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Date of Application, 10th Apr., 1905

Complete Specification Left, 9th Oct., 1905—Accepted, 11th Jan., 1906

PROVISIONAL SPECIFICATION.

“Improved Manufacture of Coloured Photographic Images.”

I, OLIVER IMRAY, of Birkbeck Bank Chambers, Southampton Buildings, in the County of London, Chartered Patent Agent, do hereby declare the nature of this invention (as communicated to me from abroad by Farbwerke vormals: Meister Lucius & Brüning, of Hoechst <sup>a</sup>/Main, in the German Empire, Chemical  
5 Manufacturers) to be as follows:—

According to French Specification No. 337054 coloured photographic images are obtained in the following manner:—

A gelatine layer sensitised with bichromate is exposed to light under a diapositive, parts of the layer being thus rendered hard. Excess of bichromate  
10 having been washed away with water, the gelatine layer is dyed by immersion in a dyestuff solution; excess of dyestuff is removed by rinsing and a moist paper coated with gelatine paper is brought into close contact with the dyed layer. In this manner the dyestuff is said to be transferred only from the  
15 unexposed parts to the gelatine paper so that a coloured positive image is produced. It appears, from the experiments of my foreign correspondents, that dyestuffs generally do not behave towards hardened or unhardened gelatine in the manner requisite for the success of the said process. If, for instance, in  
20 order to obtain a blue colour, methylene blue, patent blue or crystal violet is used, for a red colour, magenta, safranine, or rhodamine, and for a yellow colour, picric acid, tartrazine or auramine, either the exposed and unexposed parts of the gelatine layer are dyed alike, yielding their colour uniformly to the gelatine paper, so that no image is obtained, or the dyestuff is not sufficiently retained by the gelatine and may for the greater part be readily removed  
25 by washing with water, thus producing a feeble hazy image. Some dyestuffs have the peculiar property of producing a reversed image.

Similar results have been obtained with most of the other colours, even with those of different shades. Here, too, no image or only an indistinct one is obtained. Again with some dyestuffs at first an apparently good image is  
30 obtained, but subsequently proves useless, as it becomes indistinct owing to the dyestuff not having been sufficiently fixed by the gelatine.

According to the present invention excellent results may be obtained if certain dyestuffs are used. For instance, the mikado-dyestuffs obtained from paranitrotoluenesulphonic acid, the soluble azo-dyestuffs derived from dehydrothiotoluidine, primuline or their homologues and substitution products, natural  
35 carmine, the sulphonic acids of induline and nigrosine, naphthazine blue and some of the diamine colours, like diamine pure blue, dianil blue, dianil yellow, dianil garnet and others. Of the anthraquinone dyestuffs may be used the arylidoanthraquinonesulphonic acids and their derivatives.

For example, to produce a blue image, a gelatine layer sensitised by immersion in a 4 per cent solution of bichromate may be exposed to light under a diapositive and excess of bichromate removed by washing with water. The layer may then be immersed in an aqueous solution of fast blue (indulinesulphonic acid) of say 4 per cent strength, rinsed with water after 15 minutes and

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then brought into intimate contact with a moist gelatine paper. After about 10 minutes the paper may be removed from the layer, when it will be found to exhibit the image in blue. The original layer, without being re-dyed, may serve several times for reproducing the image or may be coloured again by immersion in a dye-bath. 5

This process is of special importance in the manufacture of three colour photographs. The operation may be conducted, for instance, as follows:—

From the 3 negatives are made 3 diapositives under which are exposed the bichromate gelatine plates as described above. 10

The gelatine plate which corresponds with the red screen negative may be then dyed by immersion in a solution of about 4 *per cent* strength of, for instance, diamine pure blue and the image may be transferred to the gelatine paper as hereinbefore described.

The gelatine plate which corresponds with the green negative may be dyed by immersion in a solution of about 4 *per cent* strength of carmine or of the azo-dyestuff from primulinesulphonic acid and 1:4:7-*a*-naphtholdisulphonic acid and afterwards washed. The previously obtained blue, still moist or re-moistened image may be then placed on the red plate in such a manner that the outlines cover each other, and closely pressed; after about 10—15 minutes the image is removed. 15 20

The gelatine plate which corresponds with the blue screen negative may be dyed in a solution of about 4 *per cent* strength of dianil yellow R (azo-dyestuff from primulinesulphonic acid and phenylmethylpyrazolone), excess of the dyestuff removed by rinsing with water and the blue and red image laid on so that the outlines cover each other. After about 15 minutes the finished image is removed from the plate. 25

Dated this 10th day of April, 1905.

ABEL, & IMRAY,  
Agents for the Applicant.

