C. B. STILWELL.

KINETOSCOPE.

APPLICATION FILED SEPT. 24, 1908.

1,045,905.

Patented Dec. 3, 1912.

2 SHEETS—SHEET 1.

FIG. 7.

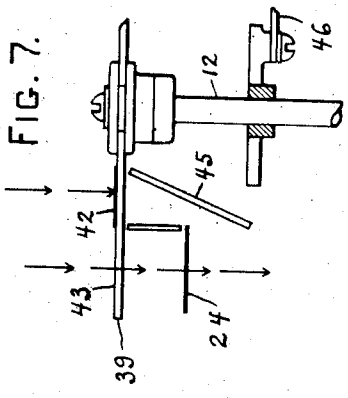


FIG. 8.

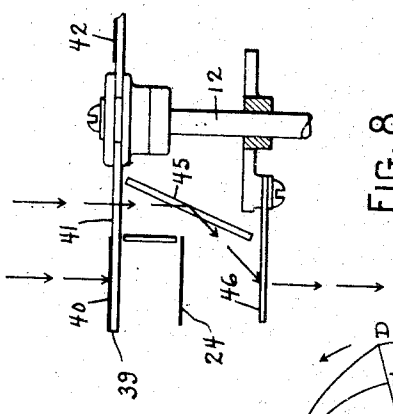


FIG. 6.

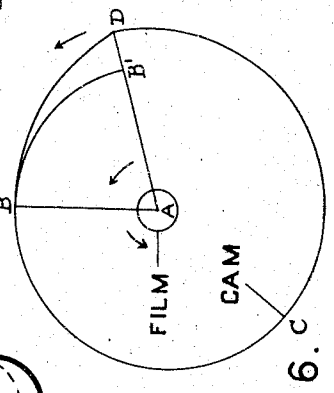


FIG. 5.

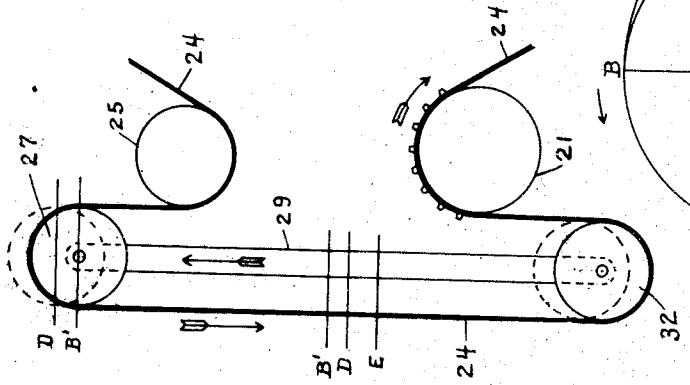
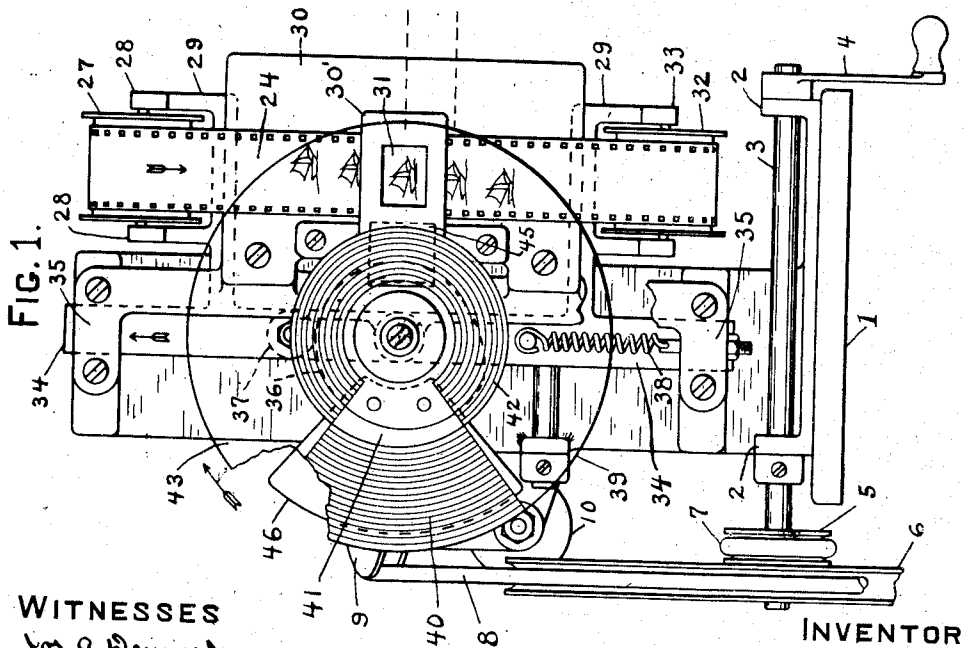


