

123,787

PATENT



SPECIFICATION

Application Date, Dec. 3, 1917. No. 17,882/17.

Complete Left, June 3, 1918.

Complete Accepted, Mar. 3, 1919.

PROVISIONAL SPECIFICATION.

Improvements relating to Colour Photography.

I, ARON HAMBURGER, of 38, Dover Street, Mayfair, London, W. 1, Consulting Chemist, do hereby declare the nature of this invention to be as follows:—

This invention relates to the preparation of photographic reproductions of objects in natural colours, and to apparatus therefor.

5 The invention consists in a multi-colour process in which complementary colour negatives say a red or orange red value negative and a blue or blue green value negative, one of which is reversed, are accurately superimposed, and printed on opposite sides of a doubly sensitised film. The combined positive is then bleached and dyed or pigmented separately or simultaneously each side
10 its respective colour, and combined after clearing with a yellow value positive prepared preferably by the process of Patent No. 20,880 of 1911, or such positive may itself be used as a finished two-colour photograph.

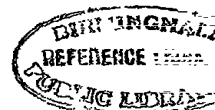
The invention also consists in a method and means for dyeing the two sides of the positive without risk of staining either side by the reagents used on the
15 other.

The invention further consists in a dyeing frame adapted for simultaneous dyeing of both sides of the positive.

In carrying this invention into effect in one form, I prepare a red value negative and a blue value negative of the coloured object to be reproduced by
20 photographing through colour screens by means of a camera in the usual way. If these negatives are prepared with an ordinary camera, then I reverse one of the negatives. I prefer, however, to employ a camera embodying the invention described in my Patent No. 28,722 of 1912, in which case I obtain both negatives at the same time, one of them being reversed. These negatives
25 represent the red value of the object and the blue value of the object respectively. I superimpose these negatives accurately in relation to one another upon opposite sides of a doubly sensitized film, *i.e.*, a film having emulsion on both sides. I then print through each of these negatives by suitable simultaneous illumination from opposite sides. I then bleach the double positive,
30 say by the well-known Traube method. The object of this process is to convert the silver image into a silver salt which has a high affinity for coal tar colours.

In order to obtain an image more stable and resistant to washing *etc.*, I prefer to employ a solution made up as follows:—2 fluid ozs. of a solution of 1 oz. of potassium iodide in 9 ozs. of water are added slowly and with stirring
35 to 4 fluid ozs. of a solution of 1 oz. of potassium bichromate and 9 ozs. of water. To the resulting solution is added very slowly and with stirring 16 fluid ozs. of water containing 80 minims hydrochloric acid. The film for

[Price 6d.]



colouring is soaked in cold water, and allowed to drain. It is then introduced into the bleaching bath, until the silver in the image is completely bleached. It is then thoroughly washed in cold water, and then in warm water up to 140° F., until all reddish and yellowish stains disappear, and the non-silver spaces are thoroughly colourless and clear. The positive is then ready for dyeing. The positive thus produced is then placed in a dyeing frame constructed as follows:—

Two rectangular frames of a suitable size for the positive film to be treated are constructed similar to printing frames, but the one is adapted to fit into the rebate of the other, just as if it were the glass of an ordinary printing frame. The rebate of the one frame is provided with rubber or like jointing material, so that the film when pressed against it round the edges will be sealed with a water-tight joint. The second half of the frame is also provided with a ring of jointing material, and is placed on the top of the film, clamping the latter against the other half frame all round its edges in a water-tight manner. The outer side of each of the halves of the frame is provided with a sheet of glass sealing against the edges of the frame, and thus forming a tank chamber on each side of the film. The two halves of the frame may be arranged for rapid opening and closing by means of hinges along the bottom edge. The tank chambers on each side of the film are provided with outlet passages at their lower ends, and these are controlled by suitable cocks. Inlets are provided at the top edges of the tank chambers, for the admission of the dyeing fluids. Means are also provided for the outlet of air as the fluid is introduced. The air exit valve may be adapted to be closed at will. To allow for sagging of the film, in case one fluid should be introduced slightly before the other, the inlet passages are preferably provided with a small reservoir, which will hold fluid displaced from one side to the other.

