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PROVISIONAL SPECIFICATION.

Improvements in Taking and in Projecting Photographic Images, in Means therefor, and in Photographic Negatives.

I, WILLIAM FRIESE-GREENE, of 39, King's Road, Chelsea, in the County of London, Photographer, do hereby declare the nature of this invention to be as follows:—

5 The primary object of my invention is to produce photographic negatives containing vibrations of the various colors existing in the original scene or picture (in other words negatives containing these various colors in a latent state) and to reproduce the scene or picture from the negative upon a screen or the like in the natural colors.

10 I effect this object chiefly by means of a special lens hereinafter described in the camera or photographic apparatus and by means of a similar special lens in the magic lantern or projecting apparatus; or instead of the special lens I may alternatively employ in both the camera and the lantern a special disc as hereinafter described in combination with an ordinary lens.

15 The special lens is composed of several lens sectors (say three) having one common centre. These lens sectors are colored in separate colors preferably blue, green and red respectively, but other colors may be adopted as for example blue, red and yellow. The respective sizes of the sectors will differ considerably. The green sector should be about half the size of the red sector and the blue sector very much smaller than the green. The proportions should to some extent
20 depend upon the particular kind of sensitive film employed but should be chiefly regulated according to the length of exposure required for photographing the several colors, an important point being that all the colors shall have an equivalent amount of exposure, having regard to the fact that blue requires much less exposure than green, and green less exposure than red.

25 My improved lens may be used in place of the three separate lenses now in use for color photography thereby producing one negative in lieu of three negatives. The negative image obtained will contain vibrations, not only of the three colors of the lens sectors but of all the varieties of color caused by the blending of these 3 colors. For some purposes the lens sectors may have slightly
30 different foci.

35 Instead of a lens composed of differently colored lens sectors as hereinbefore described I may employ an ordinary lens and use in conjunction therewith a disc of suitable translucent material and colored in sectors like the lens hereinbefore described. In taking a photograph this disc is caused to revolve with more or less rapidity, the several colored parts of the disc passing successively in front of the lens during one and the same exposure.

40 In projecting the image upon a screen a lens composed of sectors similarly colored to those of the lens used in taking the photograph is employed. The picture appearing on the screen will show all the colors of the original scene or picture. Or when the negative has been produced by means of a colored revolving

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disc in conjunction with an ordinary lens as above described the projecting apparatus will contain a similarly colored revolving disc in conjunction with an ordinary lens.

Each colored lens sector or each colored part of the disc whether in the photographing or in the projecting apparatus may be made up of several small sectors so that the size of each colored division may be increased or diminished in proportion to the others in case the particular kind of film to be used or other reason may render this change desirable. 5

If it is not required to obtain a picture which is colored I employ a lens composed of several uncolored lens sectors having one common centre and they should be of equal dimensions. The negative obtained bears, as is the case when colored lens sectors are used, as many pictures as there are sectors, these pictures being as it were superposed, the result being that the positive picture subsequently produced is softened, and "re-touching" becomes practically unnecessary. 10

The invention includes the improved photographic negatives hereinbefore described that is to say one negative containing vibrations of the different varieties of colors of the original scene or picture. 15

Dated this 14th day of October 1898.

J. C. MEWBURN & ELLIS,
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COMPLETE SPECIFICATION.**Improvements in Taking and in Projecting Photographic Images, in Means therefor, and in Photographic Negatives.**

I, WILLIAM FRIESE-GREENE, of 39, King's Road, Chelsea, in the County of London, Photographer, 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 taking photographic negatives and to projecting transparencies obtained from such negatives, and it has for its primary object to produce photographic negatives, containing in a more or less intermingled state vibrations of the various colours existing in the original scene or picture (in other words, negatives containing these various colours in a latent state) and to reproduce the scene or picture upon a screen or the like in the natural colours from a transparency obtained from the negative. 30

According to this invention a photographic negative of a scene or picture is taken by means of a camera or photographic apparatus through a transparent material or medium bearing three or more primary colours. The negatives thus obtained will contain vibrations, not only of the several colours employed, but also of all the varieties of colour caused by the blending of these colours. Then by obtaining a transparency in the usual way from this negative and projecting the image from the transparency upon a screen by means of a magic lantern or projecting apparatus through a transparent medium coloured and constituted similarly to the transparent medium employed in taking the negative, the image appearing on the screen will show all the colours of the original scene or picture. The invention allows of taking and of projecting animated or changing scenes as well as scenes of stationary objects. 35 40 45

The transparent medium which I prefer to employ consists of a disc of glass or suitable material composed of differently coloured sectors. In taking a photographic negative or in projecting a transparency obtained from such negative, 50

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this disc is caused to revolve rapidly in front of or behind the ordinary lens of the taking or projecting apparatus, or between the lenses when more than one lens is employed, the several coloured parts of the disc moving successively past the lens during one and the same exposure.

