

R. J. LEONARD.
KINETOGRAPHIC APPARATUS.
APPLICATION FILED JAN. 27, 1913.

1,163,549.

Patented Dec. 7, 1915.

4 SHEETS—SHEET 1.

Fig. 1.

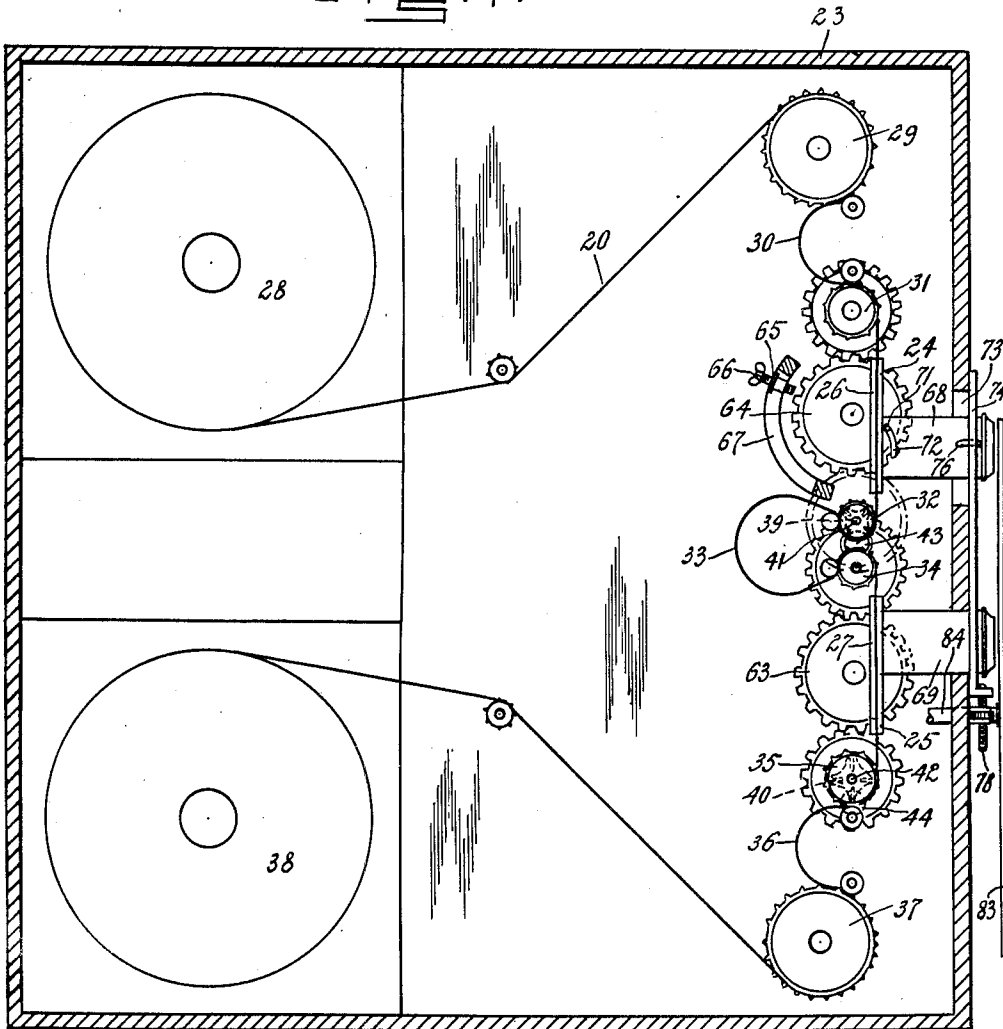
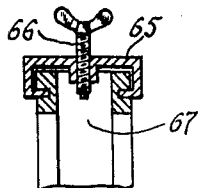


Fig. 10.



WITNESSES

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4 SHEETS—SHEET 2.

Fig. 2.