## COMPLETE SPECIFICATION. 30

## "Improved Manufacture of Coloured Photographic Images."

I, OLIVER IMRAY, of Birkbeck Bank Chambers, Southampton Buildings, in the County of London, Chartered Patent Agent, do hereby declare the nature of this invention (as communicated to me from abroad by Farbwerke vormals: Meister Lucius & Brüning, of Hoechst <sup>am</sup>Main, in the German Empire, Chemical Manufacturers) and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:— 35

According to French Specification No. 337054 coloured photographic images are obtained in the following manner, the process being applicable to tri-colour photography. 40

A gelatine layer sensitised with bichromate is exposed to light under a diapositive, parts of the layer being thus rendered hard. Excess of bichromate having been washed away with water, the gelatine layer is dyed by immersion in a dyestuff solution; excess of dyestuff is removed by rinsing and a moist paper coated with gelatine is brought into close contact with the dyed layer. In this manner the dyestuff is said to be transferred only from the unexposed parts to the gelatine paper so that a coloured positive image is produced. It appears, from the experiments of my foreign correspondents that dyestuffs generally do not behave towards hardened or unhardened gelatine in the manner requisite for the success of the said process. If, for instance, in 50

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order to obtain a blue colour, methylene blue, patent blue or crystal violet is used, for a red colour, magenta, safranine, or rhodamine, and for a yellow colour, picric acid, tartrazine or auramine, either the exposed and unexposed parts of the gelatine layer are dyed alike, yielding their colour uniformly to the gelatine paper, so that no image is obtained, or the dyestuff is not sufficiently retained by the gelatine and may for the greater part be readily removed by washing with water, thus producing a feeble hazy image. Some dyestuffs have the peculiar property of producing a reversed image.

Similar results have been obtained with most of the other colours, even with those of different shades. Here, too, no image or only an indistinct one is obtained. Again with some dyestuffs at first an apparently good image is obtained but subsequently proves useless, as it becomes indistinct owing to the dyestuff not having been sufficiently fixed by the gelatine.

According to the present invention excellent results may be obtained if certain dyestuffs are used. For instance, the mikado-dyestuffs obtained from paranitrotoluenesulphonic acid, the soluble azo-dyestuffs derived from dehydrothiitoluidine, primuline or their homologues and substitution products, natural carmine, the sulphonic acids of induline and nigrosine, naphthazine blue and some of the diamine colours, like diamine pure blue, dianil blue, dianil yellow, dianil garnet (made from benzidine, naphthylamine disulphonic acid and amidonaphthol sulphonic acid), and others. Of the anthraquinone dyestuffs may be used the arylidoanthraquinonesulphonic acids and their derivatives.

For example, to produce a blue image, a gelatine layer sensitised by immersion in a 4 *per cent* solution of bichromate may be exposed to light under a diapositive and excess of bichromate removed by washing with water. The layer may then be immersed in an aqueous solution of fast blue (indulinesulphonic acid) of say 4 *per cent* strength, rinsed with water after 15 minutes and then brought into intimate contact with a moist gelatine paper. After about 10 minutes the paper may be removed from the layer, when it will be found to exhibit the image in blue. The original layer, without being re-dyed, may serve several times for reproducing the image or may be coloured again by immersion in a dye-bath.

This process is of special importance in the manufacture of three colour photographs. The operation may be conducted, for instance, as follows;—

From the 3 negatives are made 3 diapositives under which are exposed the bichromate gelatine plates as described above.

The gelatine plate which corresponds with the red screen negative may be then dyed by immersion in a solution of about 4 *per cent* strength of, for instance, diamine pure blue, and the image may be transferred to the gelatine paper as hereinbefore described.

The gelatine plate which corresponds with the green negative may be dyed by immersion in a solution of about 4 *per cent* strength of carmine or of the azo-dyestuff from primulinesulphonic acid and 1;4;7-*a*-naphtholdisulphonic acid and afterwards washed. The previously obtained blue, still moist or re-moistened image may then be placed on the red plate in such a manner that the outlines cover each other, and closely pressed; after about 10—15 minutes the image is removed.

The gelatine plate which corresponds with the blue screen negative may be dyed in a solution of about 4 *per cent* strength of dianil yellow R (azo-dyestuff from primulinesulphonic acid and phenylmethylpyrazolone), excess of the dyestuff removed by rinsing with water and the blue and red image laid on so that the outlines cover each other. After about 15 minutes the finished image is removed from the plate.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In a manufacture of coloured photographic images of the kind herein

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described, dyeing a gelatine layer which has been sensitised with bichromate, exposed under a diapositive and washed, by immersing it in an aqueous solution of certain dyestuffs having the property of dyeing unchanged gelatine while they leave undyed gelatine that has been hardened by exposure to light, such as the so-called mikado-dyestuffs, the soluble azo-dyestuffs derived from dehydro-thiotoluidine, primuline or their homologues or substitution products, natural carmine, the sulphonic acids of induline and nigrosine, naphthazine blue, some of the diamine colours like diamine pure blue, dianil blue, dianil yellow, dianil garnet, and some anthraquinone dyestuffs of the arylidoanthraquinonesulphonic acids or their derivatives, removing the excess of dyestuff and bringing the dyed layer into close contact with moistened gelatine paper. 5 10

2. The herein described manufacture of coloured photographic images on the three-colour principle, by preparing three differently coloured images in the manner referred to in the preceding claim and transferring them to one and the same moistened gelatine paper in known manner. 15

3. Coloured photographic images manufactured as above set forth.

Dated this 9th day of October 1905.

ABEL & IMRAY,  
Agents for the Applicant.