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PROVISIONAL SPECIFICATION.

Improvements in Colour Kinematography and in Apparatus therefor.

I, COLIN NOEL BENNETT, of 9, Morrab Road, Penzance, Cornwall, Journalist, do hereby declare the nature of this invention to be as follows:—

This invention relates to kinematographic colour processes of the type proposed by me, according to which the pictures are taken or projected with the aid of a film shifting mechanism pitched to two or more times unit pitch, *i.e.* the length or distance of a single picture, in combination with means for producing simultaneously on or for projecting simultaneously from, each length of film two or more different colour sensation records of the same movement phase. In such processes two or more colour sensation records of the same movement phase are taken one below another on the film at each exposure, and in projecting positives prepared from such negatives a corresponding picture shift is employed and means are provided whereby the corresponding number of colour sensation records of same movement phase are projected simultaneously and superposed upon the screen.

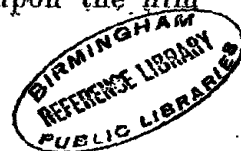
For the purpose of taking such pictures I have proposed to employ a battery of lenses and corresponding colour filters for taking the different colour sensation records forming a set of same movement phase, and I have likewise proposed to employ for this purpose one lens in conjunction with the colour filters and with mirrors or other suitable means adapted to reflect or transmit through the lens into positions on the length of film fed by each shift, the two or more colour sensation records of same movement phase.

The present invention aims to provide improvements or modifications in relation to methods and apparatus of the character above referred to.

According to one part of the invention, I make the film pitch of about the standard pitch, so that the film escapement may remain as it would be for present day black and white work when taking a full sized picture, but I employ an arrangement of colour filters and lenses (or it may be a single lens with appropriate means as above mentioned) adapted to reproduce two different colour sensation records of the same movement phase one below another on the length of film fed by each shift. The positive film prepared from this negative film will be fed with a similar length of shift, and the pairs of pictures will be projected simultaneously in such manner as to be superposed on the screen. With this miniature system it is proposed to utilise only one-half of the width of a normal film for making any one series of pictures. The remaining half of the width may be allowed to go as waste margin; or the film band may be made of only half the normal width.

Preferably, however, two distinct sets of negatives are made upon the film

[Price 8d.]



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at different times, so as to utilise the full width of a normal film. For this purpose the lens or lenses and colour filters and the opening in the gate mask of the camera may be made capable of sliding from one side to the other, to permit of the pictures being taken on the corresponding side of the film.

It will be understood that with this arrangement the one longitudinal series of pictures on the one half of the film is entirely distinct from that on the other half. 5

When a battery of lenses is employed they may be disposed one above the other as described in my prior Specification No. 1642 of 1911 and at a suitable distance apart. 10

Positives from the negative records thus produced could be projected in colour by means of an ordinary projector having its gate mask narrowed to half width, and provided with two openings one below another and each corresponding to the miniature picture (or it might be a single opening), the projector being fitted with corresponding lenses and colour filters for projecting 15 simultaneously the pair of colour sensation records corresponding to each length of shift and with means for superposing the same on the screen. For instance, I may employ two optical lantern bodies situated behind the gate of the projecting mechanism and so arranged that the light beams from their condensers pass through the one and the other of the pair of kinematograph positives in 20 position in the double picture gate opening, and from thence through the respective colour filters and lenses to the screen, these images being made to coincide on the screen by means of suitable centering attachments to the projection lenses. Or the beams from the light sources employed may be bent prior to striking the picture gate, by means of mirrors or right angled or other 25 prisms. Or a single source of light may be made to provide all the light for the purpose of the projection, and may be divided into separate beams which would be distributed on the pictures in the gate by mirrors, prisms or other devices.

According to a further part of the invention I propose to employ a film shift 30 pitched to a suitable multiple of the length or distance of one picture, and to take the different colour sensation records of a set representing same movement phase simultaneously, but not in consecutive order on the film, the spaces between appertaining pictures of a set being occupied by pictures of other sets.

For two colour work, the two colour sensation records of a set may be taken 35 simultaneously at the separation of four pictures, so that there would be a space corresponding to two picture spaces on the film between them. Calling the spaces lengthwise of the film 1, 2, 3, 4, etc. the pictures on 1 and 4 would then be taken together as a set. Then the next shift would bring spaces 3 and 6 40 opposite the gate opening for the next exposure and give the next set; then at the next shift, spaces 5 and 8 would be exposed, and so on.

