F. L. DYER & D. HOLDEN.

APPARATUS FOR PRINTING MOVING PICTURE FILMS.

APPLICATION FILED DEC. 21, 1905.

970,614. Patented Sept. 20, 1910.

2 SHEETS—SHEET 1.

Fig. 1

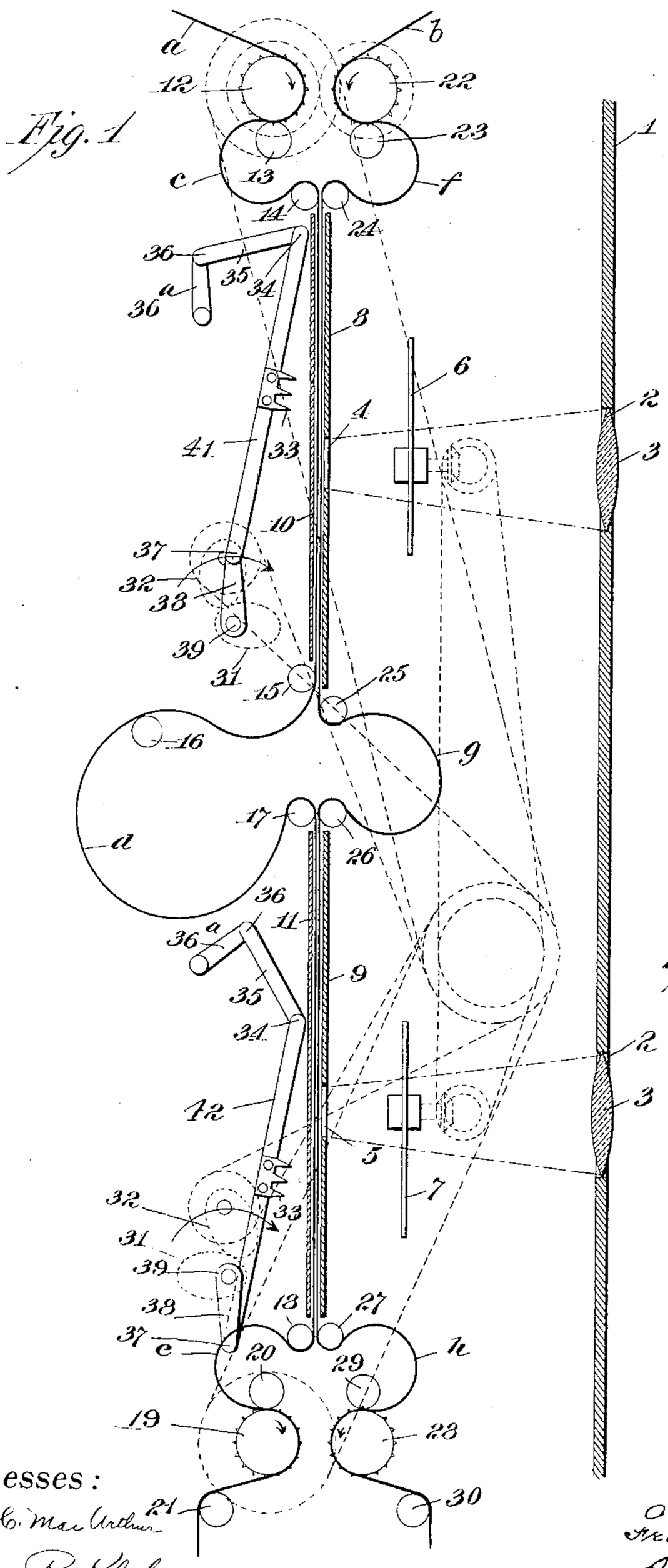


Fig. 2

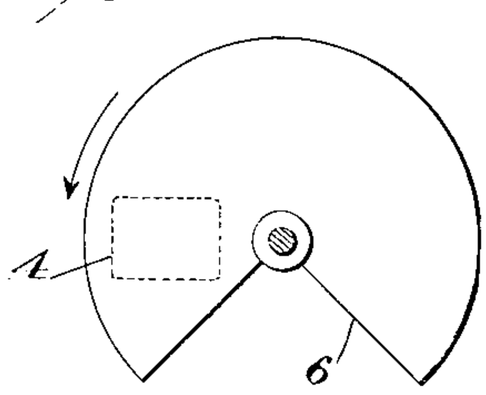
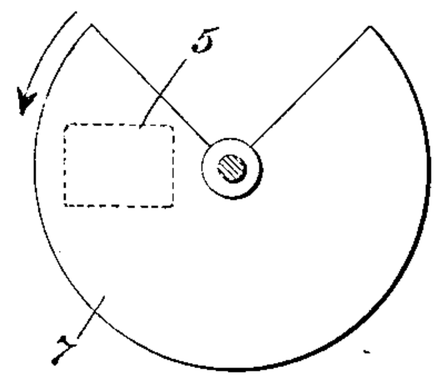


Fig. 3



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2 SHEETS—SHEET 2.

