

J. G. CAPSTAFF.
 METHOD OF REGISTERING PROJECTED IMAGES.
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1,394,504.

Patented Oct. 18, 1921.

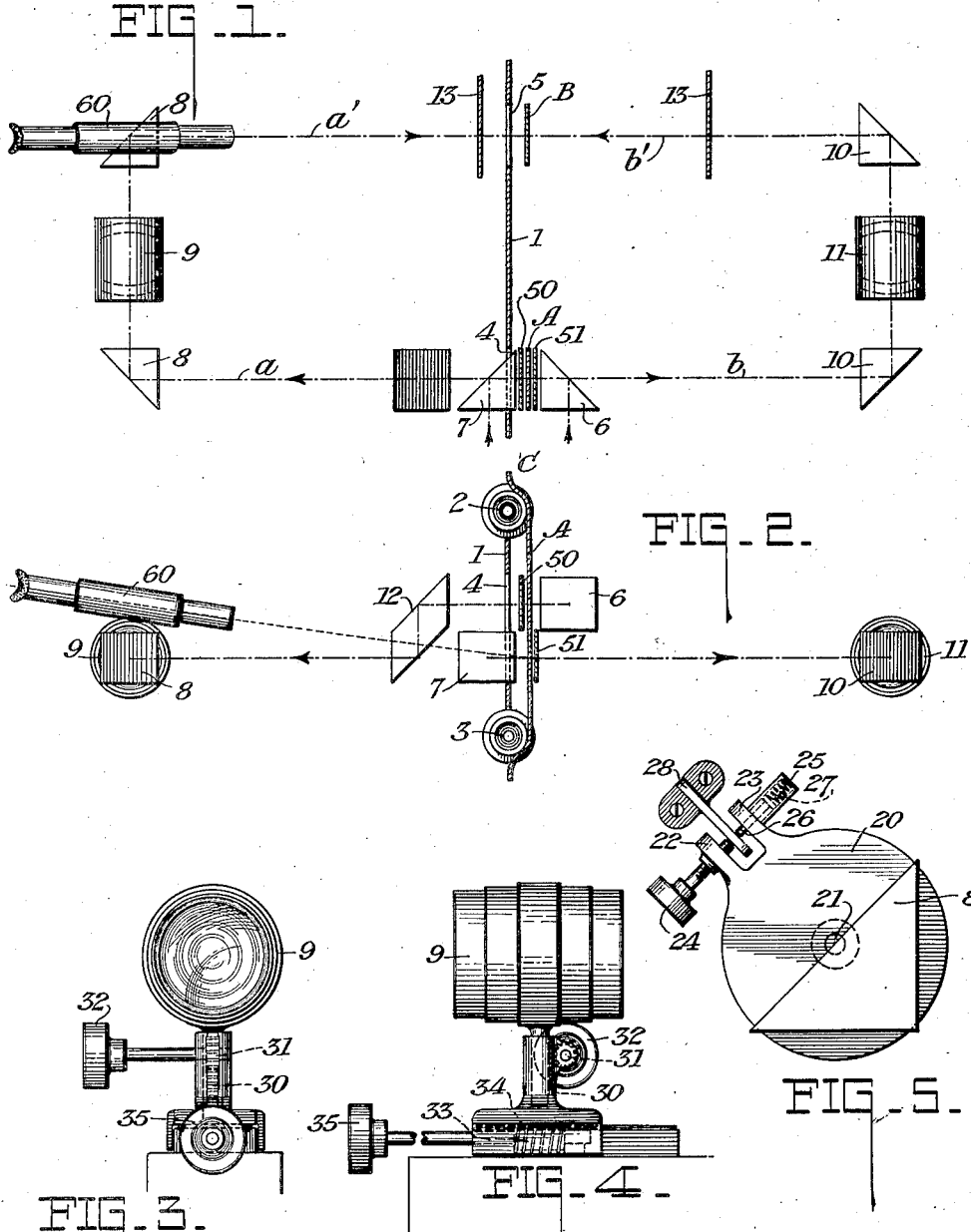


FIG. 3.