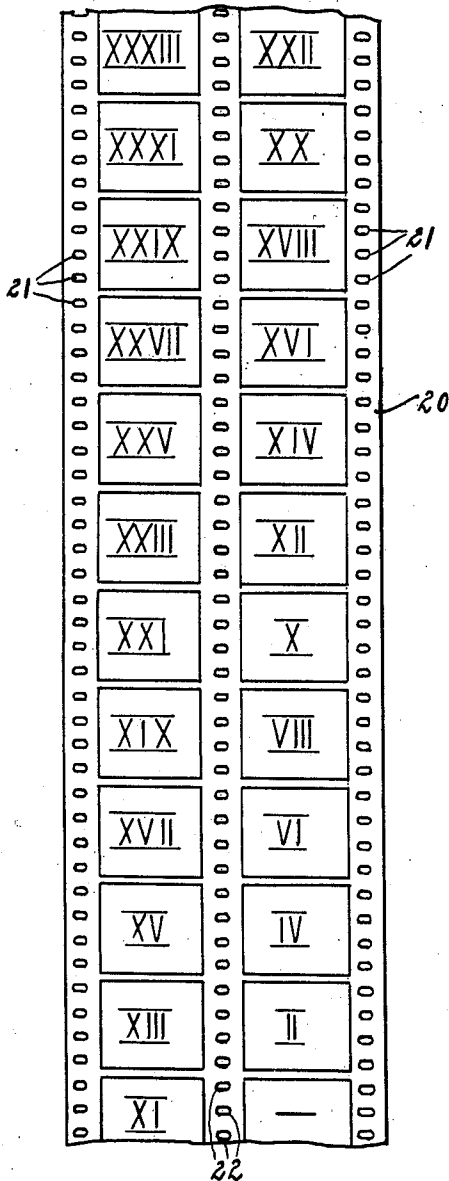
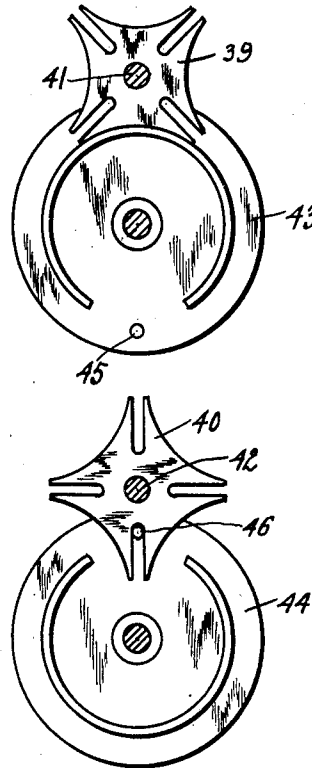


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

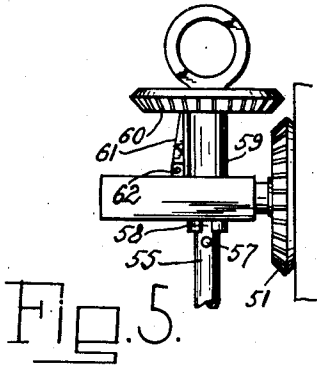
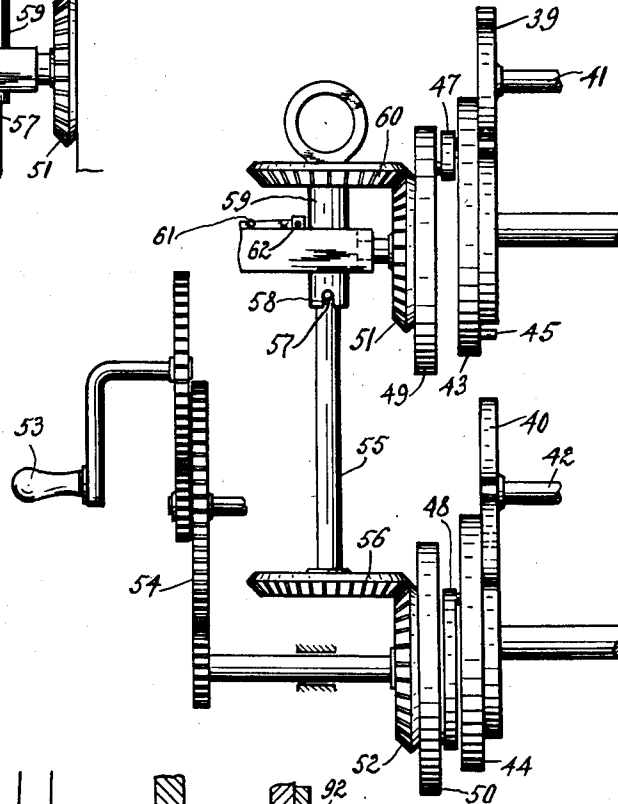
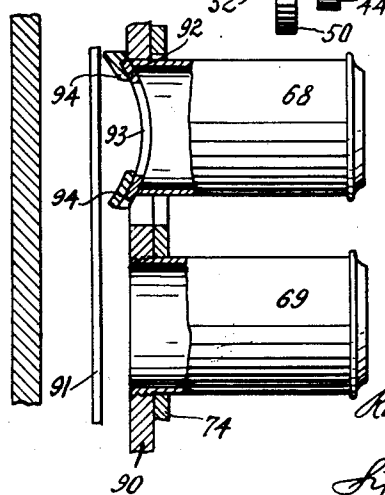


