

N<sup>o</sup> 7924



A.D. 1903

Date of Application, 6th Apr., 1903

Complete Specification Left, 1st Jan., 1904—Accepted, 18th Feb., 1904.

PROVISIONAL SPECIFICATION.

**“An Improved Process and Apparatus for the Production of Coloured Photographs and Photo-mechanical Prints.”**

I, ADOLF ALFRED GURTNER, of 3 Landhausweg, Berne, in the Swiss Confederation, Architect, do hereby declare the nature of this invention to be as follows:—

In the manufacture of coloured photographs, by the two-colour process, the procedure is as follows, one sensitized surface is exposed behind a blue filter, and the other behind a red or orange filter. The negative from the first exposure serves for the production of the red or orange picture, that is to say, the print obtained therefrom is coloured red or yellowish red, whilst the blue picture is obtained from the negative of the second exposure. Similarly to what takes place in the three-colour process, the two positive films can be brought into registration with each other in order to obtain a coloured picture.

According to the present invention, two negatives are likewise taken on different sensitized films. For the production of the negative for the positive orange component picture, a coloured screen or colour-filter is not however employed, which is rendered possible by the fact that the natural blue rays alone (that is to say, without the employment of the blue-filter) act so strongly that the action of the remaining rays is so small as to be negligible. This omission of one filter, in the present case, permits the production of the negative by a single exposure, as follows:—a chloride of silver or chloride and bromide of silver plate, which is as transparent as possible, is immersed in an aqueous solution of aniline orange or of any other suitable orange dye and after drying, is placed with the film side on the film side of an orthochromatic plate. This double plate can be united into one plate by cementing or pasting the edges with paper strips, or by other suitable means, and is then placed in the dark slide of the photographic camera in such a manner that the coloured plate is turned with its glass side towards the lens or “objective”. The coloured film thus serves as a colour filter for the orthochromatic plate lying behind the same.

The improved process is preferably carried into practice by immersing a chloride and bromide of silver plate or a chloride of silver plate, such as are sold commercially, in an aqueous solution of aniline orange, until it appears coloured deep orange when seen by transmitted light. After the plate so treated is dried, it is placed, as above described, together with an orthochromatic plate the sensitiveness of which for yellow and red is predominant, into the dark slide of the photographic camera, in which operation, care is to be taken that the two films touch each other at all points, in order to obtain perfectly sharp negatives. The orthochromatic plate is acted upon by the yellow and red rays penetrating the plate serving as a colour filter, whilst on the front plate, the blue rays act predominantly. Thus, after development, two negatives are obtained, of which one serves for the production of orange coloured component pictures and the other for the production of blue component pictures, which superposed, or printed over each other as in photo-mechanical printing, give a coloured picture that approximates very closely to nature in so far as, in the object taken, there are no pure red tones, as is generally the case, for example, in landscapes, of which the orange, brick-red and reddish-brown tones are well reproduced. The choice of the kind of plates and the preparation of

[Price 8d.]

*Improved Process and Apparatus for the Production of Coloured Photographs, &c.*

the plates for the negative are to be such that with a single exposure of the front and rear plates, both plates are correctly exposed. The colouring of the chloride or chloride and bromide of silver plate must have such intensity that, when this plate is correctly exposed, the rear orthochromatic plate is preferably somewhat over-exposed.

The two plates, exposed in the manner above described, can be developed in any suitable developer. The fixing can take place in a 10 *per cent* solution of thiosulphate of soda  $\text{Na}_2\text{S}_2\text{O}_3$  (commonly known as hyposulphite of soda). The orange coloration of the chloride and bromide of silver plate gradually becomes lost in the various baths which is of advantage in the printing.

The negatives can be copied or printed in colour both on to glass, paper or on any other base or carrier; or they can be used in the manufacture of clichés for the coloured component pictures in the photo-mechanical process of printing. Should the printing be done on glass, the procedure is as follows:—From the negative formed behind the yellow filter, a print is made on a chloride and bromide of silver plate and this is then developed in one of the usual developers and is then, as is usual, fixed. By this means it is sought to obtain a thin positive which however is capable of presenting strong contrasts.

The washed picture is tinted blue in the following manner:—

Two solutions are made as follows:—

- |    |  |  |
|----|--|--|
| A. | 5 grams of red prussiate of potash     |  |
|    | 300 " " distilled water                |  |
| B. | 5 grams of ferric chloride.            |  |
|    | $1\frac{1}{2}$ " " oxalate of ammonia. |  |
|    | 300 " " distilled water.               |  |

These two solutions are mixed in equal parts and, to the mixture, two drops of hydrochloric acid are added. The bath so obtained must have a clear bright green colour.

