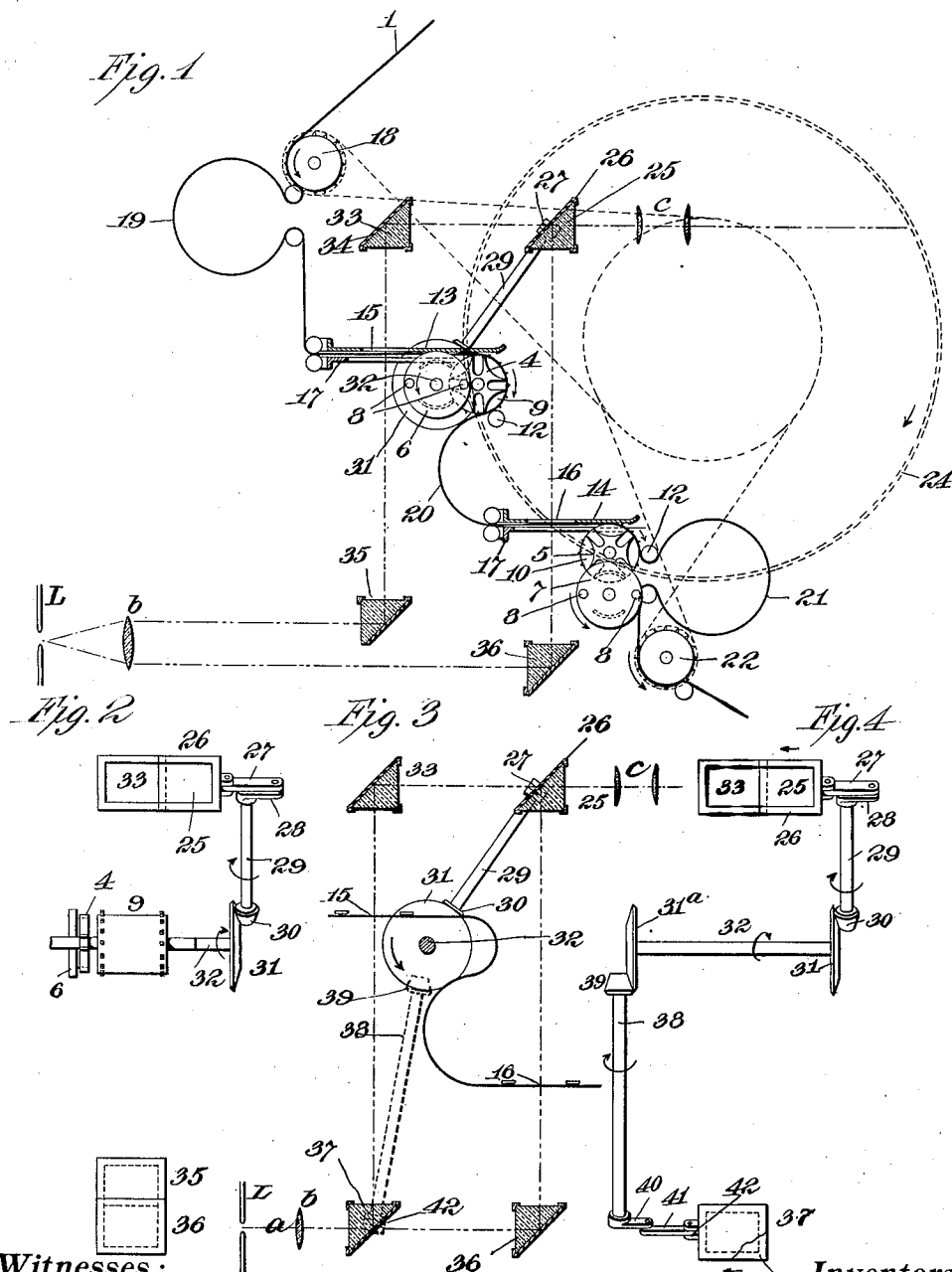


F. L. DYER & D. HOLDEN.
EXHIBITING APPARATUS FOR MOVING PICTURES.
APPLICATION FILED DEC. 21, 1905.

937,779.

Patented Oct. 26, 1909.

