

UNITED STATES PATENT OFFICE.

ALVIN FÄHRMANN, OF LUDWIGSHAFEN, GERMANY, ASSIGNOR TO THE
BADISCHE ANILIN AND SODA FABRIK, OF SAME PLACE.

PROCESS OF DYEING TURKEY RED.

SPECIFICATION forming part of Letters Patent No. 661,858, dated November 13, 1900.

Application filed October 18, 1899. Serial No. 733,989. (No specimens.)

To all whom it may concern:

Be it known that I, ALVIN FÄHRMANN, a subject of the King of Saxony, residing at Ludwigshafen-on-the-Rhine, in the Kingdom of Bavaria and Empire of Germany, have invented new and useful Improvements in Dyeing Turkey Red, (for which applications for patents have been filed in England, No. 18,742, dated September 16, 1899, and in Germany, No. B. 25,119, dated July 12, 1899,) of which the following is a specification.

The ultimate object of my invention is a simplified process for dyeing the color called "Turkey red" upon cotton or other vegetable fiber. In arriving at this simplified process I have invented a new composition of matter, which I claim in a separate application for Letters Patent divided from this.

Many attempts have been made to simplify and improve the process of dyeing the color known as "Turkey red;" but the simplest process in general use to-day is still very complicated, expensive, and requires a long time to carry it out. Perhaps the process which is now most generally used is the so-called "new-red" process, which can be carried out in the following manner: After the cotton has been prepared in the usual way by boiling it it is at first thoroughly impregnated with Turkey-red oil. For dark shades this operation is preferably repeated. The goods are then thoroughly dried at a temperature of 60° to 70° centigrade. They are then treated with the mordant solution, acetate or basic sulfate of alumina. After this they are dried once more and then treated with chalk to thoroughly fix the mordant. This is succeeded by a washing operation, and only after this complicated treatment, involving two drying operations, can the dyeing process be begun. The dyeing can be effected in a boiling bath; but if it is desired to obtain the brightest shades it is necessary to dye at a temperature of about 65° centigrade and then to steam the goods under pressure to develop the color. Finally the dyed goods are brightened by boiling with a soap solution, preferably under pressure, whereby the shade is rendered more beautiful and fresh and the

goods are freed from coloring-matter deposited on the surface and from impurities.

The process above sketched is much simpler than the old Turkey-red mordanting and dyeing process; but nevertheless it is very complicated, and the drying operations take a considerable time and render the process expensive.

I have invented a process which is much simpler than that above described. By its use it becomes possible to avoid the following steps of the process above described: First, it is unnecessary to steam the goods to develop or fix the coloring-matter on the fiber; second, the drying operation is unnecessary both after mordanting and after the dyeing operation, and, third, the treatment with chalk to thoroughly fix the mordant, which is essential in the process described, becomes unnecessary.

My new process consists, first, in treating the goods in a special oiling-bath, and I have invented the new composition of matter used in the preparation of this bath. The said new product consists of a definite mixture or combination of castor-oil, caustic soda, stannate of soda, sodium aluminate, and sodium phosphate. If desired, these ingredients or some of them can be supplied to the dyer ready mixed in the proportions I hereinafter set forth, or the dyer may prepare the product in the dye-house itself. Thus, for instance, a mixture of caustic soda, stannate of soda, sodium alluminate, and sodium phosphate in the right proportions, which I have discovered, could be supplied to the dyer and he could in the dye-house effect the boiling of the castor-oil with this new mixture, or the boiled soap mixture could be supplied to the dyer ready for use. After the treatment in my said special oiling-bath the mordanting of the goods is effected in a mordanting-bath which has a strong acid reaction.

The series of operations necessary is rendered essentially simpler, shorter, and cheaper by my invention without, on the other hand, the shades being less beautiful or less intense. The following example will serve to further illustrate the nature of the

invention. In it the best treatment is described for obtaining the desired results, using one hundred pounds of cotton yarn; but of course the proportions employed can be varied without departure from the invention.