Fig. 4

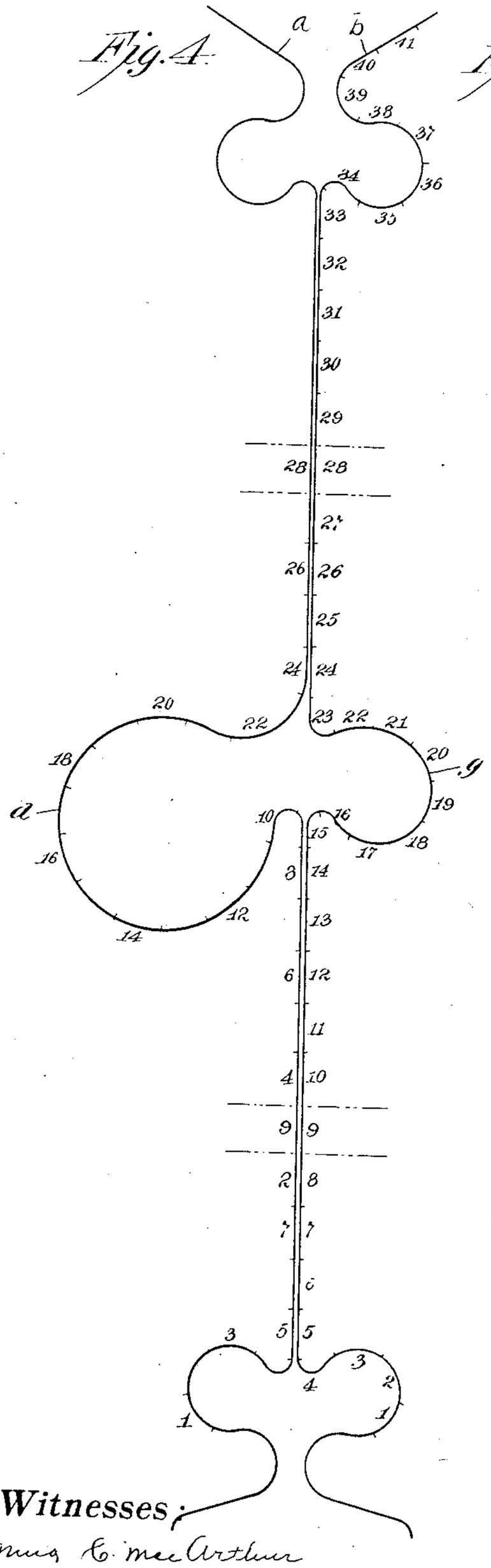


Fig. 5

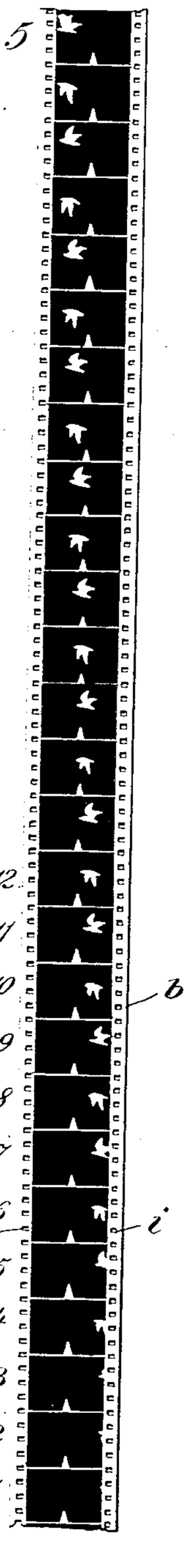
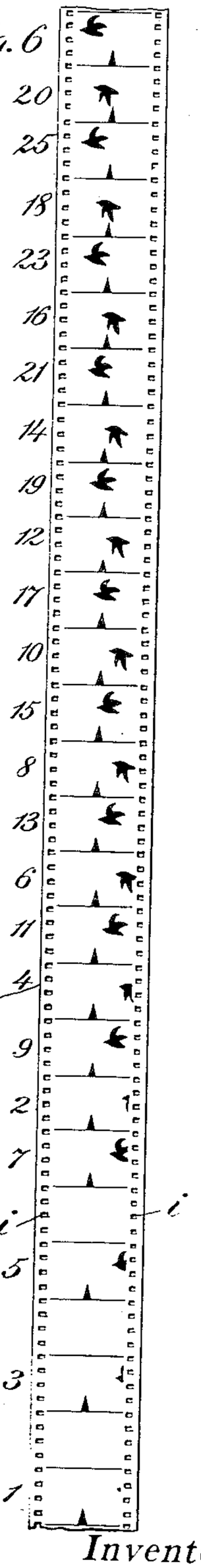


Fig. 6



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UNITED STATES PATENT OFFICE.

FRANK L. DYER, OF MONTCLAIR, AND DELOS HOLDEN, OF UPPER MONTCLAIR, NEW JERSEY, ASSIGNORS TO EDISON MANUFACTURING COMPANY, OF WEST ORANGE, NEW JERSEY, A CORPORATION OF NEW JERSEY.

APPARATUS FOR PRINTING MOVING-PICTURE FILMS.

970,614. Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed December 21, 1905. Serial No. 292,833.

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 Upper Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Printing Moving-Picture Films, of which the following is a description.

Our invention relates to apparatus for the production of a moving picture film characterized by the arrangement of the photographs in two arithmetical series the members of which alternate, and one series being shifted longitudinally of the film as regards the other series, so that the pictures do not follow each other on the film in regular numerical sequence but the photographs of one series are preceded by photographs 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 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 are all exhibited at one opening and the pictures of the other series at the other opening and there may be a continuous or uninterrupted exhibition of stationary photographs somewhat analogous to the exhibition of dissolving views and flickering entirely eliminated.

The present invention has for its object the provision of means whereby such positive moving picture films may be printed directly by the simple passage of the film through the apparatus from negatives having the usual arrangement of photographs in a continuous unbroken sequence.

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

Figure 1 is a vertical sectional view of an apparatus constructed in accordance with our invention; Figs. 2 and 3 are front views showing respectively the upper and lower shutters and exposure openings of Fig. 1; Fig. 4 is a diagrammatic view showing the relative positions of the negative and sensitive films as they are passed through the apparatus; and, Figs. 5 and 6 are detail views of fragments of the negative and positive films respectively the latter viewed from the back.