For three colour work the three colour sensation records of a set would be taken simultaneously at suitable intervals apart, and the arrangement may for 45 example be such that the picture spaces 1, 2 22, etc. lengthwise of the film are exposed simultaneously in groups of three as follows: 1, 5, 9; 4, 8, 12; 7, 11, 15; 10, 14, 18; 13, 17, 21; and so on.

In either case a suitable arrangement would be employed to mask the picture spaces on the length of film fed which do not correspond to those of the set being taken at the given exposure. A battery of two lenses for two colour work or three lenses for three colour work may be employed, the lenses being spaced 50 apart a suitable distance. Or a single lens and mirrors or other suitable means may be employed as above described. An advantage hereinafter described can, however, be obtained by the spacing apart of the lenses of a battery.

I may apply this alternating method with advantage for the production of miniature pictures of say half the standard length common in practice. For 55 this purpose I would employ a picture shift of the standard pitch and an extended gate provided with suitable openings in conjunction with the necessary colour

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filters and a battery of lenses suitably spaced apart (or a single lens and mirrors or other means as above mentioned) in such manner as to take the miniature pictures in sets of two or three simultaneously at intervals apart as above mentioned. Thus for two colour work, two half length or miniature colour
 5 sensation records may be taken simultaneously at the separation of two full size or four half size pictures, and the sequence of the pictures on the film may be as above explained for two colour work.

For three colour half length work, a similar arrangement may be adopted, using a film shift three times the length or pitch of a half length or miniature
 10 picture, and the gate may be made of the length of nine miniature pictures and provided with exposure apertures such that the picture spaces can be exposed in groups of three in the sequence above explained for three colour work, the other picture spaces on the length of film fed for a given exposure being masked. When a battery of three lenses is used they would also be spaced at the proper
 15 intervals apart.

With such an arrangement described either for two colour or three colour miniature kinematography, two distinct series of pictures may be taken on one film of ordinary width as before mentioned.

In applying the alternating method above described to the taking or projection of colour kinematograph pictures of full standard size with a battery of
 20 lenses, these may be spaced at approximately four normal picture lengths apart for two colour work, or at approximately five normal picture lengths apart for three colour work, and the film shift would be two or three times the normal as the case may be.

In these cases also a single lens may be employed with suitable mirrors or other means as before described in taking the pictures, instead of a battery of lenses.

The advantage secured by the wider spacing apart of the lens centres of a battery as employed for taking pictures by the alternating methods described is that in this way lenses can be employed of larger diameter and having greater
 30 rapidity than when the lenses have to cover adjacent spaces.

I may employ any suitable means for overcoming increased parallax trouble which may arise with a system of taking two or three pictures with lenses at increased intervals apart in alternating methods as above explained. In
 35 particular I may employ any suitable mirror system for catching the image and photographing the reflection. For example, mirrors may be disposed to reflect the object through the lenses of the battery. With a two colour camera for instance, I may arrange two mirrors at an angle to each other between the axial lines of the two lenses of the battery, each of these mirrors being arranged
 40 to reflect the image on to another mirror disposed adjacent to the corresponding lens of the battery and adapted to reflect the image through the same.

Positives from sets of pictures taken in the alternating manner explained will be projected in superposition on the screen, which can be effected in a manner similar to that hereinbefore described, the projector being adapted to
 45 project simultaneously and in superposition, the pictures forming a set, and having a double or treble pitched film shift for two and three colour work respectively.

In projecting pictures obtained by the present invention in any of its modifications I may provide the projecting lenses, as described in my Provisional
 50 Specification No. 1900 of 1912, with iris diaphragms to enable the relative brilliancies of the projected colour record sensations to be altered at will, to allow for colour changes or for compensating for the undue ascendancy of any particular colour sensation in the projected colour image.

According to a further form of the invention I propose to take the simultaneous
 55 miniature colour sensation records of a group one above another upon a film fed forward laterally instead of vertically.

