

L. F. DOUGLASS.
PROCESS OF PRODUCING MOVING PICTURES IN COLOR.
APPLICATION FILED APR. 25, 1918.

1,325,279.

Patented Dec. 16, 1919.

Fig. 1.

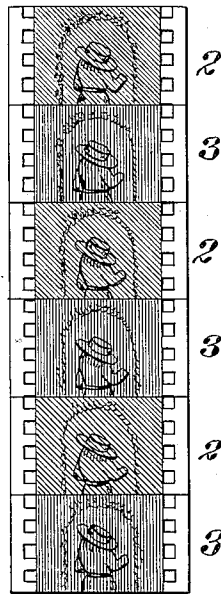
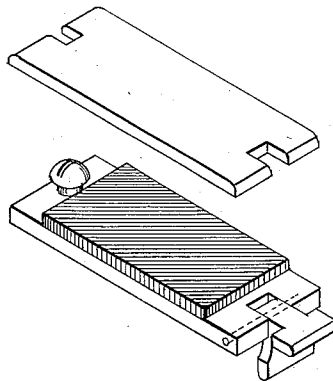


Fig. 2.



INVENTOR.
Leon F. Douglass
BY
Strong & Townsend
ATTORNEYS

UNITED STATES PATENT OFFICE.

LEON FORREST DOUGLASS, OF SAN RAFAEL, CALIFORNIA.

PROCESS OF PRODUCING MOVING PICTURES IN COLOR.

1,325,279.

Specification of Letters Patent.

Patented Dec. 16, 1919.

Application filed April 25, 1918. Serial No. 230,678.

To all whom it may concern:

Be it known that I, LEON F. DOUGLASS, a citizen of the United States, residing at San Rafael, in the county of Marin and State of California, have invented new and useful Improvements in Processes of Producing Moving Pictures in Color, of which the following is a specification.

This invention relates to the production and projection of moving pictures in natural color, and pertains especially to a process of producing a cinematographic film in color and the projection of the same. Having reference to the accompanying drawings, Figure 1 illustrates a film schematically indicative of the invention, and

Fig. 2 represents a mask suitable for use in the process.

One object of my invention is to provide a film which can be run through the ordinary projector, and which contains a series of images so colored as to give, when projected, a moving picture in natural colors, thus dispensing entirely with the rotary colored shutter which is usually required.

Another object of my invention is to increase the brilliance and intensity of the projected colored pictures.

My new process, briefly stated, comprises: 1st. Producing a positive film whereon every other image possesses a red or yellowish-red color value and the remaining alternate image a green or green-blue color value, this film being in black and white; and

2. Coloring the red color value images red, and the green color value images green, the coloring being produced by toning or tinting so that the finished colored film is a unitary film wherein the coloring is inherent on the film itself.

Toning consists in either wholly or partially replacing the silver image of the positive film by some colored compound; the clear portions or highlights of the image, consisting of plain gelatin, remaining unaffected and colorless. Tinting on the other hand, consists of immersing the film in a solution of dye which colors the gelatin itself, causing the whole picture on the screen to have a veil of color over it.

The black and white positive above mentioned may be obtained in various ways, as by using a camera with screens of complementary colors to produce negatives from which the positives are printed. The black

and white positive film is then colored or dyed in the following way:

I first mask all the pictures of red value in the film so as to protect the red color value images against the action of the green or green-blue coloring solution, while these green or green-blue images are being toned or tinted. As a mask I may employ either a suitable good quality dye proof varnish which can be washed off without affecting the film, or I may employ a mechanical mask in the form of a clamp as shown in Fig. 2 of the drawing; this clamp consisting of two pieces of metal covered with rubber, which latter is adapted to press against the film and exclude moisture without injuring the emulsion; these clamps being quickly put on and taken off by appropriate means constituting no part of the present process.

In the practice of the process I preferably color the images by tinting with appropriate dyes. The most suitable dyestuffs for tinting are those which are chemically known as the so-called "acid" dyes which are alkaline—usually sodium salts of organic acids. The dye employed should be inert and not attack the gelatin or support. It should not "bleed" to any considerable extent when the film is washed. It should also be stable to light, and not be dichroic, or change color on dilution.

In the practice of the invention, certain desired colors may be obtained by admixture to reproduce any given tint. The dyes employed are standard dyes, for example, as follows:

Name used in formula.	Commercial name.	
Cine red	Chromotrop FB	
" orange	Orange GRX	95
" yellow	Quinolin yellow	
" blue-green	Brilliant patent blue	
" blue	Naphthamin blue 12B	

The above dyes are the commercial grades as supplied by the various dye makers, and contain on an average about 20% of loading material in the form of sodium chlorid or sodium sulfate, which is in no way injurious to the film. A green dye that is suitable for this work is what is commercially known as acid green made by Wells & Richardson Co., Burlington, Vt. I may also use a green dye furnished by the National Aniline Chemical Co.; also a bluish-green and a film yellow.

The proportions that I use of these dyes are as follows:

1 oz. 5 drams of blue-green dye to 1 oz. of the yellow and 10 gals. of water.