5 I may also employ instead of the revolving disc, a band or strip of suitable transparent material bearing the three or more primary colours in regular repeated succession, caused to travel rapidly in front of or behind the lens. Or I may construct the coloured disc above referred to in the form of a lens composed of differently coloured lens sectors having a common focus. In this last case, the

10 lens is used alone and in place of the ordinary taking or projecting lens. By these means I obtain a single negative or transparency instead of the three negatives or transparencies hitherto required in colour photography.

In the accompanying drawings,—

15 Figure 1 is a side elevation partly in section of a photographic camera adapted for producing a negative according to this invention.

Figure 2 is a front end elevation of the same.

Figure 3 is a side elevation on a larger scale of the revolving coloured disc in its preferred form of manufacture.

Figure 4 is a cross section of the same on the line IV—IV of Figure 3.

20 Figure 5 is a side elevation illustrating a modified form of the coloured disc.

Figure 6 is a cross section of the same on the line VI—VI of Figure 5.

Figure 7 is a side elevation of a magic lantern or projecting apparatus adapted for projecting coloured pictures according to this invention.

Figure 8 is a front end elevation of the same.

25 Figure 9 is a front elevation of a lens mounted in its holder, said lens being composed of differently coloured lens sectors according to this invention.

Figure 10 is a cross section on the line X—X of Figure 9.

30 Referring first to Figures 1 and 2 the photographic camera therein shown is constructed in substantially the usual manner and comprises the objective piece 1, front 2, bellows 3, rear part 4, and back 5, mounted on the base 6. 7 is the objective, consisting in this arrangement of an ordinary lens. A horizontal axle 8 carried in a bearing bracket 9 fixed to the camera front 2 extends through the latter into the interior of the camera where it is provided with a rotary disc 10 constructed as hereinafter described, and arranged to be rotated rapidly behind

35 the objective. The rotary motion can be imparted to the disc 10 in any suitable manner. In the particular arrangement shown there is fixed upon the outer end of the axle 8 a small cord pulley 11 which is driven by means of a cord 12 from a considerably larger cord pulley 13 rotated by hand by means of the handle 14. The pulley 13 is carried by a projecting part 15 fixed to the camera front 2. The

40 aforesaid disc 10 which is shown more fully in Figures 3 and 4, consists of a rubber ring 11 formed with three radial strips 12 and a central boss 13 and which is adapted to be clamped fluid-tight between two circular plates 14, 14 of colourless glass or other transparent material by means of two peripheral flanges 15, 15 through which pass a number of tightening screws 16. A fluid tight joint at

45 the boss 13 of the rubber ring is further ensured by means of two plates 17, 17 which are clamped against the outsides of the glass plates 14, 14 by means of a nut 18 screwing on a hollow bolt 19 formed with a head 11^a. Rotary motion is imparted from the cord pulley 11 through the axle 8 by keying the bolt head 11^a on the axle 8. The bolt head 11^a is preferably formed as a cord pulley as shown,

50 so that when it is desired to arrange the disc 10 in front of the objective, the said disc can be driven directly from the cord pulley 13 by means of the cord 12 passing around the grooved bolt head 11^a.

The space comprised between the ring 11, its boss 13 and the glass plates 14, 14 is divided by the three radial strips 12, into three compartments of sector shape

55 which are filled respectively with liquids of separate colours, preferably blue, green and red, but other colours may be adopted as for example, blue red and yellow. Each compartment can be filled through a hole normally closed by a

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plug 20; the air displaced by the liquid escaping through a hole normally closed by a plug 21. The actinic effect of the exposure of the colors can be varied by varying the intensities of the colors.

Instead of making the three sectors containing the three differently coloured liquids of equal area, and varying the actinic effect of the exposure of the colours 5 by varying their intensities, I may employ liquids of uniform intensity of colour, and vary the exposure by varying the areas of the sectors. In such case the green sector should have about half the area of the red sector, and the blue sector be very much smaller than the green. The proportions will depend to some extent upon the particular kind of sensitive film employed but they will be chiefly 10 regulated according to the length of exposure required for photographing the several colours, an important point being that all the colours shall have an equivalent amount of exposure, having regard to the fact that blue requires much less exposure than green, and green less exposure than red.

