied; or in place of this, a number of succeeding coats with gradually increasing proportions of pyroxyline may be used. All these changes and variations come within the scope of my invention, the fundamental idea of which is to apply to the bare surface of the wood a coat of varnish rich in pyroxyline, in order to lay down the fiber and prevent the sinking into the wood of the superimposed layers of gloss giving varnish.

If I do not wish to preserve the natural color of the wood, I can tint or color the varnishes with aniline or mineral color, and if I desire to use aniline dyes, I can apply the first pyroxyline coat colorless, and after the same has dried, I immerse the article momentarily in an aniline dye, which color then fixes itself upon the pyroxyline.

I claim as my invention and desire to secure by Letters Patent:

1. The process of finishing articles of wood or of other absorbent material which consists in first producing upon the same a coat or coats of varnish containing pyroxyline or pyroxyline compound and then producing upon this coat or coats a layer or layers of varnish containing resin, substantially as described.

2. The process of finishing articles of wood or other absorbent material which consists in first producing upon the same a coat or coats of varnish containing pyroxyline or pyroxyline compound; then producing upon this coat or coats a layer or layers of varnish containing resin, and finally superimposing over the resin varnish a layer of varnish containing pyroxyline or pyroxyline compound, substantially as described.

3. The process of finishing articles of wood, or other absorbent material which consists in producing upon the same a series of coats of varnish containing gradually diminished quantities of pyroxyline and gradually increased quantities of resin, and finally superimposing upon these coats one or more coats of a varnish containing pyroxyline in excess, substantially as described.

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

BYRON BENJAMIN GOLDSMITH.

Witnesses:

ROBT. B. BACH,

SAM. J. RECKENDORFER.