2 SHEETS—SHEET 1.



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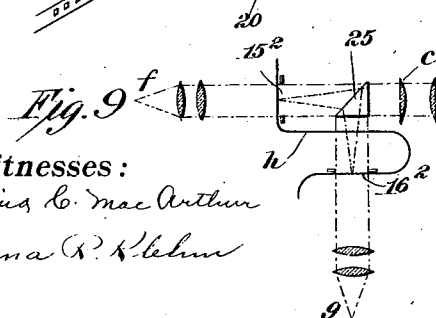
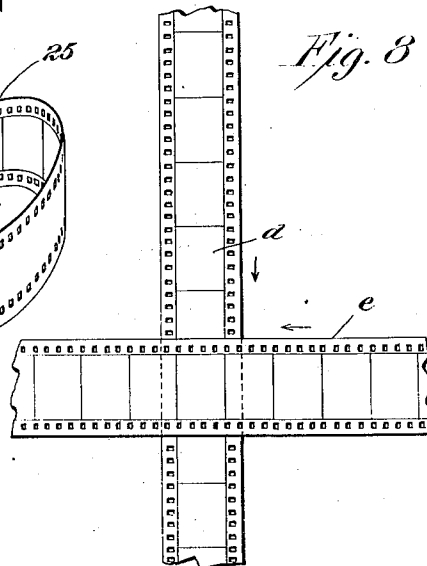
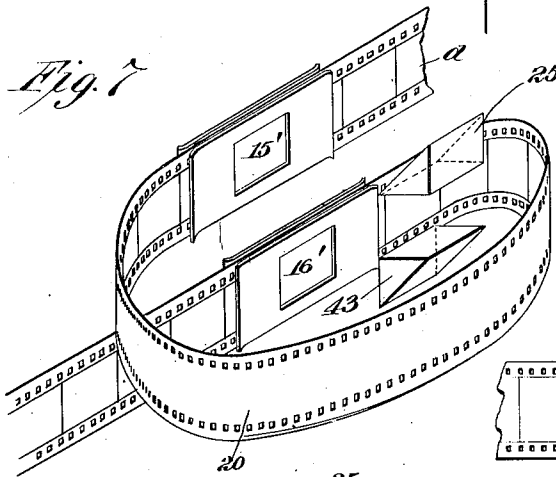
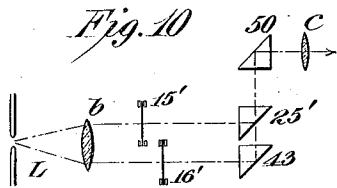
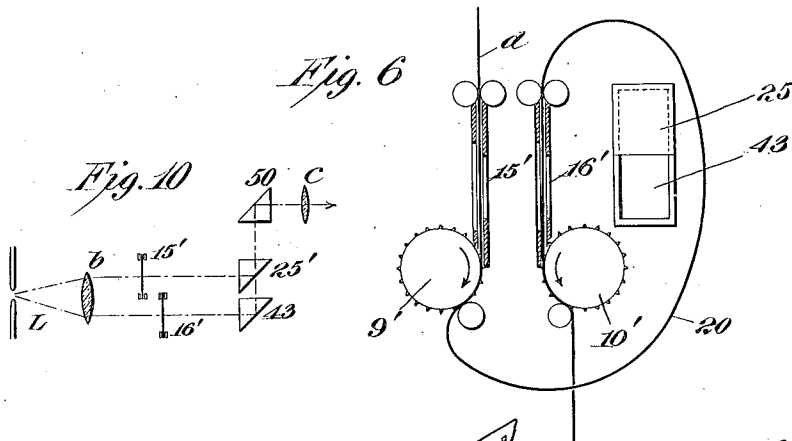
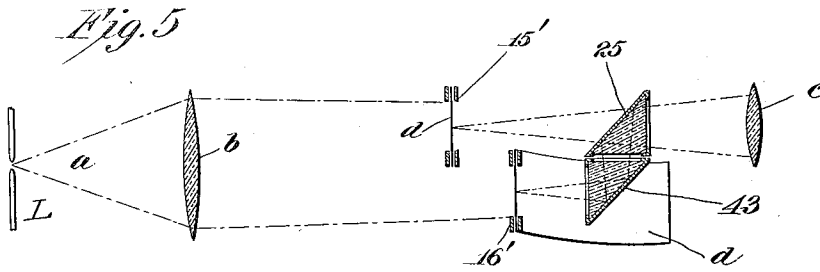
Attorney

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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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EXHIBITING APPARATUS FOR MOVING PICTURES.