Fig. 11.



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4 SHEETS—SHEET 4.

Fig. 6.

Fig. 8.

Fig. 7.

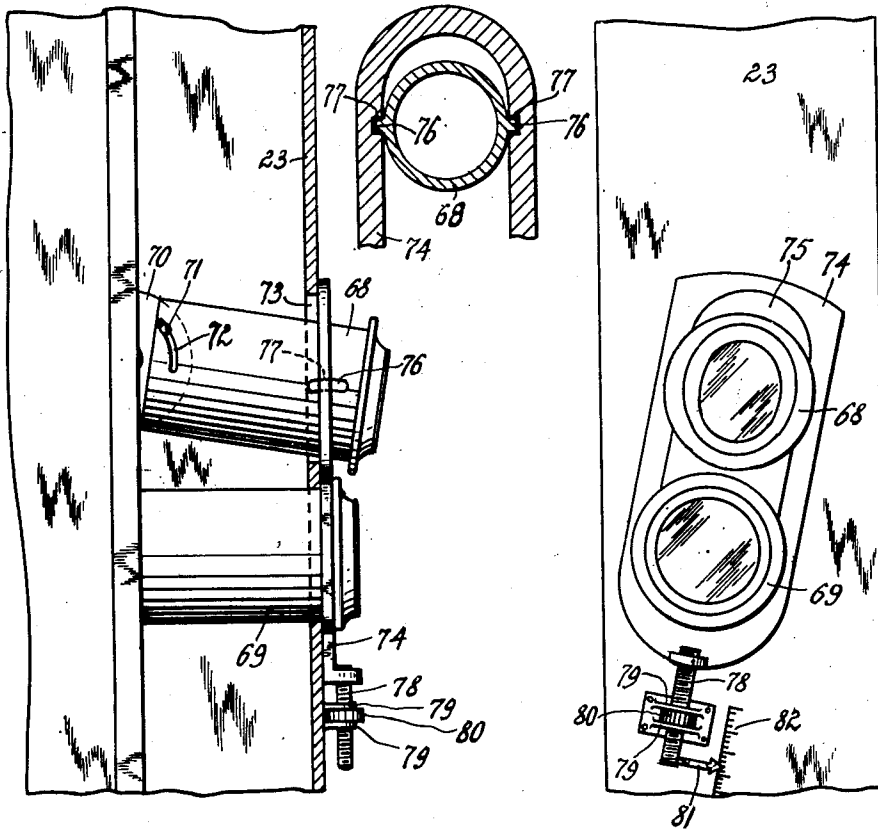
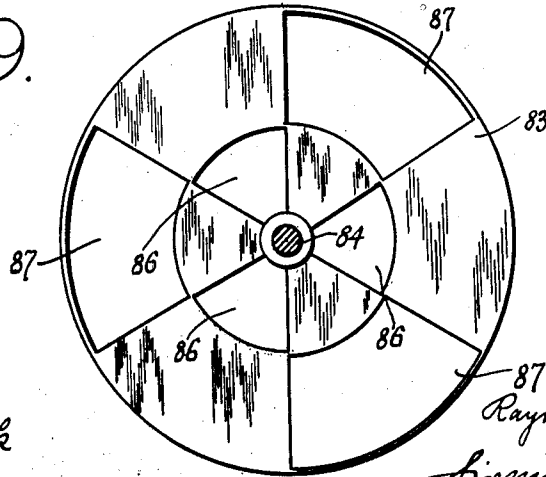


Fig. 9.



