Patented Mar. 30, 1926. 1,578,933

UNITED STATES PATENT OFFICE.

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PROCESS OF TREATING SILK.

No Drawing. Application filed March 8, 1923. Serial No. 623,730.

To all whom it may concern:

Be it known that I, HARRY B. SMITH, a citizen of the United States, and a resident of Albany, in the county of Albany and State of New York, have invented new and useful Improvements in Processes of Treating Silk, of which the following is a specification.

My invention relates to a process of treating silk and more particularly to an improved process of degumming, bleaching and, if desired, bluing or suitably coloring the silk.

One object of the invention is to produce a silk which is soft and has a high lustre. Another object of the invention is to provide a process of the character described which can be effectively carried on in a relatively short time with a corresponding saving in the cost of labor, materials and energy.

Other objects, features and advantages of my invention will appear more fully in the following detailed description and appended claims.

I have found it preferable in my practice of the invention to pursue a detailed procedure substantially as follows, but I do not limit myself thereto as the invention may be varied within the scope of the appended claims.

The silk, for example either in the form of skeins or cloth, is placed in a bath of hot water preferably at about the boiling point. By this operation the silk gum is softened and some of it goes into solution. The duration of this treatment may, of course, vary within wide limits depending, for example, upon the temperature of the bath and the amount of gum it is desired to remove from the silk. I have found that very satisfactory results may be obtained if this treatment is continued about twenty minutes.

The bath is now rendered effective to bleach the silk and also to further dissolve the silk gum. To this end a suitable agent, preferably an alkaline oxidizing agent, is added to the bath. I prefer to use peroxid of sodium as the alkaline oxidizing agent; but it is understood that any other oxygen liberating product which produces an alkaline solution, but preferably those corresponding to the "per" salts, may be used, for example, percarbonate of sodium, perborate of sodium, or persulfate of sodium. With this alkaline oxidizing agent I preferably employ a soluble salt of an alkali or other metal, preferably a soluble inorganic salt, such as sodium chloride. Examples of other salts of metals that may be used are soda ash, silicate of soda and phosphate of soda or a mixture of any of these salts. The effect of the sodium chloride or other soluble metal salts which may be used in place thereof is to prevent destructive action of the alkaline bath upon the silk fibre. In case the silk is dyed with a substantive dye in the same bath, the alkali metal salt assists in the development and fixation of the coloring matter on the fibre.

Before adding the alkaline oxidizing agent and the salt of the alkali metal to the bath a mixture of these substances is preferably first dissolved in cold water. Very satisfactory results are obtained if the alkaline oxidizing agent, such as sodium peroxid, and the alkali metal salt, such as sodium chloride, are used in equal proportions; but it is to be understood that the relative proportions of these substances may be varied according to the substances employed, the amount of gum in the material, and according to other conditions which will be known to those skilled in the art. The amount of the alkaline oxidizing agent and alkali metal salt employed may also vary depending, for example, upon the amount of time the material is to be subjected to the bath containing the same. A bath which is too strong in alkali will have a tendency to damage the silk fibre. If the bath is too weak in alkali an unnecessarily long time will be consumed in the operation. I have found that very satisfactory results are obtained by employing a mixture of sodium chloride and sodium peroxid equal in weight to about 6% of the weight of the silk material treated. It is to be understood that this amount is set forth merely by way of example and that larger and smaller amounts may be used without departing from the spirit of my invention. For example, I have used with success a bath containing sodium peroxid and sodium chloride in amount equal in weight to about 10% the weight of the silk material treated.

The alkaline oxidizing agent and the soluble metal salt dissolved as described above are added to the bath either previous to or after the silk material. The temperature of the bath is now preferably below the

boiling point, for example, about 180° F., although any temperature up to the boiling point may be employed at this stage of the process. The material is now treated in this bath preferably at first without further heat, say for about a half hour. Heat is thereupon applied preferably to bring the temperature again to about the same point as when the mixtures of alkaline oxidizing agent and alkali metal salt were added, whereupon the heat is again shut off and the material treated in the bath for a suitable time, for example, half an hour longer. The result of this treatment is to dissolve the gum or a suitable portion thereof from the silk very rapidly without damage to the fibre of the silk. The dissolved gum and the alkali metal salt affect the bath so as to prevent damaging action of the alkaline solution upon the silk fibre. The oxygen liberated in the bath at the same time exerts a very effective bleaching action upon the silk fibre.