937,779.

Specification of Letters Patent.

Patented Oct. 26, 1909.

Application filed December 21, 1905. Serial No. 292,834.

To all whom it may concern:

Be it known that we, FRANK L. DYER, a citizen of the United States, and a resident of Montclair, in the county of Essex and State of New Jersey, and DELOS HOLDEN, a citizen of the United States, and a resident of Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Exhibiting Apparatus for Moving Pictures, of which the following is a description.

Our invention relates to apparatus for the exhibition of moving picture films of the type disclosed and claimed by us in our application filed October 21, 1905, Serial No. 283,838, wherein the photographs are arranged in two arithmetical series the members of which alternate, and one series being shifted longitudinally of the film with respect to the other series, so that the pictures do not follow each other on the film in a regular numerical sequence, but the pictures of one series are preceded by pictures of the other series which are representative of later phases of movement, whereby it becomes possible to exhibit the pictures of the two series in proper numerical order at separate display openings situated at some distance from each other by intermittently moving the film at each opening in alternation a distance equal to the length of two adjacent pictures. The pictures of one series are all exhibited at one display opening and the pictures of the other series at the other opening and there may be a continuous and uninterrupted exhibition of stationary photographs somewhat analogous to the exhibition of dissolving views, and flickering entirely eliminated. In an application filed by us November 6, 1905, Serial No. 285,999, we have disclosed and broadly claimed an apparatus adapted for the exhibition of moving pictures of this type and more specifically an apparatus in which the light is reflected by means of a number of reflecting mirrors or prisms situated at various points in the path of the light. The present improvements relate to an apparatus of this general type in which the number of reflecting surfaces is greatly reduced, thereby simplifying the apparatus and lessening the cost of manufacture.

In the present application as well as that of Serial No. 285,999 the invention com-

prises apparatus having two exposure openings across which both series of photographs are moved in such a way that the photographs of one series will be successively displayed at one exposure opening while the photographs of the other series will be successively and alternately displayed at the other opening and preferably having means for combining or progressively displaying the illuminated pictures of the exposure openings, thereby eliminating flickering, since the amount of light entering the eye will be constant.

In both applications, the apparatus also comprises a single objective combined with reflecting surfaces so arranged that the images of the photographs successively and alternately brought to rest at the two exposure openings will be successively and alternately projected through the objective upon a suitable screen. In the preferred form of apparatus in the said application, Serial No. 285,999 light from a single source is reflected into two parallel beams which illuminate the two exposure openings and the light from said openings is alternately directed into a common path by a pair of reciprocating reflectors placed end to end. These reflectors perform a single function, that is, each one changes the path of the beam of light which it is adapted to receive. According to the present invention, a single reciprocating reflector is used for performing a double function, that is, it acts as a reflector for one of the beams of light and as a shutter to cut off the other beam of light. In the said apparatus of application, Serial No. 285,999, the illuminating light is divided into two beams by stationary reflectors so placed as to properly divide the said beam. This structure obviously requires a beam of light of sufficient cross-section to permit it to be divided into two beams each of sufficient size for illuminating an exposure opening. According to the present invention we propose to introduce a reflecting surface between the source of light and the exposure openings which performs a double function—that is, in one position it reflects the entire illuminating beam to one exposure opening and acts as a shutter which cuts off the light from the other exposure opening and in its other extreme position it reflects none of the light to the first exposure

opening, but permits it all to pass to the other exposure opening, whereby the cross-section of the illuminating beam may be sufficient for the illumination of only one opening, thereby permitting a smaller lamp to be used, or in case the same lamp is used, the beam may be more concentrated and therefore more intense.

In order that the invention may be better understood, attention is directed to the accompanying drawings forming a part of this specification and in which—

Figure 1 is a vertical section showing the novel elements of a projecting machine embodying our invention, the paths of light being indicated in dotted lines; Fig. 2 is a front elevation showing the fixed and movable prisms as viewed from the right of Fig. 1; Fig. 3 is a diagrammatic vertical sectional view similar to Fig. 1 of a modification of the invention; Fig. 4 is a view showing the prisms of Fig. 3 as viewed from the right; Figs. 5, 6 and 7, are respectively, a sectional elevation, a plan partly in section, and an isometric view of a second modification of the invention; Fig. 8 is a detail view showing how the film used in the apparatus of Figs. 5, 6 and 7 may be produced from a negative film; Fig. 9 is a diagrammatic plan view of a third modification of the invention; and Fig. 10 is a diagrammatic elevation of a fourth modification.

