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PATENT



SPECIFICATION

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COMPLETE SPECIFICATION.

**Improvements in or relating to Kinematograph Films and other Photographic Transparencies.**

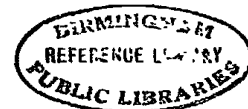
I, WILLIAM BURTON WESCOTT, of 9, Harcourt Street, Boston, Massachusetts, United States of America, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

5 My invention relates to a strip or film of negative or positive photographic images adapted for use as the prime record from which series of like positives or negatives may be reproduced; or when the strip comprises positive images, adapted for projection through a suitable image-forming optical train to produce on a distant screen a series of images, which may be superposed, and may  
10 succeed each other in a relation of time and duration suitable for motion pictures; and to the art of making such a strip or series of transparencies.

My invention consists in the art of producing a transparency having a plurality of series of complementary images, the corresponding images of the respective series preferably representing different color aspects of the object  
15 field such that the combination of the different aspects affords a reproduction of the object field in colors corresponding to the natural colors of the object field, and the corresponding images of the respective series being rendered geometrically like by exposing the corresponding negatives of the respective series from the same point of view at the same time. And my invention not only consists in  
20 rendering the corresponding images of the respective series geometrically like, as by forming them simultaneously along a single optical axis from the same point of view, but the invention also consists in producing a transparency of this character of which the corresponding images of the respective series are spaced apart by one or more picture spaces so that more space is afforded, both in the  
25 camera and in the projector for the optical apparatus in the region of the respective images which are being simultaneously recorded or projected. Moreover, my invention consists not only in spacing the corresponding images of the respective series apart but also preferably in so spacing them in alinement that substantially all of the film is utilized without undue gaps between pictures,  
30 and in so spacing the images that the images of the respective series are regularly intercalated so that the transparency may be regularly advanced. The invention also comprises the resultant transparency formed by this improved art.

Thus, the invention consists in producing a transparency in which the corresponding  
35 images represent concomitant aspects of the object field from the same point of view, and not succeeding aspects from the same point of view

[Price 6d.]



and not concomitant aspects from different points of view; and in forming the corresponding images in spaced relationship with respect to each other so that the corresponding images are separated from each other by one or more image spaces.

In the accompanying drawings,—

Figure 1 is a schematic diagram illustrating a negative film and steps taken in its production;

Figure 2 is a diagram illustrating a positive film and one use thereof.

Both the negative and the positive may have the characteristics, familiar to those skilled in the art, of a film or strip adapted to motion picture projection, comprising a continuous ribbon of a transparent supporting body coated with a sensitive emulsion and having at its edges, if desired, openings *a* to be engaged by the mechanical means employed in camera or projector for advancing the film.

In the article of commerce so far defined and as at present known, successive spaces on the film are occupied by successive pictures similarly arranged in a geometrical sense with respect to the strip of film.

My new device comprises bodily separated groups of, similarly oriented, complementary pictures taken from the same point of view of simultaneous appearances of the object field, the members of the groups being separated by a plurality of picture spaces. A negative film 1 having a group of two such pictures at  $G^1, R^1$  is illustrated in Fig. 1, together with a diagram of one form only of an optical train, forming no part of the invention herein claimed, with the aid of which such images may be satisfactorily produced. The images of any two points in the object field of the camera lens appear each twice on the film, at equal distances apart measured in the direction of length of the strip, each member of the complementary pair of images of the same point in the object field lying on one side of and separated from an imaginary axis *b*, which axis may be in the optical axis *x* of the lens *L* between two pictures simultaneously made. In one form, that illustrated, this imaginary axis *b* is displaced from the nearest point of either of the pictures by one full space for one picture, so that there are between each related pair of points in the pictures three full spaces, of which two are available for other pictures.

While I have shown the bottom and top of the pictures as being in the longitudinal axis of the film, it will be apparent that a vertical of the object field might lie at right angles across the strip of film, and in this case points at one side of the object field lead or follow in the direction of length of the strip.

In the preferred form of my device illustrated in Fig. 1, the next group of complementary pictures  $G^2, R^2$  similarly separated and similarly straddling an imaginary axis between them, is displaced in the direction contrary to the motion of the film, so that one member of the group,  $G^2$  as shown, occupies that one of the spaces left between the pictures  $G^1, R^1$  lying nearer the following member of the separated pair  $G^1, R^1$ . I prefer to make the film by first exposing the group  $G^1, R^1$ , simultaneously, then interrupting the light and causing the film to move two picture spaces with respect to the optical axis, and then exposing for group  $G^2, R^2$ , of which one member,  $G^2$  as shown, lies in the space between members  $G^1, R^1$ .