If it is not desired to blue or dye the silk the bath may now be drawn off whereupon the silk is washed, extracted and dried. Cold water is preferably employed for washing and several washings, for example three, are preferably employed.

By the employment of this process not only does the silk obtain a desirable softness and high lustre but a suitable amount of the gum may be retained in the silk to give the desired weight and strength.

When it is desired to dye the silk I prefer to perform this operation in the same bath in which the degumming and bleaching take place. To this end the process may be carried on as described above up to the point of adding heat after the addition of the alkaline oxidizing agent and alkali metal salt to the bath. Before this further heat is applied the dye is added to the bath.

I have found that various dyes may be employed, including basic dyes generally, and many substantive dyes. Among the basic dyes which may be used are some phthalein dyes, basic light green 6-Y, basic light blue B. K., brilliant basic rose A-I., brilliant basic orange T. C. N., and basic yellow. An example of phthalein dye which can be used is rhodamine B. Among the substantive dyes which may be used are the sky-blues 6-B and any other member of the same family, eureka pink and sambesia black. I prefer, however, to use basic dyes which under the conditions set forth produce a color which is very fast to light and washing and free from "crocking". The dyes employed should be of such a character as not to be materially affected in an adverse manner as to operativeness by the alkaline oxidizing agent employed.

The bath with the dye added thereto is permitted to further act on the material, preferably part of the time without further heating and then with the addition of heat to bring the bath (say in about half an hour) to a boil.

After the necessary time of operation to effect the degumming, bleaching and dyeing, the bath is withdrawn, carrying with it some of the gum from the silk, whereupon the latter is washed off preferably with several baths of cold water, extracted and dried.

To secure increased brilliancy and fastness in color the bath may be rendered slightly acid after the dye has been added. Various acids may be used to this end such as hydrochloric, sulfuric or any organic acid such as acetic, lactic or formic acid. The addition of the acid further produces in the silk the quality of "scroop" sometimes desired in the commercial article and also facilitates the liberation of the oxygen of the alkaline oxidizing agent.

Although the dye may be added to the bath after the alkaline oxidizing agent and alkali metal salt, as described above, it may also be added to the bath before the said agent and salt. In the latter case a cooler bath is preferably employed upon the addition of the dye, for example, a bath at about 100° F. The bath is preferably heated after the addition of the dye whereupon the alkaline oxidizing agent and alkali metal salt are added to it.

As some of the gum is removed from the silk at the time the dye acts upon the same, the coloring matter acts very effectively upon the fibre of the silk. By the use of the dyes at the relatively high temperature the color is made very fast to light and washing. The use of a high temperature without destructive action of the alkali upon the fibre is rendered feasible by the reason of the presence of the silk gum and alkali metal salt in solution.

If desired the silk may be subjected to a finishing bath of a neutral soap, such as Ivory soap, and water which will have a tendency to brighten the color.

In case a white product is desired instead of a dyed one the process may be carried on substantially as described above for producing a dyed silk except that a suitable bluing is added in place of color producing dyes. Various bluing materials may be used but I prefer to use an alkali violet such as that sold under the name "Alkali violet N. B." As this is an acid dye the bath should be rendered acid as described above when this bluing material is used.

A cold finishing bath of a suitable neutral soap, such as Ivory soap, serves to cleanse the material and brighten the color so that a very clear white is obtainable.

In all of the operations described above the material is preferably kept in motion during the action of the bath thereon.

While the bath is preferably in the liquid

adding an acid to the bath, and subjecting the silk to the bath with the acid added thereto.

18. The process of treating silk which comprises subjecting the same to a hot bath having added thereto an alkaline oxidizing agent and a dye which is not adversely affected by said agent to degum, bleach and dye the silk in the same bath, and rendering the bath slightly acid and subjecting the silk to the action of the acidified bath.

19. The process of treating silk which comprises degumming and bleaching the same in a bath to which peroxid of sodium and a soluble alkali metal salt have been added to an amount equal in weight to approximately 6% of the weight of the silk treated.