In all of the above views corresponding parts are represented by the same characters of reference.

Referring first to Figs. 1 and 2, the mechanism shown comprises means for intermittently feeding the film 1 at two different points in alternation, the periods of movement in each case being equal to or preferably slightly less than the periods of rest. Any suitable and appropriate mechanism may be used for this purpose, the one shown being a common form of pin and star wheel movement, the two star wheels 4 and 5 being intermittently rotated by disks 6 and 7 having pins 8, 8 thereon. Mechanism of this type is well known, being employed in the Edison projecting kinetoscope and other projecting machines now on the market. The star wheel 4 communicates its intermittent movement to the sprocket 9 on the same shaft and the star wheel 5 similarly drives the sprocket 10. The film 1 is provided with the usual perforated edges and successively engages and is driven by the sprockets 9 and 10, being held in engagement therewith with the usual idlers 12, 12. Above the feed sprockets 9 and 10 are plates 13 and 14 secured to a suitable support and provided with the usual windows 15 and 16 in which the pictures will be illuminated. These windows are situated at the same focal distance from the projecting lens measured of course along the path of the light. Below

the plates 15 and 16 the usual gates 17, 17 are hinged in any suitable way so that they may be readily opened to permit the film to be threaded over the feed sprockets, as will be understood. The film 1 is first engaged with a continuously operated sprocket 18 forming a loop 19 before reaching the first or upper exposure opening 15. A second loop 20 is formed in the film between the feed sprocket 9 and second or lower exposure opening 16. Preferably a third loop 21 is formed in the film between the feed sprocket 10 and a continuously operated sprocket 22 over which the film passes to the takeup reel. Any desired arrangement of gears may be employed for driving the several intermittent and continuously operating sprockets constituting the feed mechanism. Preferably a large driving gear 24 engages spur gears on the shafts of the two pin disks 6 and 7 and the sprockets 18 and 22 are shown for simplicity as driven by crossed belts which are indicated by dotted lines.

Directly behind the projecting lens or eye piece of the apparatus is a reciprocating reflector 25, preferably a prism held in a frame 26, which will be mounted in a suitable guide in the supporting frame so as to maintain an accurate position with respect to the projecting lens and the exposure openings, and which will be reciprocated by any suitable mechanism, as a connecting rod 27 operated by a crank 28 on the shaft 29 said shaft being driven in any suitable manner, as by means of bevel gears 30 and 31, the latter being mounted on the shaft 32 which carries the disk 6. A fixed prism 33 is suitably mounted in a frame 34 and occupies a position directly back of the projecting lens and directly above the exposure opening 15 so that the light from the opening will be directed by the prism 33 into the said lens when the prism 25 occupies the position shown in Fig. 2; but obviously when the prism 25 moves laterally it acts as a shutter cutting off the image of the photograph at the opening 15 from the objective *c*, and this prism will at the same time direct the light from the opening 16 into the objective. The frame 26 does not extend beyond the free end of the prism 25, (see Fig. 2) and the result of the progressive movement of the end of the prism across the objective is therefore to direct into the objective that portion of the image of the picture at 16 which is complementary to the portion of the image of the picture at 15 which is not cut off by the prism 25 at each instant, thus forming upon the screen a composite image which is formed of complementary parts of two simple images produced by the photographs at the openings 15 and 16 respectively. As the prism 25 advances from the position shown in Fig. 2 it will eventually cut off all

the light passing from the opening 15 to the objective. The throw of the crank 28 and the width of the prism 25 are such and they are so coördinated with the intermittent feed sprockets 9 and 10 that the prism 25 cuts off the light from the prism 33 during the entire interval that the intermittent sprocket 9 is feeding the film past the opening 15, and the image from the exposure opening 15 is reflected by the prism 33 into the objective while the sprocket 9 is at rest; this image is cut off by the prism 25 and the image at the exposure opening 16 is reflected by said prism while the feed sprocket 10 is at rest, the end of the prism 25 moving entirely across the field of the objective while both feed sprockets are at rest. Movement of the feed sprocket 9 is effected only when the prism 25 covers the entire field of the opening 15, and on the other hand the feed sprocket 10 does not move until the prism 25 is moved sufficiently far to one side as to reflect no light from the opening 16.