Also instead of employing the disc 10 containing the liquids as above described, 15 I may employ the disc 10^a shown in Figures 5 and 6. This disc is composed of three differently coloured sectors of single thicknesses of glass or other transparent material fitted in a peripheral ring or bezil 15^a, and clamped between two plates 17^a, 17^a and fixed upon the axle 8 in the manner above described with reference to the disc 10. In this arrangement the sectors are made of different 20 areas corresponding to the requisite exposures of the respective colours.

In taking a photograph, the disc 10 (or the disc 10^a as the case may be) is caused to revolve rapidly by turning the handle 14, so that the several coloured parts of the disc will pass successively behind the objective 7 during one and 25 the same exposure.

In projecting the image upon a screen the transparency 22 obtained from the negative (see Figure 7) of the photograph taken by means of the apparatus hereinbefore described is projected through the lens 23 of a magic lantern 24 in which a disc 10 composed of sectors similarly coloured to those of the disc 10 used in taking the photograph, is revolved rapidly in front of the lens 23. The picture 30 appearing on the screen will show all the colours of the original scene or picture.

The disc 10 can be rotated by any suitable arrangement; in the arrangement shown it is mounted on a horizontal axle 25 supported laterally of the lens piece 26 in a bracket 27. Rapid rotary motion is imparted to the disc 10 by means of a cord 28 passing around a small cord pulley 29 keyed on the axle 25 and around 35 a large cord pulley 30 carried by a bracket 31 and provided with an operating handle 32.

The coloured disc 10^a shown in Figures 5 and 6 may also be constructed as a lens, by dispensing with the central attachments, and the sectors being curved 40 to a common centre. This lens which does not rotate is employed alone in place of the ordinary lens in both the camera or photographic apparatus and the magic lantern or projecting apparatus.

In Figures 9 and 10, which illustrate this parti-colored lens, 33 represents the lens; it is composed of three lens sectors having one common centre, arranged in a suitably constructed holder 34. These lens sectors are colored in separate 45 colours, and the respective sizes of the sectors correspond to their respective colours as hereinbefore explained. The negative images produced by the several sectors will be as if were intermingled with one another to form one single negative image containing vibrations of the several colors. This image when transferred to a transparency and projected upon a screen by means of an apparatus or 50 lantern having a corresponding parti-colored lens will reproduce the original scene or picture in its natural colours. For some purposes the lens sectors may have slightly different foci.

If it is not required that the picture obtained should be coloured I employ a lens composed of several uncolored lens sectors having one common centre and 55 they should be of equal dimensions. The negative obtained bears, as is the case when coloured lens sectors are used as many pictures as there are sectors these pictures

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being as it were intermingled or superposed the result being that the positive picture subsequently produced is softened and "retouching" becomes practically unnecessary.

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 herein described method of taking photographic negatives, which consists in taking a single negative through a transparent medium bearing three or more primary colours, said colors being caused to pass rapidly in succession through the optical field of the apparatus during exposure of the negative, substantially as described.
2. The herein described method of taking photographic negatives which consists in taking a single negative through a lens which is built up of three or more sectors, each of said sectors being colored with a different primary color, and all of said sectors having a common centre, substantially as described.
3. The herein described method of reproducing a scene or picture in color which consists in taking a single photographic negative as specified in Claim 1 or Claim 2, then transferring the negative image to a transparency and then projecting said image from said transparency through a transparent medium of the kind specified in Claim 1 or Claim 2 substantially as set forth.
4. As a new article of manufacture, a photographic negative such as is obtained by the method specified in Claim 1 or Claim 2.
5. As a new article of manufacture, a photographic transparency such as is obtained by transferring the negative specified in Claim 4 to a transparent medium.
6. In apparatus for taking photographic negatives or projecting transparencies, a transparent medium bearing three or more primary colors and means for imparting motion thereto to cause said colors to travel rapidly and successively through the optical field of the taking or projecting apparatus substantially as described.
7. In apparatus for taking photographic negatives or projecting transparencies, a parti-colored lens composed of lens sectors having a common centre, substantially as described and represented in Figures 9 and 10.
8. In apparatus for taking photographic negatives or projecting transparencies, lens composed of several uncolored lens sectors having a common centre, substantially as described.
9. Apparatus for taking photographic negatives or projecting transparencies constructed, arranged and operating substantially as herein described and shown in the accompanying drawings.