After the tinting has taken place, the plate is washed, some hydrochloric acid being added to the first washing water. The washing must be completed in from 5 to 10 minutes, since otherwise the blue goes back and the plate must then be tinted afresh.

The blue colouring or tinting bath can be avoided by using blue copying or printing plates.

The manufacture of such plates is as follows:—

Glass plates run over with gelatine are sensitized in the following bath:—

- |  |  |
|--|--|
| 15 grams of red prussiate of potash.               |  |
| 120 cubic centimeters of water.                    |  |
| 23 grams of the double citrate of iron and ammonia |  |
| 120 cubic centimeters of water.                    |  |

A stock of these plates can be prepared and kept for a long time if packed air-tight.

After the printing has taken place, the plate is only washed with water without fixing.

The negative obtained without a yellow filter can be printed from on to a chloride of silver film with an excess of silver nitrate. These films can be obtained in commerce, for example, detachable celloidin paper made by Schütze and Noack of Hamburg, or direct printing diapositive plates made by Liesegang of Düsseldorf.

After the printing, the picture is thoroughly washed and fixed, whereby a yellowish-orange tone is obtained.

After repeated thorough washing and drying, the film is brought into registration with the blue plate, in which operation, the two plates are brought together film to film and the edges secured by means of gummed paper strips. With the detachable celloidin paper, the film must be loosened in lukewarm

*Improved Process and Apparatus for the Production of Coloured Photographs, &c.*

water and then transferred on to the blue plate, which is preferably effected by catching the loosened film swimming on water on the blue plate and bringing it into registration by suitable adjustment. Working with direct printing plates is to be preferred on account of the greater simplicity. If an intensely yellow film is aimed at, which is desirable for certain purposes, it is recommended to strongly overprint, *i.e.*, to allow the print to become very dark, and after fixing to add to the fixing bath two drops of a 10 per cent red prussiate of potash solution, in which the plate or film is then again immersed. The picture returns and receives a strong yellow tone. The washing thereupon takes place in the usual manner.

In making paper pictures, the procedure is as follows:—A blue copy is made, either directly or by toning as above described, and the ready prepared print mounted on cardboard, in which operation, care is to be taken that the cardboard is to be coated with paste and the blue picture rapidly mounted thereon by means of a roller squeegee. By this means, there is no extension or stretching. It is also advantageous to harden the blue picture by means of a 10% alum solution and to wash. The film is then less sensitive to water and consequently less extensible. The most suitable for this purpose, is direct printing gelatine paper. The yellow printing plate is printed on to detachable celloidin paper and treated as in the above described process, loosened in lukewarm water, transferred on to the blue print and preferably varnished after drying.

If desired, the tone can be altered locally by treating the picture with a one per cent solution of ammonia and with a one per cent solution of hydrochloric acid. The tone of colour alters from violet to red. This local treatment can however only take place before the two films have been mounted on each other.

A too strongly blue picture can be reduced or weakened with diluted 1 per cent ammonia, in which operation the colour is turned to violet. On immersing in dilute hydrochloric acid, the violet changes to blue again.

Should roller films be used for the exposures, it is advisable to make two exposures, one with and the other without a yellow screen, in which operation it is advantageous to use orthochromatic films for both exposures.

The production of coloured pictures by the photo-mechanical process takes place in a similar manner to that in the known three-colour printing, with the difference that, instead of the red and yellow component impressions, a single orange-coloured impression is to be made, thus making in all only two impressions.

Dated this 3rd. day of April 1903.

D. YOUNG & Co.,  
11 & 12 Southampton Buildings, London, W.C.  
Agents for the Applicant.

## COMPLETE SPECIFICATION.

“An Improved Process and Apparatus for the Production of Coloured Photographs and Photo-mechanical Prints.”