The film used by us with our improved exhibiting apparatus is of the type described in our application Serial No. 283,838 before referred to, in which the pictures are arranged in two arithmetical series, those representing even numbered pictures (2, 4, 6, etc.) being shifted lengthwise of the film so as to be alternately disposed with respect to the odd numbered pictures and be preceded by pictures representing later phases of movement, for instance, the second picture may be arranged between the seventh and ninth pictures, but obviously, the two series may be shifted to a greater or less extent, depending upon the distance between the exposure openings 15 and 16 and the extent of the loop 20, and must permit the exposure of a photograph of one series at the exposure opening 15, and the following photograph of the other series at the exposure opening 16. The feed sprockets 9 and 10 should be twice the size of those ordinarily used in order to feed the film two pictures at a time, or any other suitable mechanism to effect this result may be used. In this way the pictures of one series will be exhibited at the exposure opening 15 and the pictures of the other series will be successively and alternately exhibited at the exposure opening 16. At all times there will be projected either a simple image or a composite image, so that the element of persistence of vision does not have to be considered. Furthermore since the light admitted to the objective is always uniform, no flickering can take place.

The illumination can be furnished by any suitable source, for instance, an arc lamp as shown in Fig. 1, where the lamp and condenser are shown diagrammatically at L and b. When a single lamp is used the light may be reflected to the two exposure open-

ings by mirrors or prisms 35 and 36. It will be understood of course, that instead of using a single source of light two separate sources of light may be employed and in this case the prisms 35 and 36 may be dispensed with and the beams of light proceed directly from their source to the openings 15 and 16.

The apparatus of Figs. 3 and 4 is exactly similar to that of Figs. 1 and 2 except that the fixed prism 35 is replaced by a reciprocating prism 37. This prism in one of its extreme positions (as in Fig. 4) receives the entire beam of light *a* and reflects the same upwardly to the exposure opening 15 and permits no light to pass to the opening 16. In its other extreme position it permits the entire beam of light to pass to the prism 36 by which it is reflected to the exposure opening 16. The prism 37 may be reciprocated by any suitable mechanism, and we have shown for this purpose a shaft 38 provided at one end with a bevel gear 39 for engaging the gear 31^a of the shaft 32, and carrying at its lower end a crank 40 which operates the connecting rod 41 pivoted to the frame 42 which holds the prism 37. In Fig. 4 the prism 37 is at its extreme right hand position and would be concealed by the prism 36 but the latter is broken away in this view to show part of the prism 37 behind the same. The prism 37 in this position reflects the entire beam of light upward to the opening 15, and since the prism 25 is in its extreme right hand position the light from the opening 15 passes into the objective of the instrument. Obviously as the prism 25 moves toward the left so as to form a composite image of the left hand portion of the picture displayed at the opening 15 and the right hand portion of the picture at 16, the prism 37 moves in the same direction thus permitting the necessary illuminating light to pass to the right hand portion of the picture at 16, while the left hand portion of the picture at 15 is still illuminated by a portion of the prism 37. In the extreme left hand position of 37 the illuminating beam all passes to the prism 36 and is reflected to the picture at 16. The prism 37 is of sufficient width to illuminate the opening 15 during the entire interval of rest of the picture at said opening. The frame 42 does not project beyond the free end of the prism 37 so that the illuminating light is properly divided between the openings 15 and 16 during the formation of the composite images before referred to.

In the device of Figs. 5, 6 and 7 we are enabled to dispense with prisms or reflecting surfaces between the source of light and the exposure openings, by locating the openings so close together that a single beam of light *a* passing through the condensing lens *b* covers both openings. In all moving picture