FIG. 4.

FIG. 5.

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METHOD OF REGISTERING PROJECTED IMAGES.

1,394,504.

Specification of Letters Patent. Patented Oct. 18, 1921.

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To all whom it may concern:

Be it known that I, JOHN G. CAPSTAFF, a subject of the King of Great Britain, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Methods of Registering Projected Images, of which the following is a full, clear, and exact specification.

10 This invention relates to a method for accurately registering two images projected from opposite directions upon a sensitized element.

15 It is particularly applicable in an apparatus designed for the making of a series of color records in registry upon the opposite surfaces of a long strip of double coated motion picture film, and will be described particularly with reference to such a process. It is to be understood that there are several processes in which this may be a step, and I do not limit myself, except as my invention is defined in the appended claims, to any particular process.

25 In carrying out the process described in my Patent No. 1,196,080, a master positive is made having alternating color records and from this are made by a projection printer, such as is described in British Patent No. 13,430 of 1915, on the opposite surfaces of a double coated film two series of color records in registry, all the color records of one series on one surface and those of the other on the other surface. These records are negative, but by the process above mentioned they are transformed into color positives, which by transmitted light give a subtractive color rendering of the original subject. In certain other processes positive complementary color records are printed in registry on opposite surfaces of double coated film and these are transformed into colored images for subtractive color rendered by transmitted light.

45 My invention relates to the method of securing accurate registry of the images to be projected and light printed upon the two surfaces of the double coated film. It is especially necessary that the registry be accurate since any lack of perfect registry is painfully evident in the finished colored picture when projected.

In order to make my invention clear, ref-

erence will be made to the appended drawings in which the same reference characters 55 refer to the same elements throughout, and in which:

Figure 1 is a plan partly diagrammatic and partly in section of a double projection printer;

Figure 2 is a side elevation of the same;

Figure 3 is an end view of the mounting of a lens in one projecting system;

Figure 4 is a side view of the same, and

Figure 5 is a plan of a prism mounting.

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The apparatus shown in Figs. 1 and 2 is the same (except for certain added features hereinafter described) as that shown and described in my British patent referred to and for a complete disclosure of the details and method of use of the apparatus reference is made to that patent. 1 indicates the double gate of a duplex film strip feeding mechanism, through which two separate guiding mechanisms are provided. The elements of this mechanism are not shown, not being part of the invention herein claimed. It may be stated, however, that one gate aperture 5 is of the usual size corresponding to one picture area of the strip while the other, 4, is double the size so as to expose two picture areas at once. The film strip A, guided by rollers 2 and 3, traverses the aperture 4 and an intermittent motion of two pictures at a time is provided, while a laterally offset but parallel film strip at B is fed intermittently, one picture area at a step.

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Suitable reflectors, such as prisms 6 and 7 are placed on opposite sides of aperture 4 and film A, one in alinement with the upper picture exposed and the other in alinement with the lower picture exposed so as to project simultaneously the images of these latter in opposite directions along lines *a* and *b*, light being furnished from a common source C. Beams *a* and *b* are further projected twice at right angles through reflecting prisms 8, 8 and lens system 9 on one side, and prisms 10, 10 and lens system 11 on the other side, until, emerging from lines *a'*, *b'*, respectively, they impinge from opposite directions upon the picture area of the film at B, exposed at the gate aperture 5. As the two pictures in the gate aperture 4 are vertically offset, the beams of at least one system must be so deflected that the

projected images will ultimately coincide at the film B. A prism shown at 12 constitutes one means for accomplishing this result.