FIG. 1.



WITNESSES

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2 SHEETS—SHEET 2.

FIG. 3.

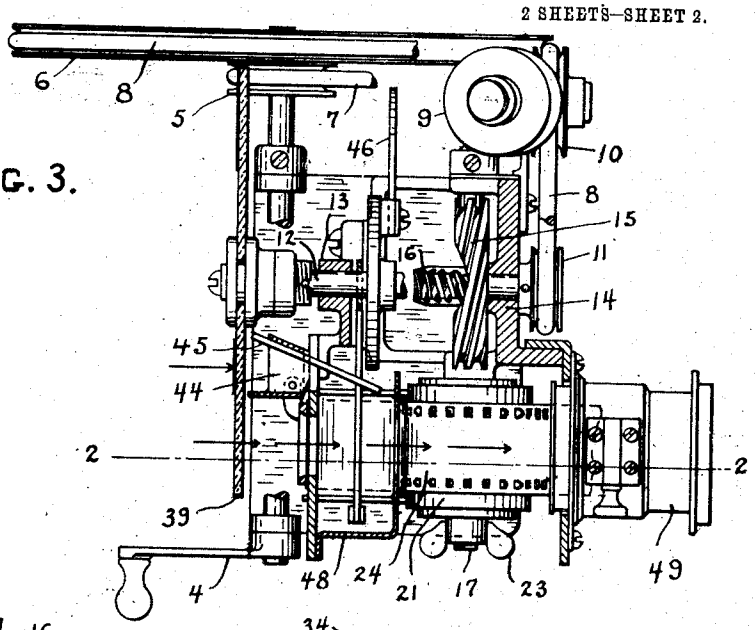


FIG. 4.

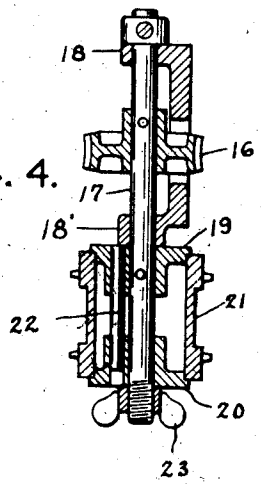
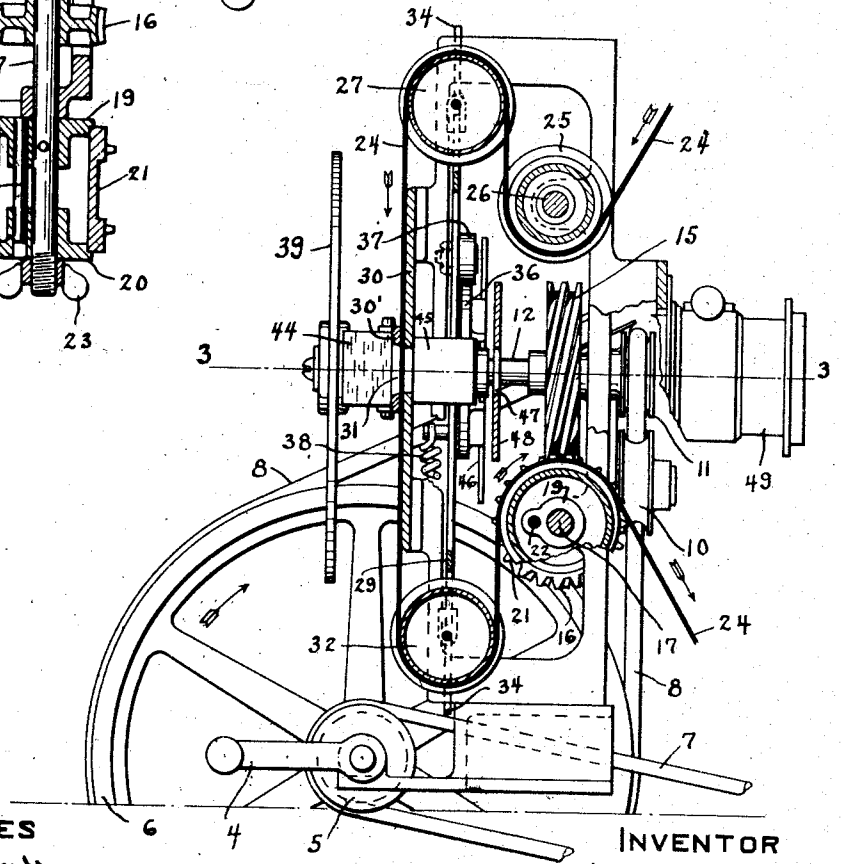