The film introduced into the dyeing tank just described, and clamped therein, is dyed by the introduction of the appropriate dyeing fluids on each side. The film may thus be simultaneously dyed on both sides. The dyeing fluids are then run off, and the positive thoroughly washed, until all the non-silver parts are cleared of dye. Fixing is then effected in hyposulphite of soda containing 5 per cent. of tannic acid, and the film is then washed and dried in the ordinary way.

The positive film thus obtained is then combined by superposition with a yellow tone positive representing the yellow colour value of the object photographed, where a two colour result only is desired, a positive similarly made from orange red and blue green value negatives and dyed relatively blue green and orange red, may be mounted on paper or used as a transparency. The yellow positive is preferably obtained by the process described in my Patent No. 20,880 of 1911, and the combination gives a practically perfect colour reproduction of the original object in natural colours.

In some cases I may employ a still further simplified form of dyeing frame, in which the film to be dyed is clamped between two faces, jointing as before, against the film, to form fluid-tight joints, but omitting the glass sides forming the outside walls of the fluid chambers, and in this case the outside parts of the frame are made as shallow tanks, so that they form practically developing trays, of which the film is the bottom. The frames are suitably shaped at the corners for proper discharge of the dyeing fluid, and as will be seen, only one side can be dyed at a time. This form of dyeing tank is for that reason not nearly so good as that formerly described, also on account of the film being unsupported on one side while the fluid acts on the other.

In carrying this invention into effect in another form instead of separately bleaching and dyeing the positive images printed on the film from complementary colour negatives I may simultaneously effect both operations by taking a carbon paper or a dye gelatine paper and soaking it for five minutes in a bleaching and pigmenting solution as described below. The paper or the like

thus soaked is pressed into contact with the two sides of the film on which the required positive complementary colour images have been printed. They are thus allowed to remain in contact a suitable time say 20 to 25 minutes. Then the carbon paper is developed in hot water as usual or the dye paper washed only in cold water. Simultaneous bleaching and pigmenting is thus effected.

The required solution is prepared from the following ingredients:—

	Copper sulphate	-	-	-	-	4	ozs.
	Potassium bromide	-	-	-	-	1400	grs.
10	Potassium bichromate	-	-	-	-	180	grs.
	HCl	-	-	-	-	80	minims.

The copper sulphate is dissolved with the potassium bromide in 20 ozs. of water and the potassium bichromate in another equal quantity of water to which the HCl is also added. The two solutions are then mixed slowly while stirring well and the resulting solution is ready for use. The dyes required are for greenish blue basic methylene blue which should be as nearly as possible minus red and for magenta red basic fuchsin red which should be as possible minus green.

Dated this 1st day of December, 1917.

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MARKS & CLERK.

COMPLETE SPECIFICATION.

Improvements relating to Colour Photography.

I, ARON HAMBURGER, of 38, Dover Street, Mayfair, London, W. 1, Consulting Chemist, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to the preparation of photographic reproductions of objects in natural colours, and to apparatus therefor (see Application 123,786).

The invention consists in a multi-colour process in which complementary colour negatives (*e.g.* a red or orange red value negative and a blue or blue-green value negative) one of which is reversed are accurately superimposed on opposite sides of a doubly sensitised film and photo-chemically printed and the combined positive produced is coloured on each side practically simultaneously (after bleaching or in a manner combining bleaching & colouring) and preferably combined with a yellow value positive prepared preferably by the process of Patent No. 20,880/11.

The invention also consists in a special dyeing frame for use in connection with such process.

