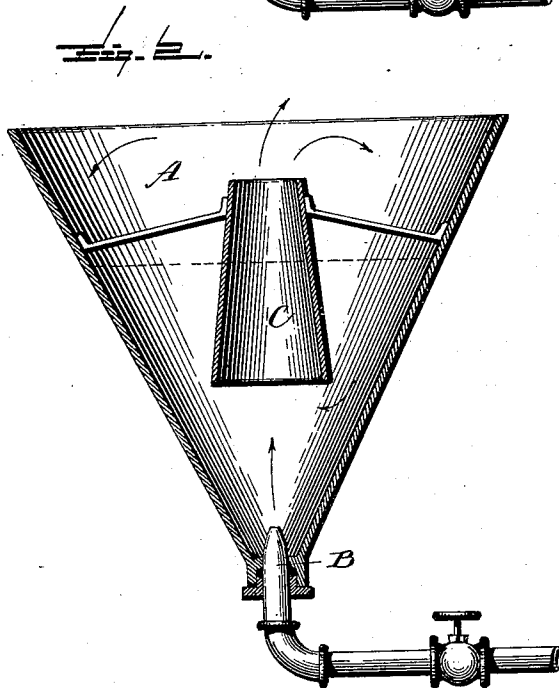
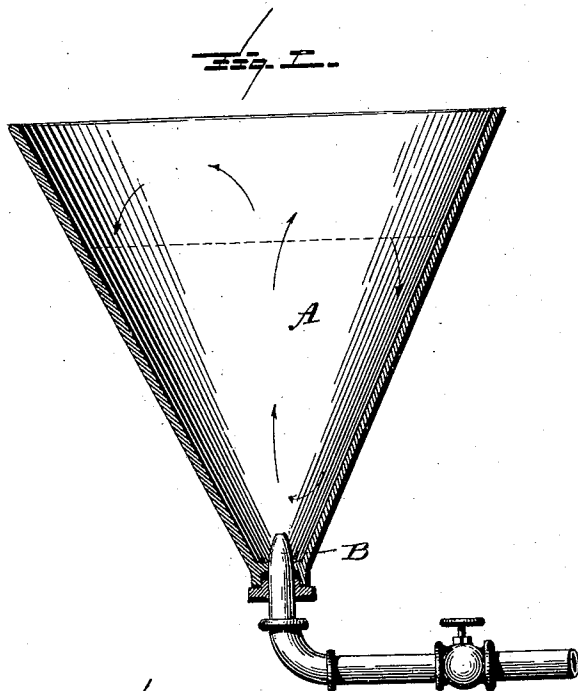


(No Model.)

J. A. YOUNG.  
ART OF DYEING WOOL.

No. 475,229.

Patented May 17, 1892.



Witnesses:  
*L. C. Mills*  
*Edwards*

Inventor  
*James A. Young*  
by *Marshall Baker*  
his Attorney

# UNITED STATES PATENT OFFICE.

JAMES A. YOUNG, OF BOSTON, MASSACHUSETTS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE YOUNG COLORING COMPANY, OF SAME PLACE.

## ART OF DYEING WOOL.

SPECIFICATION forming part of Letters Patent No. 475,229, dated May 17, 1892.

Application filed December 27, 1890. Renewed August 22, 1891. Serial No. 403,407. (No specimens.)

*To all whom it may concern:*

Be it known that I, JAMES A. YOUNG, of Boston, in the State of Massachusetts, have invented a certain new and useful Improvement in the Art of Dyeing Wool and other Substances, of which the following is a specification.

The improvement which I have invented is applicable to the dyeing of wool, felt hats, either of wool or of fur, ramie fiber, and other substances and materials which are to be kept in agitation while being dyed. It was formerly the practice in the dyeing of felt or fur hats, for example, to tack each hat on a block, then to immerse the blocked hat in the dye-liquor for a certain length of time and then to take the hat out and air it, or, in other words, expose it to the action of air in order to develop and set the color. More recently it has become the practice to dispense with the blocking of the hats and to put them unblocked into the dye-liquor, the liquor and goods being constantly stirred by the workman in order to prevent the goods from packing together and also to expose all parts of the goods as far as possible to the action of the liquor. For this purpose the workman uses a paddle or large fork with which he occasionally raises the goods above the surface of the liquor in order to give them the needed exposure to the action of the air. The process which I employ not only stirs and agitates the stock under treatment, but it supplies to the dye-liquor and the goods the oxygen which is constantly being taken up while the dyeing operation is going on.