- 5 For the red dye I use 3 oz. of dye to 5 gals. of water.

For the special blue-green dye, furnished by Wells, Richardson Co. I use 6 oz. of dye to 5 gals. of water.

- 10 In all dye baths $\frac{1}{2}$ oz. acetic acid is added to 1 gal. of water.

The time required for dyeing is from $1\frac{1}{2}$ to 5 minutes. When the dye will no longer bring the film to the proper color in five minutes I consider it exhausted and throw it away. The dye bath in practice is maintained at about 65° F.

- 15 As the red value pictures are varnished over or otherwise suitably masked, the green or green-blue dyeing in no way affects them.

- 20 The dye film is then rinsed in water to remove any surplus of dye and where varnish is employed as a mask, the film is then immersed in ethyl alcohol of approximately 190° proof to remove the varnish.

After drying I mask all the pictures that have been dyed green, and dye all of the unmasked pictures, taken for red value, with the red dye set out above.

- 25 30 The dyed film is again rinsed in water to remove any surplus red dye; the film dried and the masks removed, whereupon the film is ready for exhibition; this film being a positive film with every other picture red and green. If varnish has been used as a mask in the red dyeing operation, the same process is used for removing the varnish from the green colored pictures as was employed above when removing the varnish from the red color value pictures. The ultimate result is the same whether a mechanical mask is used, such as is shown in Fig. 2, or a varnish mask is employed, the finished film having alternate pictures of red and green, or red and green-blue, the film after being dried being ready for exhibition in a moving picture machine as in standard practice.

- 35 40 45 50 Although the tinting or dyeing by the method and means above described affects the coloration of the entire body of the gelatin, highlights, as well as images, so that all the green pictures have a veil of green color over their entirety, and correspondingly all the red pictures have a veil of red color over their entirety, nevertheless when these pictures are projected on the screen in rapid succession the green and the red in the highlights neutralize each other, or annihilate one another as it were, so that we see white light on the screen. So far as the results are concerned to the observer, the whites of the projected pictures are apparently formed by directly transmitted white light,

The toning process does not affect the whites in the picture; therefore, when it is projected there are passed only just such colors as are necessary to reproduce the picture in natural colors. Since the whites or highlights in the images on the black and white positive are not colored, or are less deeply colored than other portions, the whites of the projected pictures are formed by directly transmitted white light.

70 75 The drawing represents a positive film having the desired color value in which the green images are indicated at 2, and the red images at 3.

My process of coloring the positive entirely does away with the colored window shutter which in itself is a very decided advantage. The rapid speed necessary to produce the natural color effect can be used on any regular moving picture projector without any change whatever.

80 85 90 As there is no change whatever in the projecting machine, strips of this film can be put in on the same reel with the black and white so part of the reel could be run in black and white, and part of it in color, if desired.

By coloring the pictures, either by dyeing or toning so that the coloring is inherent in the emulsion-coating of the film, not only a greater brilliancy, but a better definition and greater sharpness of outline is obtained, and very much less light is required than where any form of mechanical screens or filters or other mechanical coloring means outside the emulsion itself are employed.

100 105 The process has been practically demonstrated, and has produced wonderfully improved results on the screens over any other known or recognized method, of which I have knowledge.

In this specification and in the claims the word "colored" is comprehensive of tinting or toning, the result of which is to render the coloring matter inherent in the color valued emulsion-coating of the film.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. The process of producing a cinematographic film which comprises producing a positive film in which alternate pictures have a red color value and the intermediate pictures have a green color value, clamping over each of a plurality of the red value pictures a separate mechanically removable mask, passing the film, with red value pictures masked, into contact with a green coloring solution, removing the masks and subjecting the film to further treatment to color red only those portions of the film which were originally masked.

2. The process of producing a cinematographic film which comprises producing a positive film in which alternate pictures

have a color value with respect to one color, and intermediate pictures have a complementary color value, covering each of a plurality of the intermediate pictures with a mechanically removable mask, passing the film with intermediate pictures masked into contact with a solution capable of coloring the unmasked pictures said one color, removing the masks, and subjecting the film to further treatment to effect the complementary coloring of only those portions of the film which were originally masked.

3. The process of producing a cinematographic film which comprises producing a positive film in which alternate pictures have a color value with respect to one color, and intermediate pictures have a complementary color value, so affixing to each of a plurality of said intermediate pictures a mechanically removable mask, having an elastic face, that said elastic face will exclude moisture from the emulsion surface of the picture and prevent the dye from creeping, bringing the resulting film with masks affixed thereto into contact with a so-

lution capable of coloring the unmasked pictures said one color, removing surplus solution from the film, removing the masks and affixing them to each of a plurality of the colored alternate pictures, then bringing the film with masks affixed thereto into contact with a solution capable of coloring the intermediate pictures said complementary color, and finally removing the masks and drying the film.

4. In the process of selectively coloring cinematographic films, the step of applying mechanically removable masks to portions of said film, said masks being adapted to completely prevent access of dye to the masked portions upon immersion of the film in a dye bath.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LEON FORREST DOUGLASS.

Witnesses:

MARIUS SCHMIDT,
ROBERT L. CARSON.