The third group similarly related,  $G^3, R^3$ , is now made after a similar motion in darkness of two spaces of the film, picture  $G^3$  filling the space between  $R^1$  and  $R^2$ , so that all the space on the film is continuously utilized.

An indefinite succession arranged in like manner is contemplated by my invention.

For some purposes the two pictures of the group  $G^1, R^1$  may be precisely alike, but it will be understood that one purpose of my invention is to provide a film in which the images  $G^1, G^2, G^3, etc.$ , are made by the emitted or reflected light of the object field of a selected range of wave-lengths, or color, for instance being taken through an absorption screen *s* having a maximum transmission

in the green; while the companion picture  $R^1$  is taken by the light of the complementary wave-length emitted by the object field, for instance through an absorption screen  $s^1$  having a maximum transmission lying in the orange-red.

5 An important quality of the groups of complementary pictures lies in the likeness of geometrical form of the complemental images secured by their relation to the same optical axis. The images of the series G and the images of the series R are geometrically similar divisions or splits of predetermined intensities of a white-light, whole, or natural-color beam of light directed to a focus, as by a suitable lens  $L$ , and divided by a half-silvered surface  $g$ , or  
 10 equivalent device, adapted to transmit approximately half the light and to reflect approximately half the light. The divisions of the beam may thereafter, if desired, be separately, selectively absorbed at screens  $s, s^1$ , before impingement upon the sensitive surface. In form, *i.e.*, in the relation of position of any one point in any dimension in the object field to the geometrical  
 15 center or boundaries of each picture space of the film, the images are identical, and are thereby to be distinguished from simultaneous pairs of pictures made from any two points of view respectively, in which case points separated in the line of sight differ in angular position in each of the optical systems, and are not and cannot be superposed without overlapping, as well illustrated by the  
 20 stereoscope of common knowledge.

The pictures of my film are therefore characterized by recurrent simultaneous like pairs, of which the members are geometrically identical; but in which there may be differences relating to the wave-length of light emitted or reflected by the object pictured.

25 If in the object field there should exist, for instance, separated objects, the first emitting light of the pure color of the absorption screen  $s$ , and the other emitting light of the pure color of the screen  $s^1$ , the pictures of the series G will bear a full image of the first object and no image of the second object, but on the complementary series R the pictures will bear a full image of the second  
 30 object and none of the first object. An infinite gradation of intensity of image may exist relatively between the complemental pairs of series G and series R. Referring now to Fig. 2, a positive 2 printed by direct contact or other means giving a reversed image of the negative illustrated in Fig. 1 will provide similar pictures,  $g^1, r^1, g^2, r^2$  in which the transparent or translucent  
 35 places represent light emitted by the object field in the wave-lengths passed by the absorption screen employed in taking the series  $G^1, G^2, etc.$ , of the negative, and it will be readily understood that my invention contemplates the use of the positive strip in a projector provided with means for projecting the positive images by light colored accordingly, so that the combined image superposed  
 40 on the screen of the pairs  $g^1, r^1, g^2, r^2, etc.$  produces upon the eye the relative distribution and intensities of the selected complementary colors, and therefore reproduces with a close approach to accuracy the natural colors of the original object field.

45 Once brought into relation to a projection device such as that suggested only in Fig. 2, as one instance of many different forms of device which may be employed, it will be perceived that images of each pair  $g^1, r^1, etc.$  through the respective lenses  $L^1, L^2$  and absorption screens  $s^2, s^3$  for colors related to those absorbed by screens  $s, s^1$  may be brought into registry at the screen S by adjustment of the position or the virtual position of the optical axes  $y^1, y^2$  of the  
 50 lenses  $L^1, L^2$ , and that thereafter successive other pairs will either accurately register or depart from registry so slowly that manual adjustment at the lenses is sufficient to maintain registry. To permit such adjustment, the physical separation of the optical axes of lenses  $L^1, L^2$  is of great practical importance.

55 Other advantages as an article of use for motion picture projection flow from the separation of the pictures. The means acting on the film to advance and position it may engage the film at or throughout the space between the components of the groups of pictures, and it will be evident that probability

of error of position will thereby be reduced, and made to affect the complementary members of a simultaneously projected group alike, to secure accurate superposition of the images at the screen as compared with the error to be expected of a film engaged by its moving devices on one side of a group of such images.

I do not herein claim such a projection device, and it will be evident that the complementary pairs of transparencies characteristic of my new film may be projected by any convenient arrangement permitting images in light of the respective colors to be simultaneously formed in registry at the screen. It will be apparent that the separation of the components of the complementary pairs is valuable to the mechanical design of such a projection apparatus, enabling a sound construction of the mechanism using the film flowing from the mechanical separation of the optical axes of the respective image-forming lenses.