20. The process of treating silk which comprises degumming and bleaching the same in a bath to which peroxid of sodium and a soluble alkali metal salt have been added in substantially equal parts by weight and to an amount equal in weight to approximately 6% of the weight of the silk treated.

In testimony whereof, I have signed my name to this specification.

HARRY B. SMITH.

condition, as described above, it may be in any condition whereby the agents are brought into suitably intimate relation to the silk, such as foam as described, for example, in U. S. patent to Schmid 836,464.

With my improved process not only is there a very large saving in time, water and heat energy over processes heretofore employed but the resulting product is also found to be very soft and bright in appearance and strong.

This application is a continuation in part of my application Ser. No. 544,651, filed March 17, 1922, entitled Improvements in process of dyeing silk; and I am including in this case claims on the subject matter common to that and this application.

It is to be understood that bluing is included in the word dyeing as used in the following claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. The process which comprises treating silk in a hot water bath to remove some of the gum from the silk into the bath, and thereafter adding an alkaline oxidizing agent to the bath and bleaching and further degumming the silk in the bath.

2. The process which comprises treating silk in a hot water bath to remove some of the gum from the silk into the bath, and thereafter adding peroxide of sodium to the bath and bleaching and further degumming the silk in the bath.

3. The process which comprises treating silk in a hot water bath to remove some of the gum from the silk into the bath, and thereafter adding to the bath an alkaline oxidizing agent and an agent resisting damaging action of the alkali upon the silk and bleaching and further degumming the silk in the bath.

4. The process which comprises treating silk in a hot water bath to remove some of the gum from the silk into the bath, and thereafter adding to the bath sodium peroxide and sodium chloride and bleaching and further degumming the silk in the bath.

5. The process which comprises treating silk in a hot water bath to remove some of the gum from the silk into the bath, thereafter adding an alkaline oxidizing agent to the bath and bleaching and further degumming the silk in the bath, and thereafter acidifying the bath.

6. The process which comprises treating silk in a hot water bath to remove some of the gum from the silk into the bath, and thereafter adding an alkaline oxidizing agent and a dye to the bath and bleaching, dyeing and further degumming the silk in the bath.

7. The process which comprises degumming and bleaching silk in a bath to which an alkaline oxidizing agent has been added, the bath containing silk gum when the alkaline oxidizing agent is added thereto.

8. The process which comprises degumming and bleaching silk in a bath to which peroxide of sodium has been added, the bath containing silk gum when the peroxide of sodium is added thereto.

9. The process of treating silk which comprises subjecting the same to a degumming and bleaching bath to which a dye has been added, whereby the silk is degummed, bleached and dyed in the same bath.

10. The process of treating silk which comprises subjecting the same to a hot bath having added thereto an alkaline oxidizing agent and a dye which is not substantially operatively affected by said agent to degum, bleach and dye the silk in the same bath.

11. The process of treating silk which comprises subjecting the same to a hot bath having added thereto an alkaline oxidizing agent, an agent resisting damaging action of alkali upon the silk fibre and a dye which is not substantially operatively affected by said alkaline oxidizing agent to degum, bleach and dye the silk in the same bath.

12. The process of treating silk which comprises subjecting the same to a hot bath having added thereto an alkaline oxidizing agent, a soluble salt of an alkali metal and a dye which is not substantially operatively affected by said alkaline oxidizing agent to degum, bleach and dye the silk in the same bath.

13. The process of treating silk which comprises subjecting the same to a hot bath having added thereto peroxid of sodium and a dye which is not substantially operatively affected by the bath to degum, bleach and dye the silk in the same bath.

14. The process of treating silk which comprises subjecting the same to a hot bath having added thereto peroxid of sodium, a soluble salt of an alkali metal and a dye which is not substantially operatively affected by the bath to degum, bleach and dye the silk in the same bath.

15. The process of treating silk which comprises subjecting the same to a hot bath having added thereto peroxid of sodium, sodium chlorid and a basic dye to degum, bleach and dye the silk in the same bath.

16. The process of treating silk which comprises subjecting the same to a hot bath having added thereto an alkaline oxidizing agent and a basic dye to degum, bleach and dye the silk in the same bath.

17. The process of treating silk which comprises subjecting the same to a degumming bath to which a dye has been added to degum and dye the silk in the same bath,