FIG. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

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KINETOSCOPE.

1,045,905. Specification of Letters Patent. Patented Dec. 3, 1912.

Application filed September 24, 1908. Serial No. 454,490.

To all whom it may concern:

Be it known that I, CHARLES B. STILWELL, a citizen of the United States, residing at Wayne, in the county of Delaware and State of Pennsylvania, have invented certain Improvements in Kinetoscopes.

The improvements of my invention are designed primarily to provide a simple apparatus that will exhibit moving pictures faithfully, with clearer definition, and without the objectionable flickering that results from the usual mode of interruption of the travel of the film sections during the projections of the successive scenes thereon, without the usual periodic obstruction of the projection of the light rays upon or the illumination of the screen, and without the vibration of the apparatus consequent upon the character of the usual movement.

I have devised means whereby, first, the successive scenes to be exhibited rest in the optical axis of the apparatus during the periods desired for projecting them while the film travels through the apparatus at a constant rate, without the formation of the usual slack or "loop" and the use of the usual jerking step by step movement given to the scene section to secure periods of rest of a portion of an otherwise constantly moving film; second, the light is cut off from the film during the periods of transition of scenes with respect to the optical axis without obstructing or periodically interrupting the projection of light through the apparatus and the illumination of the screen, and, third, the movements of all parts of the apparatus are regular and smooth by reason of the avoidance of the usual intermittent movements and of the usual spur gears.

The characteristic features of my improvements are illustrated in the accompanying drawings and the following description thereof.

In the drawings, Figure 1 is a rear elevation of a machine made in accordance with my invention; Fig. 2 is a sectional side elevation of the same taken on the line 2—2 of Fig. 3; Fig. 3 is a sectional plan view taken on the line 3—3 of Fig. 2; Fig. 4 is a sectional view taken through a film feeding sprocket and a worm wheel fixed thereto for driving it; Fig. 5 is a side elevation representing diagrammatically the film carrying mechanism; Fig. 6 is a diagrammatic representation of relations of a cam and a film section moved thereby; Fig. 7 is a diagrammatic representation of optical mechanism in its relation to the light rays during the period when the film is exposed; and Fig. 8 is a diagrammatic representation of said optical mechanism in its relation to the light rays during the period when they are cut off from the film.

In the form of the invention illustrated in the drawings, there is employed a frame 1 which carries the bearings 2 for the driving shaft 3, the latter having on one end a crank or handle 4 and on the other end the pulleys 5 and 6. The pulley 5 carries a belt 7 which operates the winding reel. The pulley 6 carries a belt 8 which passes by way of idlers 9 and 10 over a pulley 11 fixed on the shaft 12, the latter being journaled in the bearings 13 and 14.