For two colour work for example, a red sensation record and a green

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sensation record could be taken simultaneously one above the other at each exposure of the laterally fed film, by means of two lenses mounted one above the other (or one lens and mirrors or other suitable means), in conjunction with their corresponding colour filters. The pictures of a set would thus be at right angles to the length of the film. The film shift may be of the usual length, and two simultaneous records of corresponding lateral length, but each of half the width of the film between margins would then be obtained at each exposure. A reduced or an extended film shift may however be employed in some cases. 5

For projecting positives from such pictures, a normal projection system may be employed in conjunction with means for travelling the film laterally, and provided with optical means for superposing on the screen the colour record images of a set. Projecting means such as hereinbefore described may be employed or any other suitable means, such for example as a projector working on end (as usual) but provided with projection lenses disposed side by side, and with mirrors, prisms, or other optical means for superposing the projected images and turning them round through 90° to show them on the screen. 10 15

Dated this 4th day of May, 1912.

MEWBURN, ELLIS & PRYOR,
70 & 72, Chancery Lane, London, W.C.,
Chartered Patent Agents. 20

COMPLETE SPECIFICATION.

Improvements in Colour Kinematography and in Apparatus therefor.

I, COLIN NOEL BENNETT, of 9, Morrab Road, Penzance, Cornwall, Journalist, 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:— 25

This invention relates to kinematographic colour processes wherein the pictures are taken or projected with the aid of a film shifting mechanism pitched to two or more times unit pitch, *i.e.* the length or distance of a single picture, in combination with means for producing simultaneously on or for projecting simultaneously from, each length of film fed forward, two or more different colour sensation records of the same movement phase. In such processes two or more colour sensation records of the same movement phase are taken one below another on the film at each exposure, and in projecting positives prepared from such negatives a corresponding picture shift is employed and means are provided whereby the corresponding number of colour sensation records of same movement phase are projected simultaneously and superposed upon the screen. 30 35

For the purpose of taking such pictures I have proposed to employ a battery of lenses and corresponding colour filters for taking the different colour sensation records forming a set of same movement phase, and I have likewise proposed to employ for this purpose one lens in conjunction with the colour filters and with mirrors or other suitable means adapted to reflect or transmit through the lens into positions on the length of film fed by each shift, the two or more colour sensation records of same movement phase. 40 45

The present invention aims to provide improvements or modifications in relation to processes and apparatus of the character above referred to.

According to the invention I propose to employ a film shift pitched to a suitable multiple of the length or distance of one picture, and to take the 50

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different colour sensation records of a set representing same movement phase simultaneously, but not in consecutive order on the film, the spaces between appertaining pictures of a set being occupied by pictures of other sets.

For two colour work, the two colour sensation records of a set may be so taken simultaneously that there would be a space corresponding to two picture spaces on the film between them. Calling the spaces lengthwise of the film 1, 2, 3, 4, *etc.* the pictures on 1 and 4 would then be taken together as a set. Then the next shift would bring spaces 3 and 6 opposite the gate opening for the next exposure and give the next set; then at the next shift, spaces 5 and 8 would be exposed, and so on.

For three colour work the three colour sensation records of a set would be taken simultaneously at suitable intervals apart, and the arrangement may for example be such that the picture spaces 1, 2 *n etc.* lengthwise of the film are exposed simultaneously in groups of three as follows: 1, 5, 9; 4, 8, 12; 7, 11, 15; 10, 14, 18; 13, 17, 21; and so on.

In either case any suitable arrangement would be employed to mask the picture spaces on the length of film fed which do not correspond to those of the set being taken at the given exposure. A battery of two lenses for two colour work or three lenses for three colour work may be employed, the lenses being spaced apart a suitable distance. Or a single lens and mirrors or other suitable means may be employed as above described. An advantage hereinafter described can, however, be obtained by the spacing apart of the lenses of a battery.

The accompanying drawings illustrate diagrammatically arrangements for two and three colour work respectively, according to the process above described. Fig. 1 shows the two lenses *a a'* disposed at such a distance apart that two picture lengths intervene between them, whilst *b* represents the claw of the film shift mechanism, adapted to feed the film through the gate a distance of two picture lengths at each shift. Fig. 1^a shows the corresponding film, the cross-hatched divisions representing the sections of film which are opposite the lenses of Fig. 1 and being exposed together as a pair. It will be seen that by this means the pictures can be taken in pairs in the order above indicated for two colour work. R, G indicate the different colour filters for the respective lenses.