In carrying out my invention I place the stock to be dyed in the dye-liquor and then inject into the dye-liquor from below air heated to the proper degree (the usual heat in the dye-kettle is about 190° Fahrenheit) and under a pressure (say from four to twelve atmospheres) sufficient to keep the goods and liquor in continual movement, and, if need be, to throw the goods up into the atmosphere above the surface of the liquor in case very rapid oxidation is required.

In the accompanying drawings I have represented, to a great extent diagrammatically, in Figure 1 an apparatus for carrying out the process, and in Fig. 2 a slightly-modified form

of apparatus which can be used with good results in cases where it is desired to throw the stock itself above the surface of the dye-liquor.

In Fig. 1, A is a kettle of conical form, widest at the top and thence tapering to the bottom, with a nozzle B at the bottom which is in communication with a source of compressed-air supply.

Vegetable fibers can stand without deterioration a higher degree of heat than animal fibers, and in the case of felt hats, for example, the hats before the dyeing operation are sized with a size which will dissolve and leave the goods at a temperature of about 195° Fahrenheit. It is requisite, therefore, to subject fibers of the kind last referred to to a moderate heat only—say not more than 190° Fahrenheit. It is not possible, therefore, to use steam for carrying out the process, because steam at the pressure requisite for the purposes I have in view is so hot that woolen and other animal fibers will be injured materially. I therefore use compressed air, not only because I can obtain with it the oxidizing action needed, but because I can regulate its heat independently of its pressure, so that at whatever pressure it may be injected I can have it heated just to the extent needed to keep the dye-liquor at the proper temperature.

In practicing my invention the goods are placed in the dye-kettle with the proper quantity of dye-liquor and then the heated compressed air is turned on. This air issues as a jet with great force from the nozzle and passes up through the dye-liquor, carrying before it such goods as may be in its path, both the goods and the liquor being subjected to the action of the air and taking from it the supply of oxygen needed for effective dyeing. The goods carried up by the air finally get beyond the influence of the compressed-air stream and then drop back again to the bottom of the kettle, being directed in their downward course by the converging walls of the kettle to a point where they will again meet the compressed-air jet. In this way both the goods and the dye-liquor are kept in agitation and movement. The jet may readily be of sufficient force to throw the goods up above the surface of the liquor and thus to expose them intermittently to the atmosphere. Where this ac-

tion is desired, a stand-pipe C, Fig. 2, of suitable form can be placed vertically over the nozzle and there held by stays, braces, or other suitable means. This stand-pipe acts in an analogous way to the combining-tube of the ordinary injector for steam-boilers. The jet of compressed air, passing up through the tube with great force and velocity, carries with it the goods, which are ejected from the top of the tube or pipe and then fall back into the liquor, through which they drop back to the bottom of the kettle to be again carried up through the pipe. Apparatus of this kind is not here claimed, but has been made by me the subject of a separate application for Letters Patent, filed December 27, 1890, bearing Serial No. 375,984. The dye-liquor by the action of the compressed air is gradually evaporated; but the loss by evaporation can be supplied from time to time by the workman. In the case of a closed kettle the compressed air can be passed through a condenser, which will recover the moisture, and this water of condensation can be returned to the kettle through the injecting-nozzle B in substantially the same way as described in my two prior applications for Let-

ters Patent, filed April 21, 1890, and December 18, 1890, and numbered, respectively, Serial No. 348,940 and Serial No. 375,112.

Having now described my invention and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is—

The hereinbefore-described improvement in the art of dyeing wool and other substances, consisting in immersing the goods to be dyed into the dye-liquor and then subjecting the same to the action of a jet of heated and highly-compressed air introduced from below into the liquor, whereby the dye-liquor is heated to a predetermined degree and maintained at that heat, the goods are continuously agitated and kept in movement, and the dye-liquor and goods are continually supplied with the needed oxygen, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 24th day of December, 1890.

JAMES A. YOUNG.

Witnesses:

EWELL A. DICK,  
M. BAILEY.