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UNITED STATES PATENT OFFICE.

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KINETOGRAPHIC APPARATUS.

1,163,549.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RAYMOND J. LEONARD, a citizen of the United States, and resident of the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Kinetographic Apparatus, of which the following is a specification.

The present invention relates to an apparatus for the exhibition or taking of moving picture films, that is to say to a machine for exhibiting or taking in rapid succession a series of photographs of a moving object or objects in such a manner so as to reproduce an exact picture of the scene or object.

Besides the usual film which comprises photographs of a series of successive phases of movement, there has been employed heretofore, in combination with a projecting apparatus, a film, the pictures of which are arranged in one row, but in two arithmetical series, the members of which alternate so that pictures do not follow each other on the film in a regular numerical sequence, but the pictures of one series are preceded by the pictures of the other series which are representative of later phases of the movement, whereby it became possible to exhibit the pictures of the two series in proper numerical order at two separate display openings, which are 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 were all exhibited at one display opening and the pictures of the other series at another opening, whereby a continuous and uninterrupted exhibition of the photographs was obtained, the object being to eliminate the flickering.

It has been found in practice that, if one or more of the pictures of one series have to be removed from the film, it was very difficult to find the corresponding pictures of the other series in order to remove them, the result of which was, that, as soon as a film was torn, the exhibition thereof had to be either interrupted for a considerable time or had to be discontinued entirely. A further difficulty in taking or exhibiting pictures of this kind has been experienced for the reason that the camera or projector, respectively, were very complicated, difficult

to build, no means were provided for shifting the optical axes of the two lenses, which cooperate with the two display openings, so as to intersect at a distance which in photographing corresponds to the focal plane of the picture or in projecting corresponds to the plane of the screen, it being obvious that the focal plane of the picture varies as the distance of the camera from the object varies, the distance between the plane of the screen and the projecting apparatus being arbitrary. A further difficulty with the kinetographic apparatus of this type heretofore in use arose due to the fact that an ordinary film, such as is used on nearly all projecting apparatus and in nearly all cameras, could not be used in connection with such apparatus, no provision being made for disconnecting one of the two cooperating propelling mechanisms.

The main object of the present invention is to obviate the defects of the film and apparatus above mentioned in that, first, a film is produced which contains two series of pictures in two rows, the successive pictures of one row being projected in succession through one of the exposure openings and the pictures of the other row being projected also in succession through the other opening, the pictures in the two series being arranged in such a manner that if a picture in one series is to be removed from the film, the picture in the other series in line therewith can be removed from the film without interrupting to an appreciable degree the sequence of exposure; second, a very simple, inexpensive and compact camera and projector are provided, having means for adjusting the optical axes of the two lenses so as to intersect at the proper distance; and, third, a kinetographic apparatus is produced in which one of the two driving mechanisms can be disconnected, whereby the apparatus is adapted for use in connection with ordinary films.

With these and other objects in view, which will more fully appear as the nature of the invention is better understood, the same consists in the combination, arrangement and construction of parts hereinafter fully described, pointed out in the appended claims and illustrated in the accompanying drawings, it being understood that many changes may be made in the size and pro-

portion of the several parts and details of construction within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