I, ADOLF ALFRED GURTNER, of 3 Landhausweg, Berne, in the Swiss Confederation, Architect, 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:—

In the manufacture of coloured photographs, by the two-colour process, the

*Improved Process and Apparatus for the Production of Coloured Photographs, &c.*

procedure is as follows, one sensitized surface is exposed behind a blue filter, and the other behind a red or orange filter. The negative from the first exposure serves for the production of the red or orange picture, that is to say, the print obtained therefrom is coloured red or yellowish red, whilst the blue picture is obtained from the negative of the second exposure. Similarly to what takes place in the three-colour process, the two positive films can be brought into registration with each other in order to obtain a coloured picture. 5

An essential feature of my invention consists in that the light is allowed to fall directly (*i.e.*, without the intervention of a coloured screen or reflector) from the objective or lens or its equivalent on to the film or plate for producing the orange or yellowish-red picture, and also in that the said film or plate is tinted with orange or yellowish-red and is arranged in front of the second sensitized plate so as to serve as a colour-filter therefor. 10

For this purpose, a sensitized plate, which is sensitive to blue rays and which is as transparent as possible, is immersed in a solution of any suitable orange dye and, after drying, is placed with the film side on the film side of an orthochromatic plate. This double plate is preferably united into one plate by any suitable means, and is then placed in the dark slide of the photographic camera in such a manner that the coloured plate is turned with its glass side towards the lens or "objective". The coloured film thus acts as a colour filter for the orthochromatic plate lying behind the same and also serves for the production of the orange picture, that is to say, the prints obtained therefrom are coloured orange or yellowish red, whilst the orthochromatic plate serves for the production of the blue picture. 15 20

The improved process is preferably carried into practice by immersing a chloride and bromide of silver plate or a chloride of silver plate, such as are sold commercially, in an aqueous solution of aniline orange, until it appears coloured deep orange when seen by transmitted light. After the plate so treated is dried, it is united film to film with an orthochromatic plate, the sensitiveness of which for yellow and red is predominant, by cementing or pasting the edges with strips of paper or other suitable material, in which operation, care is to be taken that the two films touch each other at all points in order to obtain perfectly sharp negatives. The double plate so prepared is then placed in the dark slide of the photographic camera and exposed. In the exposure, the orthochromatic plate is acted upon by the yellow and red rays penetrating the plate serving as a colour filter, whilst on the front plate, the blue rays act predominantly. Thus, after developement, two negatives are obtained, of which one serves for the production of orange coloured component pictures and the other for the production of blue component pictures which superposed, or printed over each other as in photo-mechanical printing, give a coloured picture that approximates very closely to nature in so far as, in the object taken, there are no pure red tones, as is generally the case, for example, in landscapes, of which the orange, brick-red and reddish-brown tones are well reproduced. The choice of the kind of plates and the preparation of the plates for the negative are to be such that, with a single exposure of the front and rear plates, both plates are correctly exposed. The colouring of the chloride or chloride and bromide of silver plate must have such intensity that, when this plate is correctly exposed, the rear orthochromatic plate is preferably somewhat over-exposed. 25 30 35 40 45

The two plates, exposed in the manner above described, can be developed in any suitable developer. The fixing can take place in a 10 per cent solution of thiosulphate of soda  $\text{Na}_2\text{S}_2\text{O}_3$  (commonly known as hyposulphite of soda). The orange colouration of the chloride and bromide of silver plate gradually becomes lost in the various baths, which is of advantage in the printing. 50

The negatives can be copied or printed in colour both on to glass, paper or on any other suitable base or carrier; or they can be used in the manufacture of clichés for the coloured component pictures in the photo-mechanical process 55

*Improved Process and Apparatus for the Production of Coloured Photographs, &c.*

of printing. Should the printing be done on glass, the procedure is as follows:—From the negative formed behind the yellow filter, a print is made on a chloride and bromide of silver plate and this is then developed in one of the usual developers and is then, as is usual, fixed. By this means it is sought to obtain a thin positive which however is capable of presenting strong contrasts.

The washed picture is tinted blue in the following manner:—

Two solutions are made as follows:—

- 10           A. 5 grams of red prussiate of potash  
              300   "   "   distilled water  
              B. 5 grams of ferric chloride.  
              1½   "   "   oxalate of ammonia.  
              300   "   "   distilled water.

15           These two solutions are mixed in equal parts and, to the mixture, two drops of hydrochloric acid are added. The bath so obtained must have a clear bright green colour.

              After the tinting has taken place, the plate is washed, some hydrochloric acid being added to the first washing water. The washing must be completed in from 5 to 10 minutes, since otherwise the blue goes back and the plate must then be tinted afresh.