In carrying this invention into effect in one form, I prepare a red value negative and blue value negative of the coloured object to be reproduced by photographing through colour screens by means of a camera in the usual way. If these negatives are prepared with an ordinary camera, then I reverse one of the negatives. I prefer, however, to employ a camera embodying the invention described in Patent No. 28,722 of 1912, in which case I obtain both negatives at the same time, one of them being reversed. These negatives represent the red value of the object and the blue value of the object respectively and should be practically complementary. I superimpose these negatives accurately in relation to one another upon opposite sides of a doubly sensitised film *i.e.*, a film having emulsion on both sides. I then print through each of

these negatives by suitable simultaneous illumination from opposite sides and develop and fix as usual. When the negatives are truly complementary and of practically the same density I find that no protective screening is required if equal illuminations be used and that the colour values print without interference with one another. I then bleach the double positive, say by the well-known Traube method. The object of this process is to convert the silver image into a silver salt which has a high affinity for coal tar colours. 5

In order to obtain an image more stable and resistant to washing, &c., I prefer to employ a bleaching solution made up as follows:—2 fluid ozs. of a solution of 1 oz. of potassium iodide in 9 ozs. of water are added slowly and with stirring to 4 fluid ozs. of a solution of 1 oz. of potassium bichromate and 9 ozs. of water. To the resulting solution is added very slowly and with stirring 16 fluid ozs. of water containing 80 minims hydrochloric acid. The developed and fixed film which is to be coloured is soaked in cold water and allowed to drain. It is then introduced into the bleaching bath, until the silver in the image is completely bleached. It is then thoroughly washed in cold water, and then in warm water up to 140° F., until all reddish and yellowish stains disappear, and the non-silver spaces are thoroughly colourless and clear. The positive is then ready for dyeing. The positive thus produced is then placed in a dyeing frame as shown in the accompanying drawings: 20

Referring to the accompanying drawings:—

Figure 1 is a side elevation of a dyeing frame constructed according to my invention.

Figure 2 is a sectional elevation on line X—X of Figure 1.

Two rectangular frames a a^1 of a suitable size for the positive film to be treated are constructed similar to printing frames, but the one is adapted to fit into the rebate of the other, just as if it were the glass of an ordinary printing frame. The rebate of the one frame is provided with rubber b or like jointing material, so that the film c when pressed against it round the edges will be sealed with a watertight joint. The second half of the frame is also provided with a ring of jointing material b^1 , and is placed on the top of the film, clamping the latter against the other half frame all round its edges in a water-tight manner. The outer side of each of the halves of the frame is provided with a sheet of glass d d^1 sealing against the edges of the frames and thus forming a tank chamber on each side of the film. The two halves of the frame may be arranged for rapid opening and closing by means of hinges e along the bottom edge and wing nuts and screws f on the top edge. The tank chambers on each side of the film are provided with outlet passages g at their lower ends, and these are controlled by suitable cocks or valves h . Inlets i i^1 are provided at the top edges of the tank chambers, for the admission of the dyeing fluids. Means are also provided for the outlet of air by the valves k k^1 , as the fluid is introduced. The air exit valves k k^1 may be adapted to be closed at will. To allow for the sagging of the film, in case one fluid should be introduced slightly before the other, (the dyeing still being substantially simultaneous) the inlet passages may each be provided with a small reservoir not shown, which will hold fluid displaced from the tank chambers. 25 30 35 40 45

The film introduced into the dyeing tank just described, and clamped therein, is dyed by the introduction of the appropriate dyeing fluids on each side. The film may thus be simultaneously dyed on both sides. The dyeing fluids are then run off, and the positive thoroughly washed, until all the non-silver parts are cleared of dye. Fixing is then effected in hyposulphite of soda containing 5 per cent. of tannic acid, and the film is then washed and dried in the ordinary way. 50

The positive film thus obtained is then combined by superposition with a yellow tone positive representing the yellow colour value of the object photographed. Where a two-colour result only is desired, a positive similarly made from orange red and blue green value negatives and dyed relatively blue green 55

and orange red, may be mounted on paper or used as a transparency. The yellow positive is preferably obtained by the process described in my Patent No. 20,880 of 1911, and the combination gives a practically perfect colour reproduction of the original object in natural colours.