One of the many possible embodiments of the invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a vertical section taken through a projecting apparatus constructed in accordance with the present invention, only such parts being shown which are necessary to understand the invention; Fig. 2 is a diagrammatic representation of the film or photographic strip showing the arrangement and order of the pictures thereon; Fig. 3 is a side elevation of parts of the film propelling or feeding mechanisms; Fig. 4 is a front elevation of the said mechanisms; Fig. 5 is a front elevation of a portion of the said mechanism showing the parts in other positions; Fig. 6 is a side elevation of the lenses; Fig. 7 is a front elevation of the device shown in Fig. 6; Fig. 8 is a vertical section taken through the adjusting means shown in Figs. 6 and 7; Fig. 9 is a front elevation of the shutter used in connection with this apparatus; Fig. 10 is a section taken through a detail of construction; and Fig. 11 is a side elevation, partly in section, of the lens adjusting means as used upon a camera designed in accordance with the present invention.

In describing the invention, first, the construction of the film will be disclosed. This film is shown in Fig. 2 of the drawings and comprises a band 20, made of any suitable transparent material, provided with two rows of perforations 21, 21, which are arranged along the longitudinal edges of the band, and with a row of central perforations 22, which runs parallel to said two marginal rows. Two rows or series of pictures are upon the film, the odd-numbered pictures being exposed through one exposure opening and the even numbered being exposed through another exposure opening, adjacent pictures of the two series being arranged in alinement with each other. The Roman numerals indicate the order in which the pictures are taken or exposed, as the case may be, and it will be observed from an inspection of Fig. 2 of the drawings that the distance between the bottom of an odd-numbered picture and the top of an even-numbered picture, which is to be taken or exhibited immediately after the said odd-numbered picture, corresponds to the combined lengths of seven pictures, although it will be easily seen that any other distance may be selected, depending upon the distance between the two exposure openings of the apparatus and the extent of the loop formed between the said two openings. Taking a concrete example, picture XII is

exposed after picture XI, the distance between the bottom of the picture XI and the top of the picture XII being equal to the combined lengths of seven pictures, picture XIII following immediately picture XI in its series and picture XIV being arranged immediately after picture XII in the other series, or in other words the distance between two pictures which are to be exposed in succession at the same exposure opening is equal to the length of one picture, necessitating thereby at each movement the drawing of a length of the film which is equal to the length of a single picture.

Referring now more particularly to Figs. 1 to 10, inclusive, which illustrate a projecting apparatus constructed in accordance with this invention, the numeral 23 indicates a casing, in which is arranged the supply-reel and a wind-up reel in the usual manner, and the mechanism for intermittently feeding the film 20 past the exposure openings. These exposure openings are formed in plates 24 and 25, with which are associated the usual gates 26 and 27, respectively, the latter being hinged in any suitable manner to the said plates so that they may be readily opened to permit the film to be threaded over the sprockets hereinafter to be described. The exposure openings are located above each other at a suitable distance, correspond in size substantially to that of an individual picture, their longitudinal axes being out of alinement and the distance between the said two axes corresponding to the distance between the longitudinal axes of the two rows of pictures upon the film. The film is led from the supply reel 28 to a continuously operated sprocket 29, forming a loop 30 before reaching an intermittently operated sprocket 31, below which is arranged the upper exposure opening, the film passing between the plate 24 and the gate 26 to another intermittently operated sprocket 32. A second loop 33 is formed in the film between the sprocket 32 and an intermittently operated sprocket 34, over which the film moves past the exposure opening in the plate 25 to a fourth intermittently rotated sprocket 35. A loop 36 is formed between the intermittently operated sprocket 35 and the continuously rotating sprocket 37, over which the film passes to the wind-up reel 38. Any desired arrangement of gears may be employed for driving the continuously operated sprockets 29 and 37, the same having been omitted from the drawings as their use and operation is well known. The intermittently operating sprockets 31 and 32 serve to feed the film past the upper exposure opening, and the sprockets 34 and 35 past the lower exposure opening. Any suitable mechanism may be used for intermittently rotating the sprockets 31, 32, 34 and 35, the one shown in the drawings being the common form of the

pin and star wheel mechanism. The two star wheels are denoted by the numerals 39 and 40, to the shafts 41 and 42 of which are fixedly attached the sprockets 32 and 35, respectively. These two star wheels are rotated in alternation, that is to say when the star wheel 39 rotates, the star wheel 40 is at rest, and vice versa; for this reason they must be set at 90° relative to each other.