20           The blue colouring or tinting bath can be avoided by using blue copying or printing plates.

              The manufacture of such plates is as follows:—

              Glass plates run over with gelatine are sensitized in the following bath:—

- 25           15 grams of red prussiate of potash  
              120 cubic centimetres of water  
              23 grams of the double citrate of iron and ammonia  
              120 cubic centimeters of water.

              A stock of these plates can be prepared and kept for a long time if packed air-tight.

30           After the printing has taken place, the plate is only washed with water without fixing.

              The negative obtained without a yellow filter can be printed from on to a chloride of silver film with an excess of silver nitrate. These films can be obtained in commerce, for example, detachable colloidin paper made by Schütze and Noack of Hamburg, or direct printing diapositive plates made by Liesegang of Düsseldorf.

35           After the printing, the picture is thoroughly washed and fixed, whereby a yellowish-orange tone is obtained.

40           After repeated thorough washing and drying, the film is brought into registration with the blue plate, in which operation, the two plates are brought together film to film and the edges secured by means of gummed paper strips. With the detachable colloidin paper, the film must be loosened in lukewarm water and then transferred on to the blue plate, which is preferably effected by catching the loosened film swimming on water on the blue plate and bringing it into registration by suitable adjustment. Working with direct printing plates is to be preferred on account of the greater simplicity. If an intensely yellow film is aimed at, which is desirable for certain purposes, it is recommended to strongly overprint, *i.e.*, to allow the print to become very dark, and after fixing to add to the fixing bath two drops of a 10 *per cent* red prussiate of potash solution, in which the plate or film is then again immersed. The picture returns and receives a strong yellow tone. The washing thereupon takes place in the usual manner.

55           In making paper pictures, the procedure is as follows:—A blue copy is made, either directly or by toning as above described, and the ready prepared print mounted on cardboard, in which operation, care is to be taken that the card-

*Improved Process and Apparatus for the Production of Coloured Photographs, &c.*

board is to be coated with paste and the blue picture rapidly mounted thereon by means of a roller squeegee. By this means, there is no extension or stretching. It is also advantageous to harden the blue picture by means of a 10% alum solution and to wash. The film is then less sensitive to water and consequently less extensible. The most suitable for this purpose, is direct printing gelatine paper. The yellow printing plate is printed on to detachable 5  
celloidin paper and treated as in the above described process, loosened in lukewarm water, transferred on to the blue print and preferably varnished after drying.

If desired, the tone can be altered locally by treating the picture with a 10  
one *per cent* solution of ammonia and with a one *per cent* solution of hydrochloric acid. The tone of colour alters from violet to red. This local treatment can however only take place before the two films have been mounted on each other. A too strongly blue picture can be reduced or weakened with diluted 1 *per cent*  
ammonia, in which operation the colour is turned to violet. On immersing in 15  
dilute hydrochloric acid, the violet changes blue again.

Should roller films be used for the exposures, it is advisable to make two exposures, one with and the other without a yellow screen, in which operation it is advantageous to use orthochromatic films for both exposures.

The production of coloured pictures by the photo-mechanical process takes 20  
place in a similar manner to that in the known three-colour printing, with the difference that, instead of the red and yellow component impressions, a single orange-coloured impression is to be made, thus making in all only two impressions.

Having now particularly described and ascertained the nature of my said 25  
invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A process for the production of multi-coloured photographs and photo-  
mechanical prints by combining a blue and an orange-yellow mono-chromatic  
picture, characterized in that, during exposure, the light is allowed to fall 30  
directly from the objective or lens on to the sensitized film or plate for producing the orange or yellowish-red picture, whilst the other sensitized film or plate is exposed behind an orange or yellowish-red screen or colour-filter, substantially as described.

2. A process for the production of multi-coloured photographs and photo- 35  
mechanical prints by combining a blue and an orange-yellow mono-chromatic picture, characterized in that a dry plate tinted with orange is employed in the production of the negative for the orange yellow positive, this orange tinted plate being arranged in front of the second sensitized plate and serving as a colour-filter therefor, substantially as described. 40

3. A plate for use in carrying into practice the process claimed in Claim 2, consisting of a chloride of silver or chloride and bromide of silver plate, which is tinted orange or yellowish-red and which is placed with its film side on the film side of an orthochromatic bromide of silver gelatine plate, the two plates being detachably connected together, substantially as described. 45

Dated this 1st day of January 1904.

D. YOUNG & Co.,  
11 & 12 Southampton Buildings, London, W.C.  
Agents for the Applicant.