A worm 15 is fixed on the shaft 12 and engages a worm wheel 16 fixed on a shaft 17, the latter being journaled in bearings 18, 18′. The shaft 17 has fixed thereon a hub 19 and longitudinally movable thereon a hub 20, between which hubs a sprocket drum 21 is clamped and fixed to the shaft in adjustable relation to the wheel 16, the hub 20 being movable under control of the spline 22 by the nut 23 on the shaft.

The film 24, which is fed by the sprocket 21, passes thereto by way of a drum or roller 25 journaled in bearings 26, a drum or roller 27 journaled in bearings 28 at the upper end of a slide 29, ways 30 and 30′ having the aperture 31 therethrough, and a drum or roller 32 journaled in the bearings 33 at the lower end of the slide, the latter having the vertical guides 34 movable in ways 35 of the frame. The adjustment of the film, so that the views will occupy the proper position in the optical axis, is readily effected by adjusting the film feeding sprocket 21, which can be fixed at the desired position by loosening the nut 23 and the hub 20, turning the sprocket, and clamping it in the place to which it is adjusted.

A cam 36 is fixed on the shaft 12 and engages a roller 37 journaled above it on the slide, the roller being held in contact with the cam by gravity supplemented by a spring 38 which connects the slide with the frame. The cam is revolved to elevate the slide at the same rate that the film moves downwardly between the drums 27 and 32 when the film is exposed through the aperture 31, and to permit the slide to fall so as

to accelerate the normal rate of downward travel of the film section past the aperture between exposures.

A glass disk 39 is fixed on the shaft 12 in the rear of the aperture 31; the disk having the opaque exterior section 40 with the transparent section 41 between it and the center, and the interior opaque section 42 complemental to the section 41 with the exterior transparent section 43 complemental to the section 40. The sections 40 and 43 respectively pass the aperture 31 so as to exclude and admit the light during the respective intervals of transition and rest or exposure, while the sections 41 and 42 respectively pass an aperture or walled passage 44 during the respective periods of transition and rest or exposure of the pictures. The glass disk with its opaque sections provides not only shutters for the purpose described, but also a fire shield for protecting the film.

A reflector or mirror 45 is held diagonally in or across the path of the light passing through the aperture 44 and a refractor, as a ground glass plate 46, is fixed to the shaft 12 opposite the opaque disk section 40, so that light passing through the section 41 will be reflected by the mirror 45 and refracted by the plate 46, whereby it is projected by an indirect path, around the film, through an aperture 47, in a shield 48 in front of the aperture 31, and the objective 49. Light is thus projected through the apparatus continuously, by which a screen may be illuminated constantly and steadily, obviating the usual interruption of illumination during the periods of obstruction of the light rays to the film. Preferably the light projected around the film is subdued, as by the ground glass plate or the character of the section 41, to approximately the same extent as is the light passing through the film, by reason of the obstruction of the latter, so that the intensity of the light upon the screen shall not vary materially.

In the operation of the mechanism, the cam 36 has its point of shortest radius vector in contact with the roller 37 at the period when the disk 39, revolving in the direction of the arrow, has its section 40 leaving and its section 43 approaching the light aperture 31, and the radius vectors increase in length so that the points of the cam determined thereby gradually lift the slide 29 during the period required for the movement of the section 43 past the aperture. During the period required for the section 40 to cross the aperture 31 the revolution of the cam permits these rollers and slide to drop from their highest to their lowest position. The curvature of the cam is such that the rise of the slide is at the same rate as the downward travel of the film section between the rollers 27 and 32 so that the picture exposed remains stationary in the optical axis of the apparatus during the passage of the disk section 43 and its projection upon the screen. That is to say, with reference to the diagrams of Figs. 5 and 6, the radius vector A—B is the shortest vector of the cam B, C, D, B, and the vector A—D is the longest. During the period of exposure, the cam periphery B, C, D, rolls in contact with the roller 37 and elevates the slide 29 the distance B′—D. During this period the periphery of each roller 27 and 32 has traveled a distance B′—D and advanced the film section down between them a like distance. Consequently the view remains stationary until the part D of the cam reaches the roller 37. While the section D—B of the cam is passing the roller 37 the slide drops the distance D—B′ and with the further travel of the film over the rollers 27 and 32 such film is carried the distance B′—E so that the succeeding view is brought into the optical axis of the apparatus, to be held there during the succeeding rise of the slide by reason of the downward travel of the section, between the slide rollers, of the constantly feeding film. The function of the travel of the film is a constant, represented digrammatically by the circle shown and marked "Film," while the function of the movement of the scenes is a variable and is represented diagrammatically by the "cam" or curve of variable radius vector. The movements are therefore such that the constantly fed film is maintained taut in its passage through the apparatus and travels smoothly at all times while providing for the scenes the periods of rest, in the optical axis of the apparatus, desired for projecting them.