The star wheels are rotated by disks 43 and 44, having pins 45 and 46, respectively, thereon, the disks 43 and 44 being connected by links 47 and 48 with disks 49 and 50, respectively. Upon the disks 49 and 50 are formed bevel gears 51 and 52, respectively, the latter being rotated by an operating handle 53 through the intermediary of a train of gears 54. The operating handle 53 is obviously arranged outside of the casing 23.

For the purpose of transmitting the rotation of the bevel gear 52 to the bevel gear 51, a shaft 55 is provided, to which is keyed or otherwise attached a bevel gear 56, in mesh with the bevel gear 52. This shaft carries a pin 57, adapted to be seated in a recess 58 of a sleeve 59, to which is keyed a bevel gear 60, adapted to be brought into mesh with the bevel gear 51 of the disk 49. When the bevel gear 60 meshes with the gear 51 and the handle 53 is turned, the two star wheels are intermittently and alternately rotated. The gear 60 can, however, be disengaged from the gear 51 by shifting the sleeve 59 longitudinally upon the shaft 55 and bringing the free end of a stop 61, which is pivoted at 62 to some stationary part of the apparatus, in engagement with the gear 60. These positions of the parts are shown in Fig. 5 of the drawings, it being obvious that, when the parts are arranged in this manner, the upper feeding mechanism will be rendered inoperative, leaving, however, the lower feeding mechanism in its operative state. The purpose of this arrangement is to permit ordinary films to be used upon this apparatus. The sprockets 35 and 32 are connected by trains of gears 63 and 64 with the sprockets 34 and 31, respectively, the sprockets 31 and 34 moving thus in unison with the sprockets 32 and 35, or in other words the sprocket 31 moves at the same speed and in the same direction as the sprocket 32 and also at the same time. In a similar manner moves the sprocket 34 in relation to the sprocket 35.

When the film is being inserted into the apparatus, the gear 60 is disengaged from the gear 51 and the film brought into engagement with the four intermittently rotatable sprockets 31, 32, 34 and 35 in such a manner that no loop is formed between the sprockets 32 and 34, or in other words the loop 33 is left out. The purpose of this loop is to bring the pictures which are to be exhibited through the two exposure openings in proper

relation to said openings, and for the purpose of forming the said loop there is provided a bridge 65, having a screw threaded hole in mesh with a set screw 66, the said bridge being shiftably arranged in an arc-shaped slot 67, which is formed in a stationary part of the apparatus. While the gear 60 is still disengaged from the gear 51, and after the film has been engaged in the manner described with the four intermittently rotatable sprocket wheels, the set screw 66 is brought into engagement with one of the teeth of one of the gears of the train 64 when the bridge 65 is in its uppermost position, said bridge being then shifted to its lowermost position, rotating thereby the train of gears 64 and the sprocket wheels 32 and 31 through an angular distance which corresponds to the length of the loop 33. By this operation not only is the loop formed, but the star wheels 39 and 40 are set to the proper positions. After this setting, the stop 61 is disengaged from the gear 60, and the sleeve 59 shifted to seat the pin 57 in the recess 58. The device is then ready for action.

The lenses of the apparatus are denoted by the numerals 68 and 69, the lens 68 being in alinement with the exposure opening in the plate 24, and the lens 69 in alinement with the exposure opening in the plate 25. The lens 69 is stationary, the lens 68 being shiftable for the purpose of causing an intersecting of the optical axes of said two lenses. It is, however, obvious that the axes of the two lenses must be arranged in one plane, or in other words the lens 68 must move toward the lens 69 in a plane which is arranged at an angle to the vertical plane, as will appear from Fig. 7 of the drawings. For this purpose there is formed a semi-globular head 70 upon the plate 24, said head being provided with an aperture in alinement with the exposure opening. Upon diametrically opposite points of this head are formed pins 71, said pins engaging slots 72 in the casing of the lens 68, which projects through a slot 73 in the front wall of the casing 23. The means for shifting the lens 68 comprises a plate member 74, having an elongated slot 75, in which are seated the casings of the lenses 68 and 69. The casing of the lens 68 carries upon diametrically opposite portions two lugs 76, engaging recesses 77 in the plate member 74. To the lower end of this plate member is fixedly attached a screw threaded spindle 78, extending through openings in two stops 79, which are attached to the front wall of the casing 23. Between these stops is held an operating nut 80 in mesh with the threads of the spindle 78. A pointer 81 is secured to the lower end of the spindle 78, coöperating with a scale 82 upon the front wall of the casing. The graduations of this scale