Dated this 14th day of July 1899.

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SHEET 1

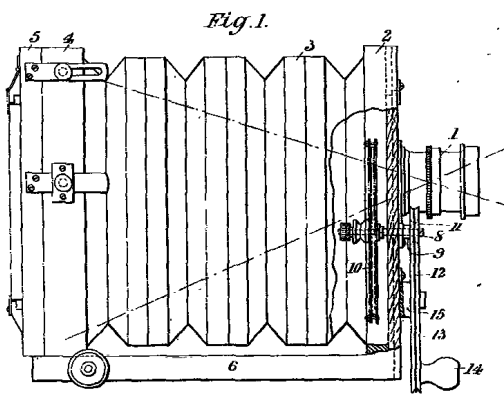


Fig. 1.

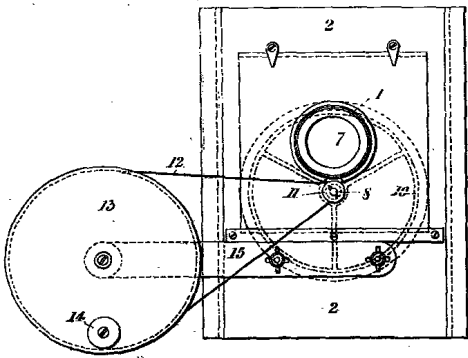


Fig. 2.

Fig. 4.

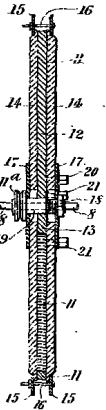


Fig. 3.

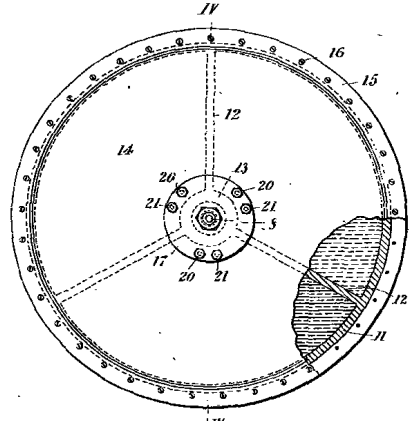


Fig. 6.

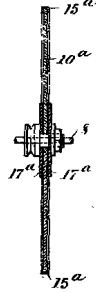
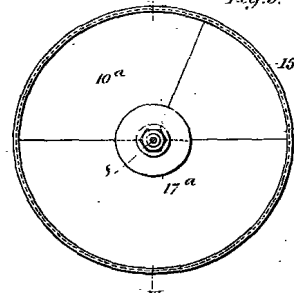


Fig. 5.



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

Fig. 1.