It will be understood that this movement is applicable to a camera as well as to a projecting machine.

Having described my invention, I claim:

1. A kinetoscope having an objective, film feeding mechanism comprising means for effecting the intermittent movement of the film sections across said objective, in combination with means whereby light is passed through said film sections when at rest and around said sections through said objective when said sections are in motion.

2. A kinetoscope having a pair of rollers for carrying a film, means comprising a shaft having a cam thereon for reciprocating said rollers together, and a shutter carried by said shaft for periodically excluding light from said film.

3. A kinetoscope having mechanism comprising a shaft and a sprocket for feeding a film, a second shaft, a worm mechanism connecting said shafts, a shutter carried by said second shaft and means operated by said second shaft for giving an intermittent movement to sections of said film.

4. A kinetoscope comprising a shaft,

means on said shaft for engaging and feeding a film at a constant rate, a second shaft, means whereby said shafts are connected and operated together, a cam revolved by said second shaft, a shutter carried by said second shaft, a pair of rollers for carrying said film, mechanism connecting said rollers, and means whereby said cam reciprocates said mechanism.

5. A kinetoscope having means for feeding a film therethrough, an objective, passages through which light is projected through and around said film through said objective of the kinetoscope, and means whereby the light projections through the respective passages are alternately obstructed.

6. A kinetoscope having an objective, means whereby light is projected by different courses through said objective, means for feeding a film across one only of said courses, and means for intermittently obstructing the passage of light through said film.

7. A kinetoscope having an objective, means comprising apertures for passing light through said objective, means for carrying a film across the course of light through one of said apertures, and a disk intersecting the axes of said apertures, said disk having for each of said apertures a transparent and an opaque section arranged so that light is cut off alternately from the respective apertures.

8. A kinetoscope having a direct passage for projecting light therethrough, means for feeding a film across the axis thereof, a second passage, means for reflecting light from said second passage, means for refracting said reflected light in the direction of said axis, and means for obstructing alternately the light projections through said passages.

9. A kinetoscope having a passage through which light may be projected and a refracting device passing periodically across the path of said light.

10. A kinetoscope having a light aperture, a mirror for reflecting light projected through said aperture, and a revolving device for refracting the reflected light.

11. A kinetoscope having a light aperture, a revoluble device whereby light is alternately admitted to and cut off from said aperture, and a revoluble device for diverting the light projected through said aperture.

12. A kinetoscope having a light aperture, a revoluble device whereby light is periodically cut off from said aperture, a mirror for reflecting light passing through said aperture, and a revolving glass for refracting light reflected by said mirror.

13. A kinetoscope having a sprocket for engaging and feeding a film, a revoluble shaft, and means comprising a hub fixed and a hub movable on said shaft whereby said sprocket is adapted to be revolved and clamped in various positions relative to said shaft.

In witness whereof I have hereunto set my name this 21st day of September A. D. 1908, in the presence of the subscribing witnesses.

CHAS. B. STILWELL.

Witnesses:

ROBERT JAMES EARLEY,

JOS. G. DENNY, JR.