indicate distances of the plane of the screen on which the pictures are projected, or in other words they indicate to what extent the lens 68 must be shifted to cause the optical axes of the two lenses of the apparatus to intersect at given distances.

It is obvious that the light must be shut off at the two exposure openings alternately and intermittently, that is to say it must be shut off, say for instance, at the upper exposure opening while the film moves past the said opening, at which time the light must pass through the lower exposure opening, and vice versa. The shutter is shown in Fig. 9 of the drawings, and denoted by the numeral 83. It comprises a disk of any suitable material, fixedly attached to a shaft 84, which is geared to the lower driving mechanism, said disk being provided with two series of openings 86 and 87, which are arranged concentrically, but are staggered. The openings 86 cooperate with the lens 69, and the openings 87 with the lens 68, consequently wherever there is an opening provided for the lens 69 there must be a shutter portion arranged in the corresponding section of the disk for the lens 68, and vice versa. The connection between the shaft 84 of the shutter and the driving mechanism has not been shown, as any suitable means may be provided, such connection, on the other hand, not forming part of the present invention.

The operation of this projecting apparatus is obvious from the foregoing. The film having been set, that is to say the loop 33 having been formed in the manner above described, and the shiftable lens 68 having been brought into its proper position according to the distance of the screen from the apparatus, the projecting machine is operated in the well known manner. In turning the handle 53, the two interconnected feeding mechanisms are actuated, whereby the proper portions of the film are fed alternately and intermittently past the two exposure openings, a portion of the film between the loops 30 and 33 being in motion, while the portion between the sprockets 34 and 35 is at rest and a picture is projected through the opening in the plate 25, and a portion of the film between the loops 33 and 36 being in motion while a portion thereof between the sprockets 31 and 32 is at rest and a picture projected through the opening in the plate 24. Since between the two exposure openings there are arranged two sprockets, more particularly the sprockets 32 and 34, the movement of a portion of the film past one of the exposure openings will in no way affect the full stop of the film at the other exposure opening, for the reason that the corresponding sprocket below or above the opening, as the case may be, is kept against movement

and prevents thereby a shifting of the film below or above the opening, as the case may be.

Inasmuch as the pictures are arranged in two rows on the film, it is obvious that the length of the film, taking into consideration a given object, will be substantially the same as that of an ordinary film, but showing, of course, double the amount of phases of movement.

By the use of this projecting apparatus the flickering is entirely eliminated, such flickering being due to the fact that at certain intervals, that is to say while the film is in motion in an ordinary projecting apparatus, the light is shut off from the screen. Those phases of movement which are, as it were, cut out upon the ordinary projecting apparatus during the time that the light is shut off, are clearly visible by means of an apparatus and film constructed in accordance with this invention, a continuous movement being obtained inasmuch as a continuously operating projector is provided. By this is meant that during the entire exhibition the projecting of pictures is not even for a fraction of a second interrupted.