5 In order to adjust the focus and the registrations of the images, the various components of the optical systems are made adjustable. Most of the elements will be permanently positioned and adjusted when the apparatus is originally set up, and will be additionally adjusted but rarely, any adjustments necessary to the proper registry of any particular set of records being done with certain elements only. Figs. 3 and 4 show the adjustments of a lens mounting and Fig. 5 that of a prism mounting. The horizontal corrections are made by angular movement of a prism, such as 8, which is carefully leveled on and mounted to turn with a table 20, which is adapted to rotate about a point 21. From the table 20 extend two lugs, 22 and 23, in one of which is mounted a screw 24, and the other of which carries a barrel 25, in which is mounted a pin 26 pressed inwardly by a spring 27. The screw and pin normally bear against opposite faces of a lug 28 rigidly carried on the frame of the machine. Turning of the screw 24 causes rotation of the prism and lateral displacement of the projected image.

Vertical displacement of the image is caused by raising or lowering the lens 9 by means of an ordinary rack and pinion 30 and 31 controlled by handwheel 32, or any other fine adjustment. Changes in magnification are effected by moving the lens axially by means of a worm 33 engaging a suitable rack or thread 34, and actuated by handwheel 35. This slight change necessary to alter magnification is not sufficient to disturb the focus of the system materially. The mechanical movements noted are not important as obviously others can be substituted therefor. Lens 11 may have similar adjustments.

At a suitable point in each projecting system I insert a color filter or screen 50, 51. In the processes to which this invention is applicable the color records are taken through complementary filters, which I will designate as red and green. The red color record is ultimately colored "minus-red" and the green color record is colored "minus-green," since the projection of the completed film is a subtractive process. By the terms "red" and "green," I mean records that are complementary, the prevailing colors being red and green. The filters 50 and 51 are, however, preferably similar to those through which the records were taken. At the exposure gate I now place a translucent color screen without any prevailing color tone. This is placed at identically the plane B customarily occupied by the double coated film. As a screen I employ preferably a piece of

transparent pyroxylin coated on one surface with a thin coating of a fine grained gelatin emulsion of silver iodid. Upon this screen a projected image is visible with great detail by either transmitted or reflected light. Since there are projected thereon in superposition two images, these may be examined from either side of the screen, one being visible by transmitted and the other by reflected light. Moreover since they are independently projected through filters colored like the taking filters, the resultant combined image is an additive one, but corresponds in color rendering to the subtractive image that will ultimately be projected from the colored double coated film. This additive color record permits a very fine standard of registration to be attained. Very slight imperfections of registration are at once visible as color fringes or lines of color bounding the objects or pictures, and these are distinctly visible where lack of registry could not be detected by other means of examining superposed images. In order to attain the highest possible accuracy, I mount at a suitable point a telescope 60 through which the screen may be examined. It is to be understood that the details of the machine are unimportant and that the arrangement of the picture areas on the projected film at A may be varied by making such suitable changes in the gate as could be made by a competent designer.

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

1. The method of perfecting the registration of two images of the same subject projected through independent optical systems and superposed from opposite directions upon the same exposure and focusing plane that consists of inserting in said plane a focusing screen upon which projected images are visible by reflected and by transmitted light, inserting into said optical systems contrasting color filters whereby additive color images are projected on said screen from opposite sides, examining said additive images, one by reflected and one by transmitted light, upon said screen for the presence of color fringes caused by imperfect registration and relatively adjusting said optical systems to correct such imperfect registration.

2. The method of perfecting the registration of the images of two color records of the same subject projected through independent optical systems and superposed from opposite directions upon the same exposure and focusing plane that consists of inserting in said plane a translucent focusing screen upon which projected images are visible by reflected or transmitted light, inserting into said optical systems complementary color filters similar to those by means of

which the color records were produced so that additive color images are projected on said screen from opposite sides, examining said additive color images, one by transmitted light and one by reflected light, upon said screen for the presence of color fringes caused by imperfect registration and adjust-

ing one of said optical systems to correct any such imperfect registration and remove the color fringes.

Signed at Rochester, New York, this 27th day of March, 1920.

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JOHN G. CAPSTAFF.