

# UNITED STATES PATENT OFFICE.

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## MANUFACTURING CELLULOSE PRODUCTS.

No. 839,825.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that we, EDUARD ECK, of Gross-Anheim, and ERNST BECHTEL, of Hanau, Germany, subjects of the German Emperor, have invented certain new and useful Improvements in Manufacturing Cellulose Products, of which the following is a specification.

Our invention relates to a new method of manufacturing cellulose products—such as filaments, films, rods, bars, strips, or plates—which are intended to replace celluloid products, to which they are far superior.

The new method utilizes the known property of the cellulose to dissolve in a solution of ammonia copper and to furnish on becoming torpid solid products, which are more or less strong or durable. Hitherto this property has been made use of only for the manufacture of filaments, which are more or less fine according to their purpose.

The new method is founded upon our discovery that cellulose products, be it filaments or other objects, will offer a considerably larger resistance to tensile strength and other external influences than hitherto if no endeavors are made to accelerate as much as possible the coagulation of the liquid cellulose; but ample time is allowed for its coagulation and only care is taken to maintain the form of the cellulose after leaving the mouth of the press.

Our new method is as follows: A solution of cellulose with ammoniureted cupric oxid is caused by a hydrostatic pressure to issue from an opening the cross area of which is a little larger than that of the product to be produced. The rope or mass of liquid cellulose leaving the opening is at once conducted through a solution of an alkali (for example, caustic soda) of about 30° Baumé, and it is important that this solution be maintained on a temperature of about 40° centigrade. By the contact between the rope or mass of liquid cellulose and the alkali solution a film is formed on the rope or mass of cellulose, and care must be taken that this film be only just so strong as to prevent the rope or mass from changing its shape. The heating of the lye up to the said temperature is necessary, for the reason that the said film must possess a certain flexibility, which would not be the case if the lye were cold, since the

latter would render the said film brittle and produce fissures or cracks through which the still liquid contents of the rope or mass would escape. The so-formed rope with liquid core is wound up on a reel or the like, if this is possible, while thicker ropes—such as rods or bars, strips, and the like—are conducted over tables, which are preferably made of glass, and the ropes are then left alone for about an hour, so that the cellulose will coagulate and consolidate. During the passage of the rope or mass of cellulose through the solution of caustic soda the intimate combination of the cellulose with the ammoniureted cupric oxid will be loosened, it is true, but not to such a degree as to cause a local division of the two components, which is not permissible, since the presence of the ammoniureted cupric oxid is essential for promoting the coagulation of the cellulose. The solid rope is then unwound from the reel or removed from the table and is treated for about a quarter of an hour in a solution of caustic soda to complete the consolidation of the rope or mass, while a further loosening of the combination between the cellulose and the ammoniureted cupric oxid without an actual local division of both is effected. The rope taken out of the lye is still blue and is at last placed in or passed through acidulated water for about ten minutes to completely decolorize it. On leaving the bath of acidulated water the product will be as glossy and transparent as glass. If the product is a filament or the like, it will also possess a tensile strength which is far superior to that of filaments produced by the known methods.

The new method renders it also possible to produce moderately-thick blocks or plates which can be easily cut up into thinner rods or bars, strips, or plates. Such cellulose products are superior to celluloid products in that they are perfectly fireproof.

The method may be varied without deviating from the spirit of our invention.

We claim—

1. The process of manufacturing cellulose products, which consists in passing a solution of cellulose with ammoniureted cupric oxid through an opening of a cross-section a little larger than that of the product, conducting the issuing rope or mass through a warm solution of caustic soda to form a film

on the rope or mass, leaving the rope or mass alone for a time to allow the cellulose to coagulate and to consolidate, and finally treating the product in a bath of caustic soda to complete its consolidation.

2. The process of manufacturing cellulose products, which consists in passing a solution of cellulose with ammoniureted cupric oxid through an opening of a cross-section a little larger than that of the product, conducting the issuing rope or mass through a warm solution of caustic soda to form a film on the rope or mass, leaving the rope or mass alone for a time to allow the cellulose to coagulate and to consolidate, treating the rope or mass in a bath of caustic soda to complete its consolidation, and finally subjecting the product to the action of acidulated water to decolorize it.

3. The process of manufacturing cellulose products, which consists in passing a solu-

tion of cellulose with ammoniureted cupric oxid through an opening of a cross-section a little larger than that of a finished block, conducting the issuing block through a warm solution of caustic soda to form a film on the block, leaving the block alone for a time to allow the cellulose to coagulate and to consolidate, treating the block in a bath of caustic soda to complete its consolidation, subjecting the block to the action of acidulated water to decolorize it, and finally cutting the block up into thinner products (rods, strips or plates).

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

EDUARD ECK.

ERNST BECHTEL.

Witnesses:

FRANZ HASSLOUHER.

ERWIN DEPPEL.