If the apparatus is to be used for taking pictures, or in other words as a camera, the same mechanism can be made use of with the exception that the light is admitted to the exposure openings for a shorter time, as well known in the art, and furthermore that the shutter mechanism is arranged inside of the casing in close proximity to the exposure openings. The movable lens 68 must be shifted in such a manner that the distance between its center and the plane of the film must remain at all times the same. A mechanism of this type is shown in Fig. 11 of the drawings, in which the front plate of the casing is denoted by the numeral 90 and the shutter by the numeral 91. The construction of the shutter is the same as that described in connection with Fig. 9. The construction of the stationary lens 69 is also the same, that of the casing of the lens 68 is, however, modified to some extent; more particularly it is provided upon its rear end with a curved plate 92, having an opening 93, said plate being seated in arc-shaped guides 94, which are attached in any suitable manner to the front wall. The shifting mechanism, that is to say the plate member 74 with its accessories, remains the same. The center of the curvature of the arc-shaped guides 94 is in the plane of the film, due to which fact the distance between the center of the lens and the film remains always the same. It is to be observed that only one finder is necessary for a camera constructed in accordance with the present invention, said finder cooperating with the lower lens, that is to say with the fixed lens. Otherwise the construction and oper-

ation of the camera is identical with that of the projecting apparatus herein described.

What I claim is:—

1. In a kinetographic apparatus, the combination with a casing having two exposure openings arranged in such a manner that the connecting line of their centers is inclined toward the vertical line, of a shutter adapted to uncover said openings alternately, and two intermittently operating film feeding mechanisms adapted to engage successive portions of one film and to feed such portions alternately past said openings, whereby stationary portions of said film are alternately exposed at said openings.

2. In a kinetographic apparatus, the combination with a casing having two exposure openings arranged in such a manner that the connecting line of their centers is inclined toward the vertical line, of a shutter adapted to uncover said openings alternately, two intermittently operating film feeding mechanisms adapted to engage successive portions of one film and to feed such portions alternately past said openings, whereby stationary portions of said film are alternately exposed at said openings, a lens in alinement with each exposure opening, and means for casing, at will, the optical axes of the two lenses to intersect.

3. In a kinetographic apparatus, the combination with a casing having two exposure openings arranged in such a manner that the connecting line of their centers is inclined toward the vertical line, of a shutter adapted to uncover said openings alternately, two intermittently operating film feeding mechanisms adapted to engage successive portions of one film and to feed such portions alternately past said openings, whereby stationary portions of said film are alternately exposed at said openings, a stationary lens in alinement with one of said exposure openings, a movable lens in registering position with the other exposure opening, and means for shifting said movable lens for causing, at will, the optical axes of said two lenses to intersect.

4. In a kinetographic apparatus, the combination with a casing having two exposure openings arranged in such a manner that the connecting line of their centers is inclined toward the vertical line, of a shutter adapted to uncover said openings alternately, two intermittently operating film feeding mechanisms adapted to engage successive portions of one film and to feed such portions alternately past said openings,

whereby stationary portions of said film are alternately exposed at said openings, and means for rendering, at will, one of said feeding mechanisms inoperative.

5. In a kinetographic apparatus, the combination with a casing having two exposure openings arranged in such a manner that the connecting line of their centers is inclined toward the vertical line, of a shutter adapted to uncover said openings alternately, and two intermittently operating film feeding mechanisms adapted to engage successive portions of one film and to feed such portions alternately past said openings, whereby stationary portions of said film are alternately exposed at said openings, each feeding mechanism comprising a sprocket above its corresponding exposure opening and a sprocket below its opening, whereby a loop is formed in the film between the two sprockets which are located between the two openings.

6. In a kinetographic apparatus, the combination with a casing having two exposure openings arranged in such a manner that the connecting line of their centers is inclined toward the vertical line, of a shutter adapted to uncover said openings alternately, two intermittently operating film feeding mechanisms adapted to engage successive portions of one film and to feed such portions alternately past said openings, whereby stationary portions of said film are alternately exposed at said openings, each feeding mechanism comprising a sprocket above its corresponding exposure opening and a sprocket below its opening, whereby a loop is formed in the film between the two sprockets which are located between the two openings, and means for predetermining the initial size of said loop.

7. In a kinetographic apparatus, the combination with a casing having two exposure openings, of two intermittently operating film feeding mechanisms adapted to engage successive portions of one film and to feed such portions alternately past said openings, whereby stationary portions of said film are alternately exposed at said openings, and means for rendering, at will, one of said feeding mechanisms inoperative.

Signed at New York, in the county of New York and State of New York, this 21st day of January, A. D. 1913.

RAYMOND J. LEONARD.

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