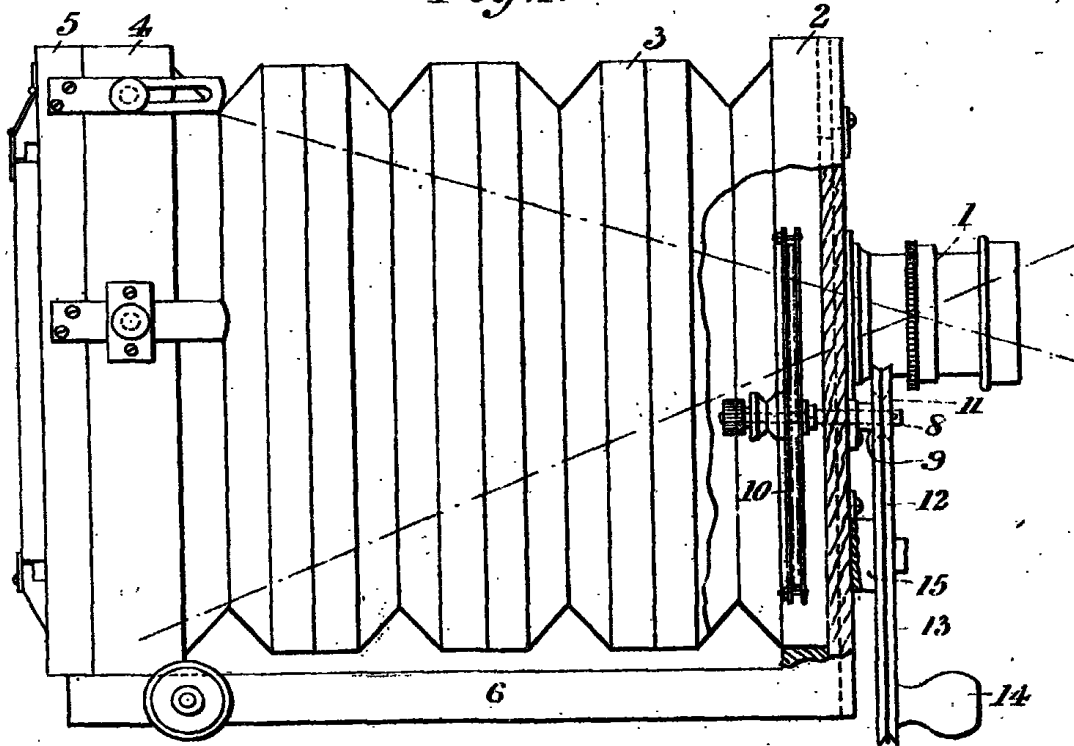


Fig. 2.

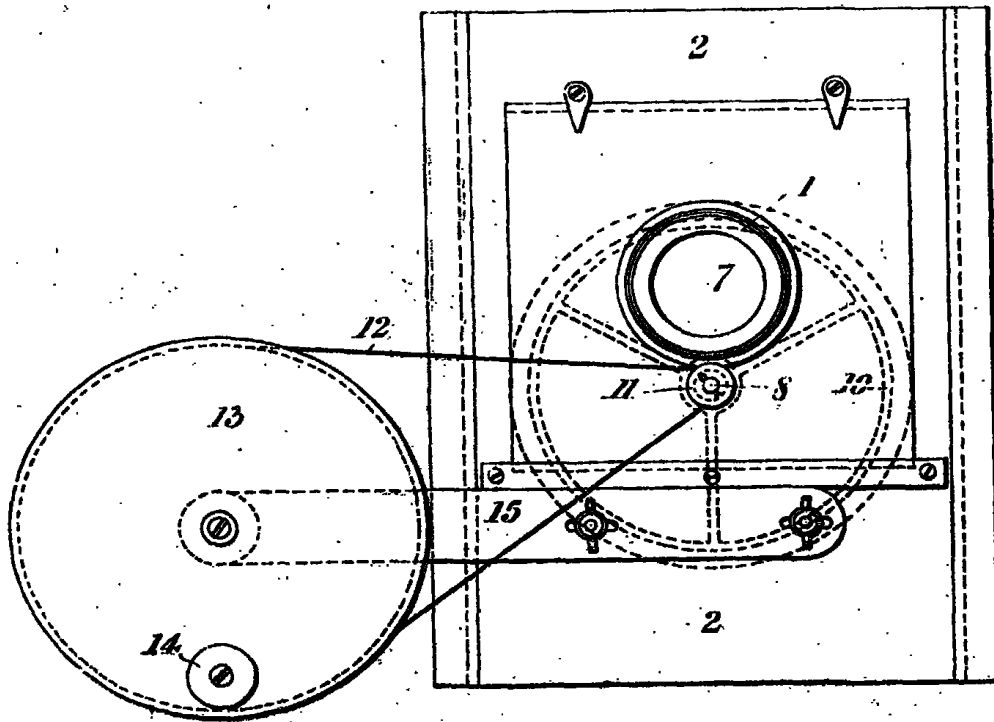


Fig. 4.

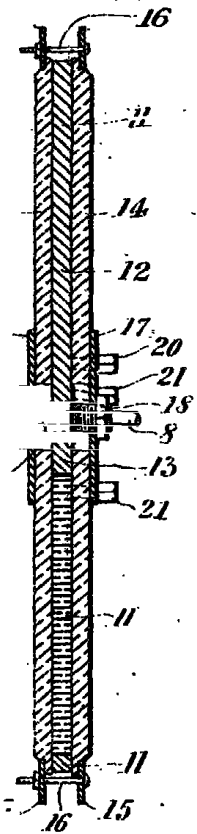


Fig. 3.