But it is not essential in order to obtain many of the advantages of my invention that the registering complementary images shall be simultaneously projected. Having been formed simultaneously from the same point of view, images of the respective colors may be correctly displayed on the screen in succession, the film remaining stationary, the effect of the persistence of vision being relied upon to combine the successive differently colored registering images in an impression upon the observer similar to that due to superposed simultaneous projection, motion of the film for a new set of complementary images occurring after the successive display of the components of the previous set. I do not prefer such successive display of the color components of the combined image, believing it to be one cause of excessive fatigue to the eyes observed in connection with a well known form of colored motion pictures depending on successive display of images of the different colors, but it will be apparent that my new transparency will permit such display with the great advantage of a rigid likeness in the successive pictures of different color, so that moving objects displayed will not be preceded and followed by a fringe or strip of the respective colors due to movement of the moving object during the time interval between taking a picture in one color and taking the next picture in another color.

It will be observed that having arranged the components of my transparency for simultaneous display of all the elements of color of each interval of illumination, that I am enabled to employ all of the projected light at each illumination, and thereby to secure a resultant total illumination of the persistent images of the successive components of the series greatly increased as effective to the observer while avoiding the fatigue of attempting to combine in the eye pictures not registering exactly on the screen.

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 art of forming transparencies, comprising the simultaneous exposure of different parts of the same sensitive surface separated by a plurality of spaces not then exposed, to a plurality of images of the same object field viewed from the same point.
2. In the art of forming a continuous strip of transparencies as in Claim 1, exposing a first group of separated spaces of the sensitive surface of said strip to a plurality of images of the same object field originating along the same optical axis, and thereafter exposing to a similar plurality of images a second group of spaces having a member intervening between members of the said first group.
3. In the art of forming as in Claim 1, transparencies characterized by series of groups of pictures of which the members are geometrically similar, simultaneously exposing a plurality of picture spaces separated by a plurality of similar spaces of the sensitive surface to a plurality of images formed by light gathered along a single axis, and thereafter moving the sensitive surface

through a plurality of spaces and exposing another similar plurality of picture spaces to a plurality of images similarly formed.

4. The art of forming a continuous strip of transparencies bearing complementary indications mutually capable of obscuring light of different colors whereby to form superposed images then having a combined color related to the color of the object photographed, comprising the simultaneous exposure of different spaces of the same sensitive surface separated by a plurality of similar spaces to a plurality of images of the object originating along the same optical axis, one or more of the images being subjected to selective absorption with respect to color.

5. In the art of forming transparencies by photography as in Claim 4, exposing separated spaces of the film bearing one group of said pictures to light originating along a single optical axis and divided into parts impinging on said spaces of the film, the parts of the light being subjected to selective absorption, and thereafter moving the film and exposing spaces including a space intervening between said separated spaces for another group of pictures.

6. In the art of forming photographic transparencies for the projection of colored pictures of an object as in Claim 1, exposing a continuous sensitive surface to spaced images representing the aspect of said object from a single point of view in light of different colors for each image, the images being spaced apart by as many intervening spaces as there are images.

7. A transparency for motion pictures characterized by two intercalated series of pictures thereon of which the pictures of each complementary group, comprising one picture in each series, are geometrically alike and separated by at least one picture space.

8. A transparency according to Claim 7 bearing a series of groups each of complementary geometrically like photographs characterized by the complementary photographs being simultaneous and separated by a plurality of spaces for members of similar groups.

9. A transparency for motion pictures according to Claim 8 further characterized by each group of pictures representing from the same point of view the same object field at the same time.

10. A transparency for motion pictures as claimed in Claiming Clause 7, further characterized by one component picture of each group being photographed by light predominantly of a different color from the light by which another picture of the complementary group is photographed.

Dated the 18th day of October, 1916.

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Chartered Patent Agents.

Reference has been directed in pursuance of Section 7, Sub-section 4, of the Patents and Designs Act, 1907, to Specification No. 10,639 of 1912.

This reference is inserted as the result of a Provisional Report under Rule 29 of the Patents Rules, 1908.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1917.