Example: The preliminary boiling out of the yarn can be effected in the usual way by heating under pressure for two hours in a solution containing one (1) kilogram calcined soda or one kilogram calcined soda and one-half ($\frac{1}{2}$) kilogram sodium-silicate solution possessing a density of forty (40°) degrees Baumé. After this boiling-out treatment the goods are swilled and freed from the excess of water in a centrifugal machine. The next operation is the treatment in the special oiling-bath according to this invention. For this purpose make the following composition of matter: piled fourteen (14) kilograms of caustic soda, twenty-five (25) kilograms of sodium stannate, fifteen (15) kilograms of sodium aluminate, (commercial,) and ten (10) kilograms of sodium phosphate. This mixture constitutes the new composition of matter with which the castor-oil is treated according to my invention. For this purpose dissolve the said mixture in two hundred (200) liters of boiling water. Then add one hundred (100) kilograms of castor-oil and boil until the oil is completely saponified. In this way what may be called a "new" castor-oil soap which I have invented is prepared. In order to use this in my new oiling and mordanting process, I prepare a stock solution by diluting that obtained as above described, so as to make up the mixture to eight hundred and fifty (850) liters. If the mixture has been rightly prepared and the operations have proceeded properly, the oiling solution thus obtained should show a density of ten (10°) degrees Baumé. The oiling can be effected in a small vat with a broad rim or a machine can be used in which the goods are passed through the solution. It is recommended that about two pounds of cotton should be treated simultaneously with six liters of the oiling solution obtained as above described and two liters of water, which must be as free from chalk as well may be. For every further two pounds of yarn one-half ($\frac{1}{2}$) liter of oiling solution is added. After passing the goods a second time through the solution the yarn is thoroughly and evenly wrung out and dried at about sixty (60°) to seventy (70°) degrees centigrade. The next operation is the actual mordanting. For this purpose dissolve forty (40) kilograms of sulfate of alumina in two hundred and forty (240) liters of boiling water. Run off the clear solution from any sediment. The solution obtained should show a density of about twelve (12°) degrees Baumé. Immediately before using add about six and four-tenths (6.4) kilograms ammonium chlorid and five and one-fifth (5.2) kilograms of sulfate of magnesium dissolved in one hundred and twenty (120) liters of boiling water. The mordanting solution that is obtained should

show a density of about seven (7°) degrees Baumé. The yarn is again preferably treated in proportions of two pounds at a time and either in a small vat with a broad rim or with the aid of a machine for passing the goods through the solution. The mordanting solution is maintained at a temperature of about thirty-five to forty (35° to 40°) degrees centigrade, and at first twelve liters of the solution are used. For each successive two pounds of yarn three-quarters ($\frac{3}{4}$) of a liter more mordanting solution is added. The goods are passed once through the solution and are then washed until the wash-water no longer shows an acid reaction.

As aforesaid, the proportion of the ingredients used in the various operations according to this invention can be varied. In this actual mordanting operation it is essential that the bath should have a distinctly acid reaction, which is not the case in the mordanting-baths as usually employed. The addition of the sulfate of magnesium is not absolutely necessary, but I find that it has the effect of rendering it easier to obtain uniform shades.

The actual dyeing operation is effected as follows: The dyeing-vat is prepared with from eight (8) to ten (10) per cent. of alizarin paste containing twenty (20) per cent. alizarin. To this is added from one (1) to one and a half ($1\frac{1}{2}$) per cent. solid acetate of lime dissolved in water. The quantity of this substance used is regulated according to the hardness of the water. The mordanted yarn without being dried is entered into this dyeing-bath and treated therein for about a quarter ($\frac{1}{4}$) of an hour at the ordinary temperature. After this the bath is gradually heated, so that in about three-quarters ($\frac{3}{4}$) of an hour it boils and the boiling is continued for from one (1) to one and a half ($1\frac{1}{2}$) hours. Finally the goods are well swilled. The next operation of "brightening" can either be effected in an open vat or in a closed apparatus under pressure. The water to be used is boiled with from two (2) to four (4) kilograms of calcined soda to every one thousand (1,000) liters, the quantity of soda being chosen according to the hardness of the water. Remove the scum that forms. Add an emulsion of five (5) kilograms tournant oil and two and a half ($2\frac{1}{2}$) kilograms of soap and one (1) kilogram of potato-starch. The soap and potato-starch are each separately mixed or dissolved in hot water, and then the oil is added. Enter the yarn into this solution and treat for from one (1) to one and a half ($1\frac{1}{2}$) hours, preferably under pressure of one atmosphere. Wash the goods well and dry.

Now what I claim is—

The new process for dyeing Turkey red on vegetable fiber consisting first in boiling out the goods in the usual way, then oiling in a bath containing a castor-oil soap composed of castor-oil, caustic soda, sodium stannate, sodium aluminate, and sodium phosphate, then

thoroughly wringing out and drying, then
mordanting in a bath possessing an acid re-
action and containing sulfate of alumina, am-
monium chlorid, and sulfate of magnesium,
5 washing the goods until the wash-water no
longer shows an acid reaction, and then, with-
out drying, dyeing in a bath containing aliza-
rin paste and acetate of lime, swelling thor-
oughly and finally, without drying brighten-
10 ing by treating with an aqueous solution or

mixture containing tournant oil, soap and po-
tato-starch, all substantially as described.

In testimony whereof I have hereunto set
my hand in the presence of two subscribing
witnesses.

ALVIN FÄHRMANN.

Witnesses:

ERNEST F. EHRHARDT,
BERNHARD C. HESSE.

Correction in Letters Patent No. 661,858.

It is hereby certified that in Letters Patent No. 661,858, granted November 13, 1900, upon the application of Alvin Fährmann, of Ludwigshafen, Germany, for an improvement in "Processes of Dyeing Turkey Red," an error appears in the printed specification requiring correction, as follows: In line 19, page 2, the word "pied" should be stricken out; and that the said Letters Patent should be read with this correction, therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 1st day of January, A. D., 1901.

[SEAL.]

F. L. CAMPBELL,
Assistant Secretary of the Interior.

Countersigned:

C. H. DUELL,
Commissioner of Patents.