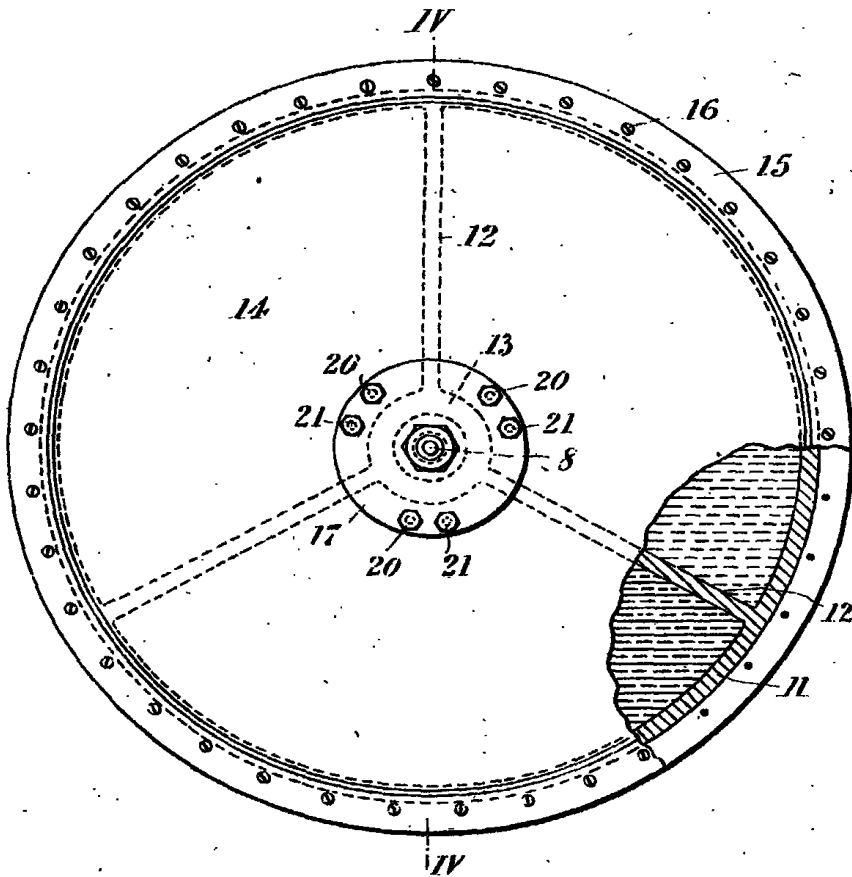


Fig. 6.

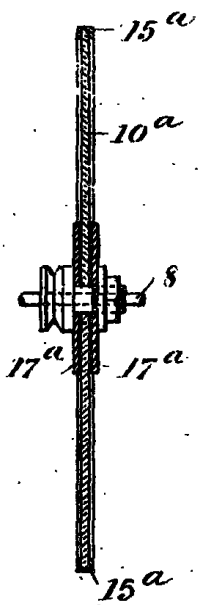
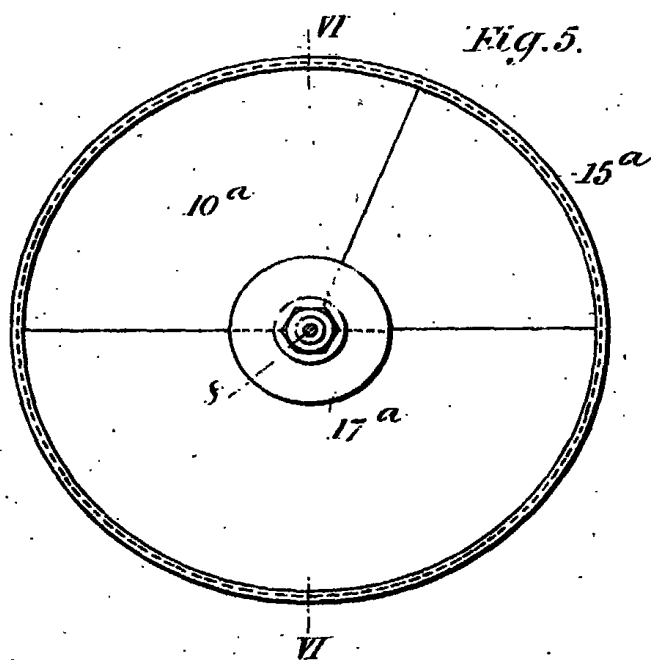


Fig. 5.