In Fig. 2, *c c' c''* represent three lenses disposed at equal distances apart, such that there is a distance corresponding to the feed of three picture lengths between them. The film shift claw *b* in this case feeds the film three picture lengths at a time, so that the pictures are taken in sets of three on the film (Fig. 2^b) in the order indicated above for three colour work. R G B represent the different colour filters for the respective lenses.

I may apply the alternating process of the present invention with advantage for the production of miniature pictures of say half the standard length common in practice. For this purpose I would employ a picture shift of the standard pitch and an extended gate provided with suitable openings in conjunction with the necessary colour filters and a battery of lenses suitably spaced apart (or a single lens and mirrors or other means as above mentioned) in such manner as to take the miniature pictures in sets of two or three simultaneously at intervals apart as above mentioned. Thus for two colour work, two half length or miniature colour sensation records may be taken simultaneously at the separation of two full size or four half size pictures, and the sequence of the pictures on the film may be as above explained for two colour work.

For three colour half length work, a similar arrangement may be adopted, using a film shift three times the length or pitch of a half length or miniature picture, and the gate may be made of the length of nine miniature pictures and provided with exposure apertures such that the picture spaces can be exposed in groups of three in the sequence above explained for three colour work, the other picture spaces on the length of film fed for a given exposure being masked. When a battery of three lenses is used they would also be spaced at the proper intervals apart.

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With such an arrangement described either for two colour or three colour miniature kinematography, two distinct series of pictures may be taken on one film of ordinary width.

In applying the alternating process above described to the taking or projection of colour kinematograph pictures of full standard size with a battery of lenses, these may be spaced at four normal picture lengths apart for two colour work, or at five normal picture lengths apart for three colour work, and the film shift would be two or three times the normal as the case may be.

In these cases also a single lens may be employed with suitable mirrors or other means as before described in taking the pictures, instead of a battery of lenses.

The advantage secured by the wider spacing apart of the lens centres of a battery as employed for taking pictures by the alternating methods described, is that in this way lenses can be employed of larger diameter and having greater rapidity than when the lenses have to cover adjacent spaces.

I may employ any suitable means for overcoming increased parallax trouble which may arise with a system of taking two or three pictures with lenses at increased intervals apart in alternating methods as above explained. In particular I may employ any suitable mirror or prismatic system for catching the image and photographing the reflected or refracted image. For example, mirrors may be disposed to reflect the object through the lenses of the battery. With a two colour camera for instance, I may employ an arrangement such as described in my Specification No. 10,150 of 1912, and in which two mirrors are arranged at an angle to each other between the axial lines of the two lenses of the battery, each of these mirrors being arranged to reflect the image on to another mirror disposed adjacent to the corresponding lens of the battery and adapted to reflect the image through the same.

Positives from sets of pictures taken in the alternating manner explained will be projected in superposition on the screen with the aid of appropriate colour filters, which can be effected in any suitable manner, the projector being adapted by any suitable known means, such for example as tilting the lenses or adjusting the centering of the lenses,—to project simultaneously and in superposition, the pictures forming a set, and the projector having a double or treble pitched film shift for two and three colour work respectively.

It is obvious that instead of shifting the film vertically in any of the forms of the present invention it may be shifted horizontally, the whole machine being then turned round through 90°.

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. The improvement in colour kinematography which consists in taking the different colour sensation records of a set of two or more of same movement phase simultaneously but not in consecutive order on the film, the spaces between appertaining pictures of a set being occupied by pictures of other sets, and the film shift being pitched to a suitable multiple of the length or distance of one picture, substantially as described.

2. In the method specified in Claim 1, the taking of the alternating sets of colour sensation records in the order as hereinbefore described for two colour and three colour work respectively.

3. The application of the methods specified in Claim 1 or 2 to the production of miniature pictures of about half the usual or standard size, the film shift being suitably pitched for the purpose, substantially as described.

4. In a method according to Claims 1 to 3, the employment of means such as hereinbefore described for reducing parallax in the taking of the sets of colour sensation records.

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5. The projection in superposition and with the aid of colour filters, of positives prepared from negatives produced according to Claims 1 to 4 respectively.

6. Negative films produced substantially as set forth in Claims 1 to 4 respectively, and positives prepared therefrom.

Dated this 4th day of November, 1912.

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