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

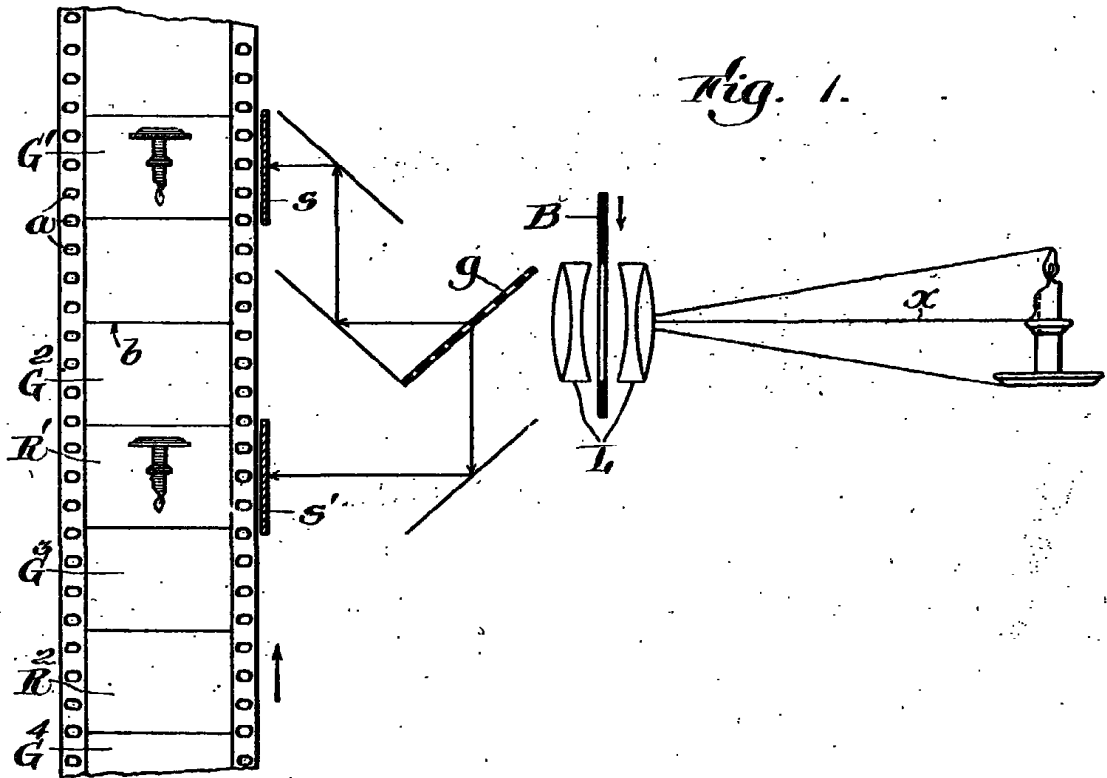


Fig. 1.

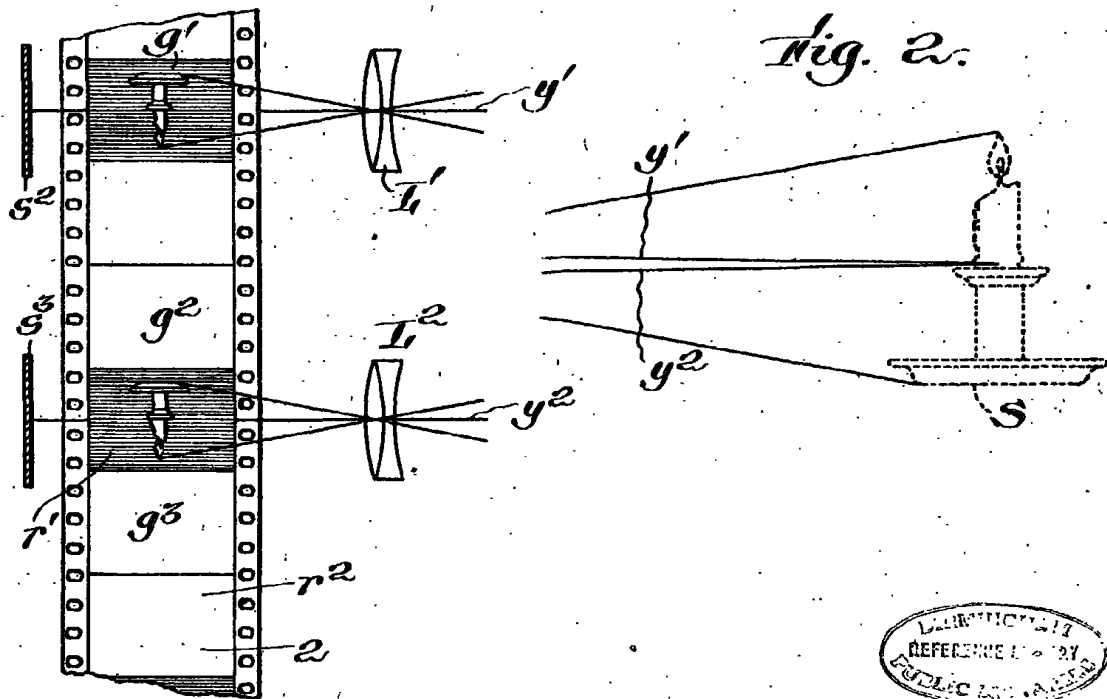


Fig. 2.