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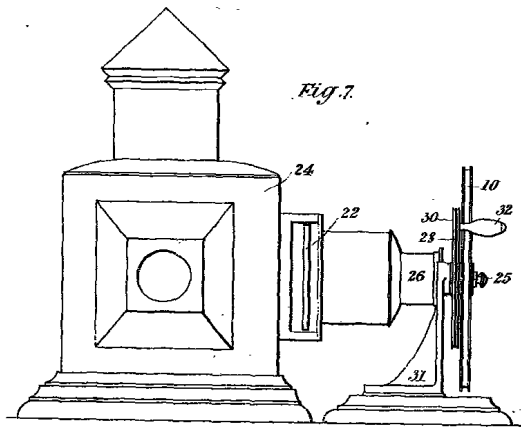


Fig. 7.

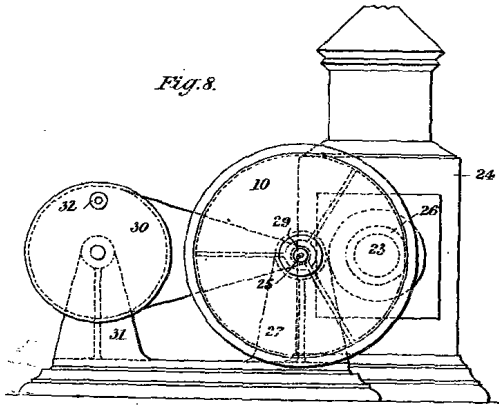


Fig. 8.

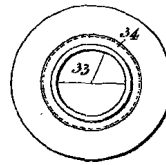


Fig. 9.

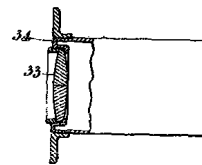


Fig. 10.