films commonly used, the photographs are oblong in shape, the longest dimension being transverse with respect to the body of the film as in the film *e* of Fig. 8, such films being run through the projecting apparatus in such a way that the pictures viewed on the screen will be of greater width than height, this being the most desirable form of picture. In other words the images produced by the exposure openings must have their shortest dimension vertical when passed through the projecting lens. It is also extremely desirable that in case the exposure openings are to be illuminated by a single beam of light that they be so placed as to occupy the least space, that is, instead of placing them so that the oblongs are end to end—that is, so that their longest dimensions are added to each other, they should be placed so that the shortest dimensions are added to each other, whereby the circular beam of illuminating light may be of the least possible diameter. In order to effect these results we place one exposure opening 15' immediately above the exposure opening 16' and in order that the said openings may be at the same focal distance from the objective *c* the opening 16' is in advance of the opening 15'. These openings are of greater width than height. The film *d* is provided with photographs whose longest dimension is in the direction of the length of the film, and is intermittently moved across the opening 15' in a horizontal direction by an intermittent feed sprocket 9' forming a loop 20, passing thence horizontally across the opening 16' to the intermittent sprocket 10' and then to a take-up reel. Directly behind the objective *c* is a reciprocating prism 25 which alternately cuts off the light from the opening 15' and reflects the light from the opening 16' into the objective *c* as previously described. A fixed prism 43 is situated directly in front of the opening 16' and below the prism 25. The arrangement of pictures upon the film *d* so that their long dimension is in the direction of the length of the film may be obtained from an ordinary negative *e* by causing the two films to travel intermittently in directions at right angles to each other as illustrated in Fig. 8, the film *d* traveling faster than the film *e* so that it moves a distance equal to the long dimension while the film *e* moves a distance equal to the short dimension, the printing of course being done while both films are stationary. In Fig. 9 only one reflecting surface is used, namely, that of the reciprocating prism 25 placed directly behind the objective *c*. Two sources of light *f* and *g* are used for illuminating the exposure openings 15² and 16², the film *h* being provided with pictures whose longest dimension is in the direction of the length of the film. The openings 15² and 16² are at the same focal distance from

the objective *c* and the prism 25 operates as previously described. The film *h* crosses the path of light from the source *g* only once, namely, at the opening 16², a loop being formed between the openings 15² and 16² of sufficient extent to allow the film to pass either above or below said light when between said openings.

The apparatus of Fig. 10 is exactly similar to that of Fig. 5 except that the reciprocating prism 25' is reversed so as to act as a reflector for the light from the opening 15' and as a shutter for the light from 16'. A fixed prism 50 receives the light from 15' and 16' in alternation and directs the same horizontally into the objective. Each beam is therefore reflected twice.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is as follows:—

1. In a picture exhibiting apparatus, the combination of a frame or body having a pair of display openings, a single objective, means for illuminating the fields of said openings, one of said fields being fixedly in optical alinement with said objective, and movable means comprising a reflecting surface reciprocating in right lines for progressively cutting off the light from said field and simultaneously directing the light from the other field into the objective, substantially as set forth.

2. In a picture exhibiting apparatus, the combination of a single source of light, a single objective, a frame or body having a pair of display openings situated at equal focal distances from said objective, and co-operating means for simultaneously and progressively cutting off the illuminating light from one opening and the light passing from said opening into the objective, substantially as set forth.

3. In a picture exhibiting apparatus, the combination of a single objective, a frame or body having a pair of display openings in optical alinement therewith, fixed means for illuminating one of said openings, and a reflector movable in a straight line across the path of the illuminating light for progressively cutting it off from said last named opening and simultaneously directing it to that portion of the other opening which corresponds optically with that portion of the opening which is masked by said moving member, substantially as set forth.

4. In a picture exhibiting apparatus, the combination of a single objective, a frame or body having a pair of display openings in optical alinement therewith, a fixed reflector for directing the light from one of said openings into the objective, and a reciprocating reflector that simultaneously reflects the light from the other opening into the objective and cuts off the light from the fixed reflector, substantially as set forth.

5. In a picture exhibiting apparatus, the combination of a single objective, a frame or body having a pair of display openings, a fixed prism for directing the light from one opening into the objective, and a reciprocating prism for progressively directing the light from the other opening into the objective and simultaneously cutting off the light from the first prism, substantially as
10 and for the purposes set forth.

6. In a picture exhibiting apparatus, the combination of a single objective, a frame or

body having a pair of display openings 15 and 16, fixed reflectors 33 and 36, reciprocating reflectors 25 and 37, and means for 15 driving said reflectors in unison and in the same direction, substantially as set forth.

This specification signed and witnessed this 20th day of December, 1905.

FRANK L. DYER.
DELOS HOLDEN.

Witnesses:

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