

# UNITED STATES PATENT OFFICE.

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## PROCESS OF DYEING.

SPECIFICATION forming part of Letters Patent No. 647,268, dated April 10, 1900.

Application filed July 19, 1899. Serial No. 724,336. (No specimens.)

*To all whom it may concern:*

Be it known that I, FRIEDRICH JUST, a citizen of the Empire of Austria-Hungary, residing at Höchst-on-the-Main, Germany, have  
5 invented certain new and useful Improvements in the Manufacture of Colors Developed by Chromium Compounds on Wool Fiber, of which the following is a specification.

In the process for producing fast colors developed by chromium compounds on wool fiber, forming part of the German Patents Nos. 66,838 and 67,240 and the English Patent No. 9,371, of 1898, I have made an important improvement and have thus opened a  
15 new field to colors developed by chromium compounds in fast wool-dyeing. The process which takes place in producing such colors on the fiber is such that the respective azo-dyestuffs are first dyed in an acid-bath on the  
20 wool fiber, then oxidized by the action of chromic acid, while being transformed simultaneously into the chromium-oxid lakes of the oxidation products are thus formed. With the present mode of working (also described  
25 in the above-cited patents) the transformation into the oxidation products, as well as the formation of their chromium-oxid lakes, is by no means complete. A part of the dyestuff, though small, is fixed on the fiber in an un-  
30 changed condition, as shown, when the fiber is milled and washed by bleeding on white material. I have made the surprising observation, which could not have been foreseen, that a simultaneous addition of reducing  
35 agents—such as lactic acid, lactates, tartaric acid, citric acid and its salts, bisulfite, &c.—to the chromium fluid avoids this drawback.

If woolen yarns, for instance, be dyed with four per cent. of chrome brown, (RO), fifteen  
40 per cent. of Glauber's salt, and three per cent. of sulfuric acid in the usual manner and boiled for one hour, then on adding five per cent. of potassium bichromate, two per cent. of sulfuric acid, and three per cent. of lactic  
45 acid and boiling for another hour a deep brown is obtained exceedingly fast to milling and not liable to bleed. If, however, there is no addition of lactic acid, a brown is obtained which bleeds on the white when the fiber is  
50 strongly milled with soap and still more so when milled with soda. It is consequently

useless for dyeing loose wool, slubbing, or yarns which, besides white or light colors, are employed for milled goods.

An effect similar to that obtained with lactic acid is obtained with tartar, oxalic acid, tartaric acid, citric acid, bisulfite, &c., which, like lactic acid, reduce chromic acid.

In obtaining colors developed by chromium compounds fast to milling it is also of importance that the dye-bath at the time of the oxidizing action of the chromate should give a decidedly-acid reaction. A simultaneous addition of mineral acids with the chromate liberating the chromic acid is therefore indis-  
65 pensable.

It is preferable in some cases, as stated in the second claim of the German Patent No. 66,838, to prepare the bath at the beginning, together with the dyestuff, acid, Glauber's  
70 salt, and chromate. In this case the above-mentioned reducing agents, together with an excess of lactic acid, are only added after the formation of the lake on the fiber is fairly  
75 completed by boiling for about one hour.

The action of the reducing agents upon the fastness of the colors to milling is a remarkable one and may be observed with all colors developed by chromium.

The process may be illustrated by the following examples:

*Example I—Dark brown fast to milling on fifty kilos loose wool.*—The bath is prepared with about one hundred and fifty liters of water, 7.5 kilos of Glauber's salt, 1.5 kilos of  
85 sulfuric acid, and two kilos of chrome brown, (RO.) The wool is introduced at 40° centigrade, brought to boil within half an hour, and boiled for one hour. Then the bath is somewhat cooled. The solution of 2.5 kilos  
90 of potassium bichromate, one kilo of sulfuric acid, and 1.25 of lactic acid is added, and the brown is developed by boiling for about one hour.

*Example II—Black upon fifty kilos of cheviot yarn.*—The bath is prepared with about two hundred of liters of water, ten kilos of Glauber's salt, two kilos of sulfuric acid, and two thousand seven hundred and fifty kilos of chromotrope S. The yarn is introduced at 40°  
100 centigrade, brought to boil in about one hour, and after boiling one hour 1.25 kilos of tartar

and 1.5 kilos of sulfuric acid are added and the whole is further boiled for about half an hour.

Having now described my invention, what  
5 I claim is—

The process herein described of producing on wool fiber colors developed by chromium compounds, which consists in dyeing the fiber with an azo-dyestuff, oxidizing the same with  
10 chromic acid, and subjecting the dyestuff si-

multaneously to the action of a reducing agent, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

FRIEDRICH JUST.

Witnesses:

CARL JUST,  
FRANK TEDLATD.