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

Referring to Fig. 1 of the drawing, the printing machine will be situated in a dark room close to a wall 1 provided with a pair of openings 2, 2 which are closed by condensing lenses 3, 3 which receive the light from any suitable source and direct the same to the upper and lower exposure openings 4 and 5 respectively. In front of the opening 4 is a rotary shutter 6 and in front of the opening 5 is a similar shutter 7, said shutters being provided with cut-away portions as shown, of sufficient extent to enable a proper exposure to be made when continuously rotated in any suitable manner, as is well understood. The two shutters are shown as set with the cut-away portions 180 degrees apart, but this is immaterial, as the shutters may be set in any positions whatever so long as the cut-away portions cross the openings 4 and 5 during the periods of rest of the films at such openings. These periods of rest may occur either coincidently or in alteration at the two openings, but in the machine illustrated the said periods occur in alternation. The exposure openings 4 and 5 are formed in fixed plates 8 and 9 respectively. The sensitive and negative films *a* and *b* respectively pass directly behind the said openings, being suitably held by plates 10 and 11, which may be hinged along one edge if desired to permit the films to be readily threaded through the apparatus. The sensitive film passes from a suitable supply reel over a continuously operated sprocket 12 with which it is held in engagement by an idler 13 and forms a loop *c*, passing thence over an idler 14, thence between the plates 8 and 10, and then over the idlers 15 and 16 to form a loop *d*. This film then passes over an idler 17 thence between the plates 9 and 11 and over the idler 18 to form a loop *e*. It then passes over a continuously operated sprocket 19 with which it is held in engagement by the idler 20; thence over an idler 21 to a suitable take-up reel. The negative film *b*

passes from its supply reel over the continuously operated sprocket 22 with which it is held in engagement by the idler 23 and forms a loop *f*. It then passes over the idler 24 and between the plates 8 and 10; thence over an idler 25 to form a loop *g* which is of different length from the loop *d*, being either larger or smaller. The film *b* then passes over the idler 26 and between the plates 9 and 11 from which it passes over an idler 27 to form a loop *h*; thence over the continuously operated sprocket 28 with which it is held in engagement by an idler 29; thence over an idler 30 to a suitable take-up reel.

The film feeding mechanism comprises means for intermittently feeding the films at two exposure openings 4 and 5 and may be of any suitable type, that shown being illustrated in U. S. Patent No. 714,845 granted December 2, 1902 to James H. White, and comprises the two oscillating frames 41 and 42 having teeth 33 which pass through slots in the plates 10 and 11 respectively and engage the usual holes or perforations *i* provided along the edges of the films *a* and *b*, one end of each of said frames being pivoted at 34 to a link 35 which is pivotally supported at 36 by an oscillating arm 36ª and the other end of said frames 41 and 42 being pivoted at 37 to a crank 38 carried by a shaft 39, driven through the gears 31 and 32 by any suitable driving mechanism. The intermittent movement of the teeth 33 will carry the film at each engagement a distance equal to twice the height of the openings 4 and 5 and the films will be so threaded through the apparatus that different sections will be brought to rest and exposed at the openings 4 and 5, those which are brought to rest at the opening 4 being moved past the opening 5 without stopping, by the feed mechanism located at said opening, and vice versa those sections which are to be exposed at the opening 5 will be carried past the opening 4 without any exposure, so that the impressions produced by the light admitted by the shutters 6 and 7 respectively will fall upon distinct portions of the film *a*, said portions alternating with each other. Thus as shown in Fig. 4, the ninth picture of the negative is brought to rest at the lower exposure opening opposite a blank section of the film *a*, situated between sections upon which the second and fourth pictures of the negative have already been printed at the upper exposure opening. In this diagram, all the photographs of the negative which correspond to even numbers are printed at the upper exposure opening and all the photographs of the negative corresponding to odd numbers are printed at the lower exposure opening. The loop *g* of the negative film *b* is smaller than the loop *d* of the sensitive film *a*, thus producing a longitudinal shifting of one film with respect to the other between the upper and lower openings. It will be obvious that in case the intermittent feeding devices at the two openings 4 and 5 move simultaneously in the same direction the loop *g* may be dispensed with but the film *a* will still be provided with a loop *d* so that the relative shifting of the two series of pictures will be obtained.

Fig. 5 shows the negative *b* of the usual type, the objects photographed being shown as a bird flying toward the left over a steeple and the photographs occur in a continuous, straight line, numerical sequence. Fig. 6 shows the positive which will be obtained from the said negative wherein the pictures are arranged in two arithmetical series the members of which alternate and in which one series is shifted so that its pictures are preceded by pictures of the other series which are representative of later phases of motion, as is clearly shown by the different positions of the bird.