5 In carrying this invention into effect in another form; instead of separately bleaching and dyeing the positive images printed on the film from complementary colour negatives, I may simultaneously effect both bleaching and pigmenting or dyeing by taking carbon papers or dye gelatine papers containing the desired colours and soaking them for five minutes in a bleaching solution
10 as described below.

I have found that such papers when applied to a silver photograph image have in addition to the property of bleaching the silver image, the property of impregnating the bleached image with the colour or pigment contained in them, that is to say, as the silver image is bleached by the solution, it is at
15 the same time absorbing pigment or pigmented gelatine from the band or plaster of carbon paper or dye gelatine paper, and by some action, perhaps catalytic, the amount of pigmented or coloured gelatine which is absorbed by the silver image during the coincident bleaching and pigmenting process becomes insoluble in water. The papers or the like thus soaked are therefore
20 pressed into contact with the two sides of the film on which the required positive complementary colour images have been printed. The two papers and the film are thus allowed to remain in contact simultaneously for a suitable time say 20 to 25 minutes. Then in the case of carbon paper, this is developed in hot water as usual, the paper floating away or being gently removed, and the result-
25 ing mass being treated with the warm water as in the usual carbon process; removing the soluble pigmented gelatine and leaving the image in colour. In the case of dye-gelatine papers cold water treatment is employed instead of treatment by warm water. Simultaneous bleaching and pigmenting or dyeing is thus effected.

30 The required solution is prepared from the following ingredients:—

Copper sulphate	-	-	-	-	4	ozs.
Potassium bromide	-	-	-	-	1400	grs.
Potassium bichromate	-	-	-	-	180	grs.
HCl	-	-	-	-	80	minims..

35 The copper sulphate is dissolved with the potassium bromide in 20 ozs. of water and the potassium bichromate in another equal quantity of water to which the HCl is also added. The two solutions are then mixed slowly while stirring well and the resulting solution is ready for use. The dyes required are for greenish blue basic methylene blue which should be as nearly as
40 possible minus red and for magenta red basic fuchsin red which should be as nearly as possible minus green.

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:—

45 1. A multicolour process in which complementary colour negatives (*e.g.* a red or orange red value negative and a blue or blue green value negative) one of which is reversed are accurately superimposed on opposite sides of a doubly sensitised film and photo-chemically printed and the combined positive produced is coloured on each side practically simultaneously (after bleaching or
50 in a manner bleached and dyed or combining bleaching and colouring) and preferably combined with a yellow value positive.

2. In a process as claimed in Claim 1, the method of and means for dyeing the two sides of a combined positive consisting in framing the positive in such a way as to form tanks one wall of each of which is the film itself.

55 3. A dyeing frame for use in the process of colour photography claimed in

Claim 1, in which a tank chamber is formed on each side of a film positive by clamping its elements against the film in a fluid-tight manner.

4. A process as claimed in Claim 1 in which the bleaching and colouring on each side are effected simultaneously, for example by means of carbon paper.

5. A special form of tank chamber for use in a multi-colour process as claimed in Claim 1, comprising jointed rectangular frames preferably hinged together and adapted to clamp between them with jointing material the film, the tank chambers being provided with suitable inlet and outlet means for admitting and withdrawing dyeing fluid and air escape means, clamping devices for securing the films and making a tight joint between the sections of the tank chamber and the film being also provided, substantially as described.

6. A multi-colour process substantially as herein described.

7. A frame for effecting the dyeing of films, for use in any of the processes claimed above, substantially as shown and described.

Dated this 3rd day of June, 1918.

MARKS & CLERK.

ERRATUM.