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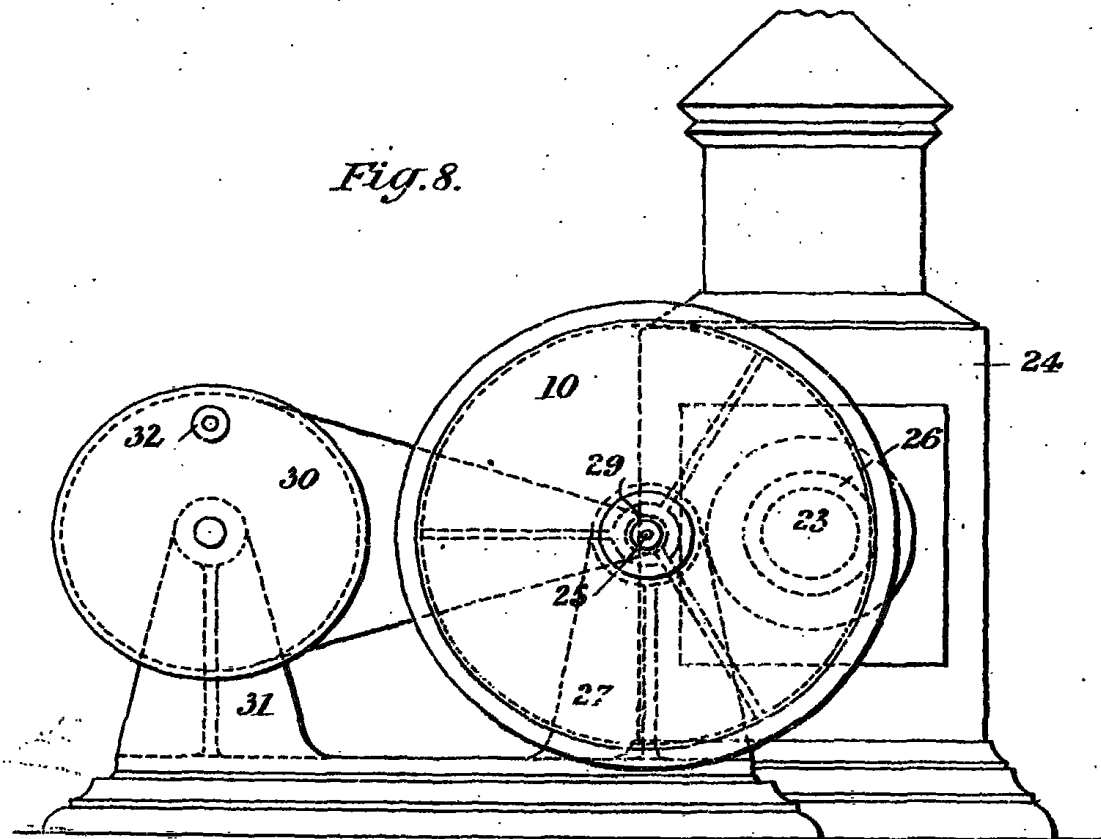
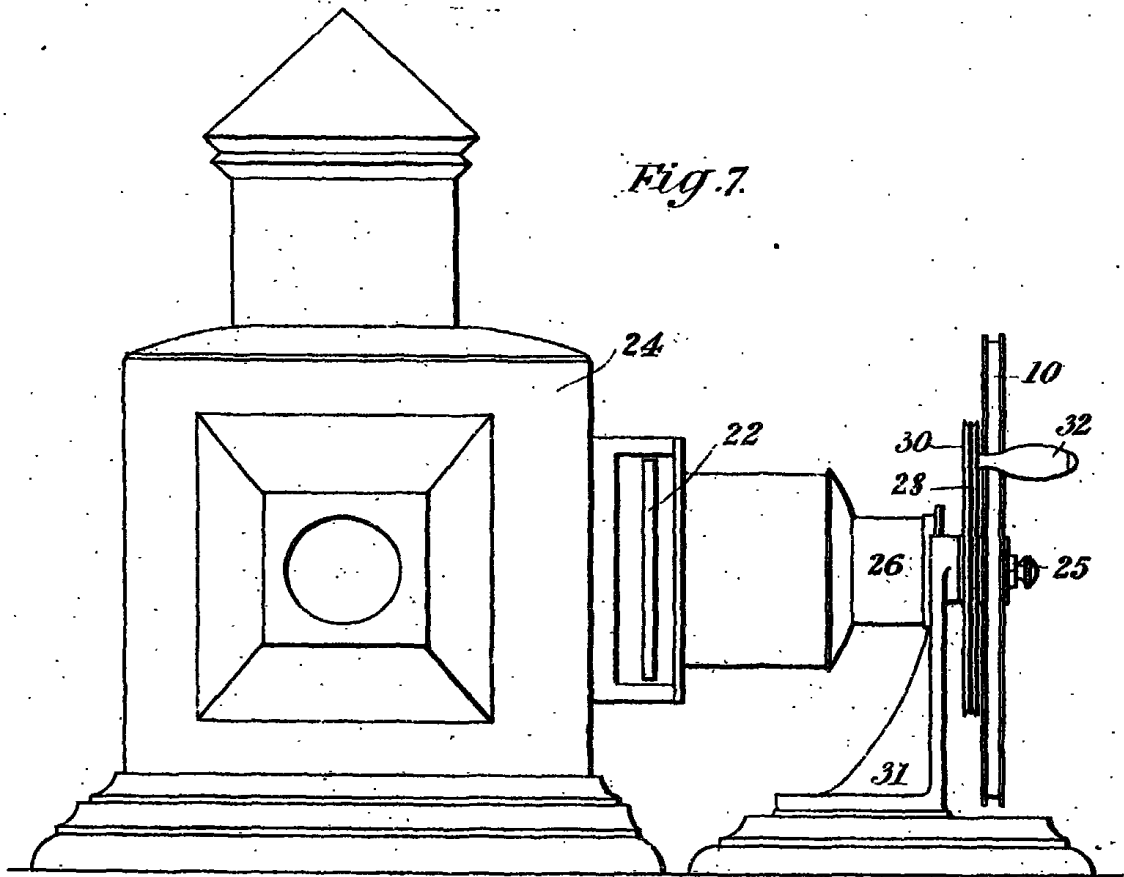


Fig. 9.

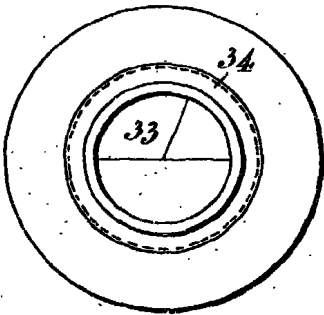
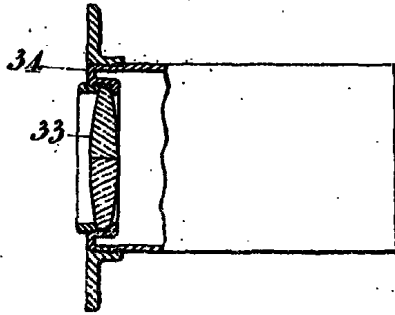


Fig. 10.



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