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METHOD OF RESTORING INKED DOCUMENTS

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Our invention relates to a method of restoring inked documents on which the ink has faded. Documents or papers restored according to our invention will not darken upon further aging. It is also possible, according to our invention, to impart a desired tint to the paper.

The characters written in iron ink on public and private documents or papers in time become so faded that they can be read only with difficulty and in some instances the writings are entirely illegible. This is due to the iron ink having been oxidized to ferric oxide. In order to make such writings legible, it is customary to treat the documents or papers with chemicals so as to revivify the characters since most of the writings on old documents was done with the use of iron-tannin inks, they can be readily brought back to normal, or even better than normal condition by the application of well known chemical laws. By treating the paper by immersing it in a water solution of potassium ferrocyanide acidified with a suitable acid such as, for example, acetic, phosphoric, hydrochloric or sulphuric, the ink is changed from its faded condition to one that is bright, clear and well defined. This change is due to the ferric oxide to which the ink has changed being converted into a bright precipitate of Prussian blue, which is a permanent color. The amount of potassium ferrocyanide in the solution may be varied to meet conditions, and modifiers, such as sodium chloride or potassium chloride, may be added to the solution if desired. Such modifiers tend to increase the permanence of the Prussian blue and prevent edge blurring of the characters.

The treatment which we have described will revivify the written characters. However, certain ferrocyanide salts are left in the paper, probably adsorbed on certain of the colloids, resins, proteins, etc., found in the paper, and despite the most thorough and extended washings, all the ferrocyanide salts cannot be completely removed. In time the potassium ferrocyanide salts remaining in or on the paper precipitate as a blue color and discolor the paper. This discoloration may take place to such an extent that the legibility of the revivified writings may be seriously impaired and in time the color of the paper may become so pronounced as to entirely mask the writing itself.

We have discovered a method of treating the documents to prevent these discolorations and herein lies our invention. After the writing has been developed in a suitable ferro-cyanide solution, the paper is washed in water as usual and then is treated with a second solution which precipitates the ferrocyanide remaining in the paper as an insoluble salt and causes it to become permanently inactive and incapable of further reaction, thus preventing discoloration of the paper. The latter solution, which is hereinafter referred to as a precipitating solution, consists of an organic or inorganic salt of a heavy metal selected from the group consisting of zinc, lead, barium, cobalt, nickel, silver, cadmium, copper, thallium, manganese, mercury, uranium and tin or a mixture of such salts either in physical or chemical combination. Many of these salts will yield a white or nearly white precipitate, while certain of the salts may turn the paper a desirable color. For example, zinc gives a white precipitate; barium, yellowish; cobalt, a gray-green; silver, yellow; cadmium, yellowish; copper, red-brown; manganese, green-white. In practice, it will usually be found desirable to use a soluble salt of zinc which is at once cheap and gives a white insoluble precipitate. A solution of from 5 to 10% of zinc chloride, zinc sulphate, or zinc acetate has proved to be very satisfactory for the purpose, but it is to be understood that the amount used may be varied, depending upon the paper and its tendency to discolor upon aging. The precipitate, namely zinc ferrocyanide, if a zinc salt is used, is white, insoluble and is not affected by long exposure to light. The excess soluble zinc salt or any other soluble salt is washed away.

In some instances, the paper may have a bluish tinge after treatment, which we may desire to change to white. In such a case, we can add a suitable yellow dye, either of vegetable or coal tar origin, such as saffron, turmeric, annatto or auramine, naphthol yellow, sunset yellow or tartrazine. Other dyes may be used, so long as they are of such a character that they are not precipitated by the metallic salt used in the precipitating solution. Such a dye will be hereinafter referred to as a modifying dye. The object of adding the modifying dye is to offset the blue background and change it to white. This is particularly useful where the paper itself has originally been discolored.

By following the teachings of our invention, it is possible to treat documents on which the ink has faded and which have been revivified by treatment with a ferrocyanide solution, so as to insure that the brilliance and permanence of the revivified characters will not be affected and that the paper itself will not be discolored with further aging. Furthermore, the paper itself may, at the

same time, be given a desired permanent coloration.

While our invention has been described in connection with certain specific examples thereof, it is to be understood that these have been used for the purpose of illustration only and that the scope of the invention is not to be limited thereby.

We claim:

1. The method of revivifying iron containing faded characters on documents which consists in treating the characters with an acid solution of potassium ferrocyanide, washing the paper, and subjecting the paper so treated to the action of a precipitatihg solution which will cause the potassium ferrocyanide remaining on the paper to be changed to an insoluble stable substance of a contrasting color to the revived characters, and washing the paper.

2. The method of revivifying faded iron tannin characters on documents which consists in treating the documents with an acid solution of potassium ferrocyanide, and thereafter treating the documents with a precipitating solution which will cause the potassium ferrocyanide remaining on the paper to be changed to an insoluble stable substance of a contrasting color to the revived characters, and washing the paper.

3. The method of revivifying faded iron tannin ink characters on documents which consists in treating the documents with an acid solution of potassium ferrocyanide and thereafter treating the documents with a precipitating solution to which has been added a modifying dye the precipitating solution being of such a character that it will precipitate the potassium ferrocyanide remaining in the paper, as an insoluble salt of a desirable color.

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