UNITED STATES PATENT OFFICE.

ERNST MICHAËLIS AND CARL HENNING, OF COTTBUS, PRUSSIA, GERMANY.

PROCESS OF DYEING.

SPECIFICATION forming part of Letters Patent No. 472,267, dated April 5, 1892.

Application filed June 5, 1891. Serial No. 395,261. (No model.) Patented in Germany October 22, 1890, No. 58,124; in England October 29, 1890, No. 17,326; in Austria-Hungary October 31, 1890, No. 7,081 and No. 20,196; in Belgium November 8, 1890, No. 92,642; in France November 10, 1890, No. 209,392, and in Italy May 30, 1891, XXV, 29,808, and LVIII, 325.

To all whom it may concern.

Be it known that we, ERNST MICHAËLIS and CARL HENNING, subjects of the King of Prussia and German Emperor, residing at Cottbus, in the Kingdom of Prussia and German Empire, have invented certain new and useful Improvements in Processes for Dyeing Textile Materials of All Kinds in the Hyposulphite Vat; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Letters Patent have been obtained for this invention in the following countries: in Germany, No. 58,124, dated October 22, 1890; in England, No. 17,326, dated October 29, 1890; in Austria-Hungary, No. 7,081 and No. 20,196, Fol. 41 and 25, Tom. 2,079 and 1,997, dated October 31, 1890; in Belgium, No. 92,642, dated November 8, 1890; in France, No. 209,392, dated November 10, 1890, and in Italy, XXV, 29,808, and LVIII, 325, dated May 30, 1891.

This invention relates to dyeing textile materials with indigo; and it consists in the process hereinafter fully described and claimed.

For practically carrying out this invention the proceeding is as follows: The sodium bisulphite dissolved in water is in the first instance made to act upon zinc, and a portion of the so-called "acid" solution resulting from this reducing process is poured off, and after adding a certain quantity of caustic soda and indigo-white it is introduced into the dye-vat, while the other part of the acid solution is stored for subsequent use. The yarn is then hung upon wooden bars, which are laid upon an iron frame extending across the vat and which are held down upon the same by suitable means, such as by iron bars laid across the wooden bars. The frame carrying the yarn is then lowered uniformly by suitable means until the yarn is completely immersed in the vat, whereupon by a lateral to-and-fro motion of the bars a uniform saturation of the yarn will be effected. When the latter has taken up a sufficient quantity of the dye, the bars with the yarn are withdrawn as rapidly as possible and are at once plunged into oxygenated water, which may have ammonia added to it and which, in order to increase the percentage of oxygen, may also be mixed with a suitable body that will not injure either the dye or the yarn, such as alcohol, ethyl-ether, &c. The separate threads then swell and the water, penetrating uniformly to the interior thereof, converts, by means of its oxygen, the indigo-white into indigo-blue. This process being completed, the yarn may be advantageously passed through a second and even a third vat, through which water is made to flow so as to wash off all salts still adhering to the yarn.

The oxygenated water is obtained in any approved manner—as, for instance, by mixing peroxide of hydrogen with ordinary pure water.

In consequence of the perfectly-uniform oxidation of the indigo-white by means of the oxygenated liquid very large quantities of yarn, &c., can be introduced at the same time into the vat in order to be simultaneously acted upon, which is not possible with the ordinary process of blue coloration by contact with the atmosphere.

If large quantities of yarn or other textile material have been consecutively treated in one and the same vat the vat will have become alkaline to such a degree that in the further use thereof the material would suffer and no uniform useful dyeing could be any longer carried out. There is consequently added to the vat as much of the acid solution (consisting mainly of sodium hyposulphite) which was retained on preparing the vat as will cause the strongly-alkaline reaction of the vat to disappear, and will therefore render the latter again suitable for the production of uniform tints.

The above-described process is applicable to all textile materials in any form with appropriate manipulation.

What we claim is—

1. The process of dyeing textile material, which consists in first immersing the material in a bath consisting of an acid solution formed by treating zinc with sodium bisulphite mixed with caustic soda and indigo, and

then immersing the material in oxygenated water to oxidize the indigo, substantially as set forth.

2. The process of dyeing textile material, which consists in first immersing the material in a bath consisting of an acid solution formed by treating zinc with sodium bisulphite mixed with caustic soda and indigo, and then immersing the material in oxygenated water to which a percentage of ammonia has been added, substantially as and for the purpose set forth.

3. The process of dyeing textile material, which consists in immersing the textile material in separate quantities in a bath consisting of an acid solution formed by treating zinc with sodium bisulphite mixed with caustic soda and indigo, adding to the bath from time to time additional amounts of the said acid solution as additional quantities of textile material are immersed therein, so that the bath may have a uniform alkaline reaction, and immersing each quantity of textile material as it comes from the bath in oxygenated water, whereby the indigo is oxidized, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

ERNST MICHAËLIS.
CARL HENNING.

Witnesses:
MARC M. ROTTEN,
S. HAMBURGER.