The operation of the apparatus is as follows: The films *a* and *b* are threaded through the apparatus in a manner shown in Fig. 4 so that the odd numbered pictures of the negative will be printed at the lower exposure opening and the even numbered pictures at the upper exposure opening. The two films are moved together by the teeth 33 alternately at each opening a distance equal to twice the height of the said openings, the periods of rest occurring during the interval when the cut-away portions of the shutters 6 and 7 permit the light to fall upon said openings, and the result is that the impressions received upon the film *a* at the opening 4 will be separated by blank spaces, which spaces will be filled in at the opening 5 and by reason of the loop *g* being of different size from the loop *d*, the pictures of one series, that is, those printed at one opening, will be preceded by pictures printed at the other opening which are representative of later phases of movement.

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

1. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and means for causing the said negative and sensitive films to follow paths of unequal length between said pair of exposure openings, whereby one film is shifted longitudinally with respect to the other film between the two openings, substantially as set forth.

2. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across

said openings and intermittently bringing the same to rest at each opening, and means for causing the said negative and sensitive films to follow paths of unequal length between said pair of exposure openings, whereby one film is shifted longitudinally with respect to the other film between the two openings, substantially as set forth.

3. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings and intermittently bringing the same to rest at each opening, said intermittent feed operating to move the two films at each step a distance equal to the length of a plurality of adjacent pictures greater than one, and means for causing the said negative and sensitive films to follow paths of unequal length between said pair of exposure openings, whereby one film is shifted longitudinally with respect to the other film between the two openings, substantially as set forth.

4. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and means for causing a longitudinal shift of one film relatively to the other a distance equal to the length of an integral even number of pictures between said pair of exposure openings, substantially as set forth.

5. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and intermittently bringing the same to rest at each opening, the feeding means being so arranged with relation to the films as to bring odd numbered sections of the films to rest in front of one opening, and moving the same past the other opening without stopping, and even numbered sections of the films to rest in front of the last named opening, and moving the same past the first named opening without stopping, substantially as set forth.

6. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and intermittently bringing the same to rest at each opening, the feeding means being so arranged with relation to the films as to bring odd numbered sections of the films to rest in front of one opening, and moving the same past the other opening without stopping, and even numbered sections of the films to rest in front of the last named opening, and moving the same past the first named opening without stopping, and shutters for said openings, and means for operating said shutters timed to expose said films while the same are at rest only, substantially as set forth.

7. In a photographic printing apparatus, the combination with a frame having a pair of exposure openings of means for feeding a negative and a sensitive film together across said openings, and intermittently bringing the same to rest at each opening, the feeding means being so arranged with relation to the films as to bring odd numbered sections of the films to rest in front of one opening, and moving the same past the other opening without stopping, and even numbered sections of the films to rest in front of the last named opening, and moving the same past the first named opening without stopping, and shutters for said openings, and means for operating said shutters time to expose said films while the same are at rest only, and means for causing the said negative and sensitive films to follow paths of unequal length between said pair of exposure openings whereby one film is shifted longitudinally with respect to the other film between the two openings, substantially as set forth.

This specification signed and witnessed this 18th day of December, 1905.

FRANK L. DYER.
DELOS HOLDEN.

Witnesses:
J. F. RANDOLPH,
MINA C. MACARTHUR.

Correction in Letters Patent No. 970,614.

It is hereby certified that in Letters Patent No. 970,614, granted September 20, 1910, upon the application of Frank L. Dyer, of Montclair, and Delos Holden, of Upper Montclair, New Jersey, for an improvement in "Apparatus for Printing Moving-Picture Films," an error appears in the printed specification requiring correction as follows: Page 1, line 85, the word "alteration" should read *alternation*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of October, A. D., 1910.

[SEAL.]

E. B. MOORE,
Commissioner of Patents.