SPECIFICATION No. 123,787.

Page 2, line 44. *for* "faces" *read* "frames."

PATENT OFFICE,
April 10th, 1919.

[This Drawing is a reproduction of the Original on a reduced scale.]

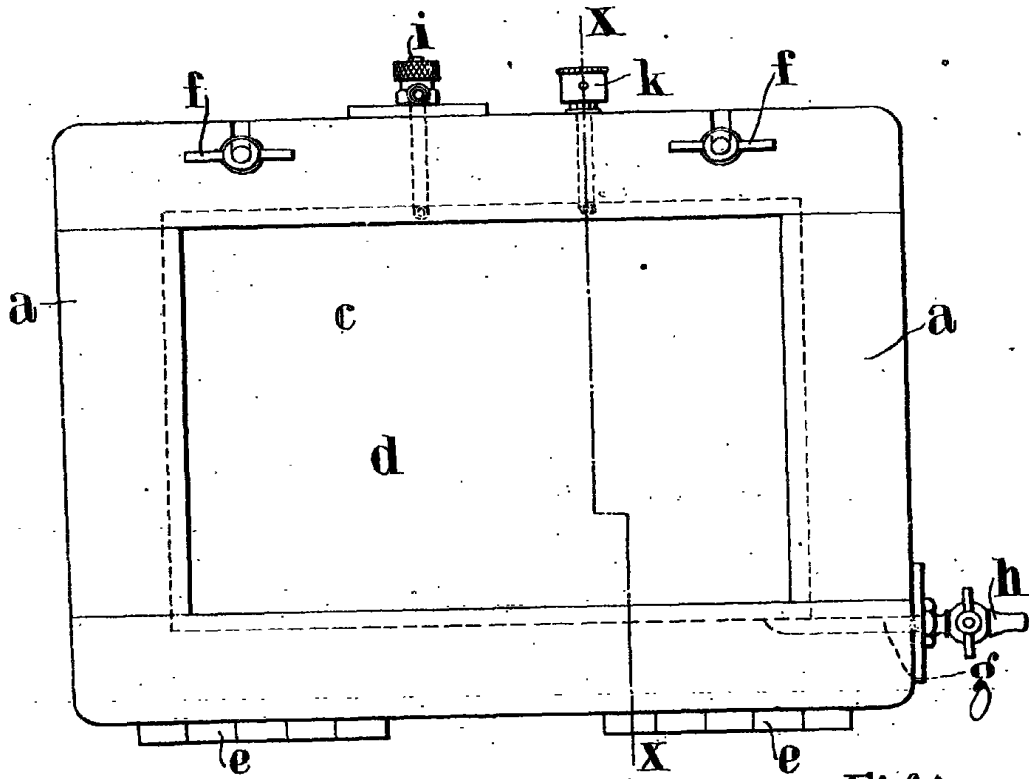


Fig. 1.

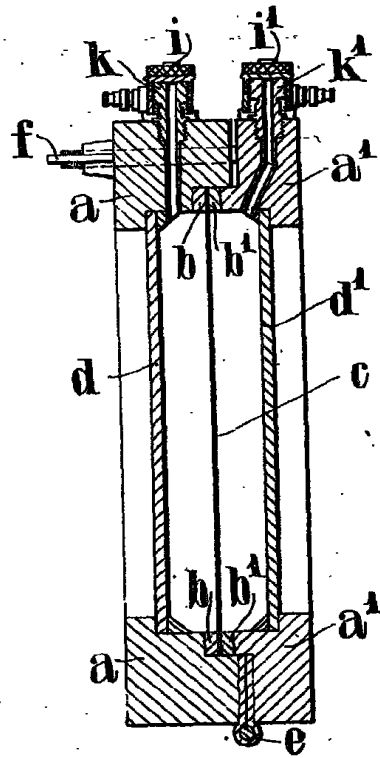


Fig. 2.

