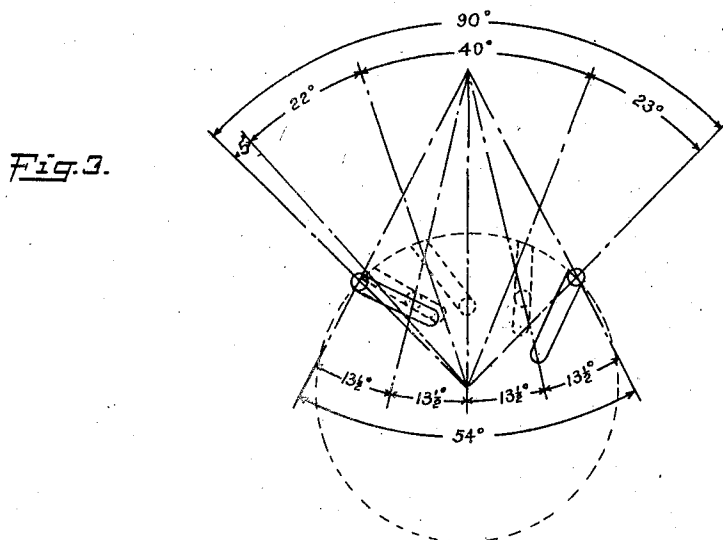
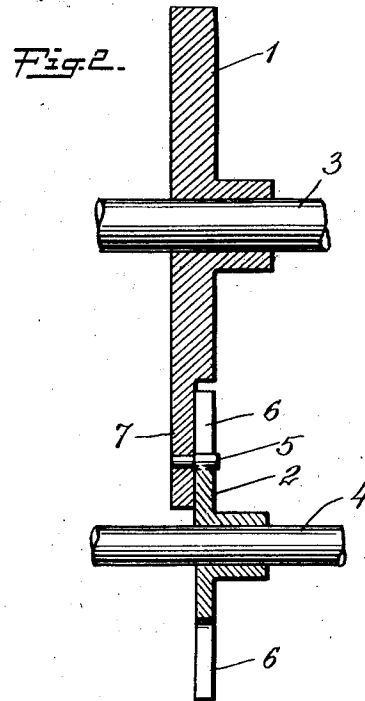
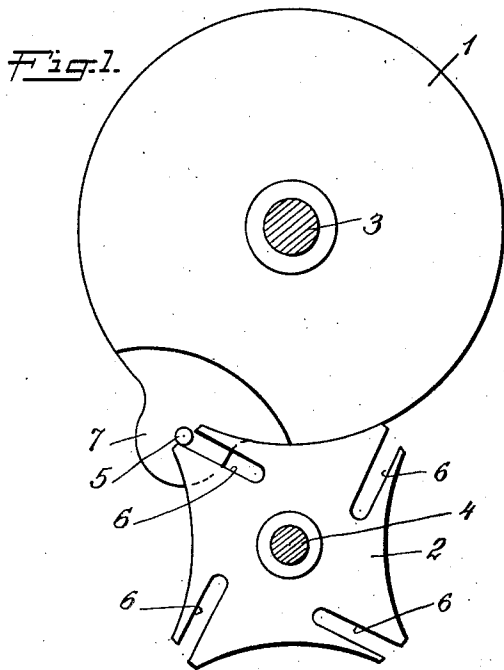


W. B. MORTON.
 INTERMITTENT MOVEMENT FOR MOVING PICTURE MACHINES.
 APPLICATION FILED NOV. 10, 1917.

1,361,168.

Patented Dec. 7, 1920.



INVENTOR

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INTERMITTENT MOVEMENT FOR MOVING-PICTURE MACHINES.

1,361,168.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WOOLRIDGE BROWN MORTON, a citizen of the United States, and a resident of Larchmont Gardens, county of Westchester, and State of New York, have invented new and useful Improvements in Intermittent Movements for Moving-Picture Machines, of which the following is a specification.

10 This invention relates to improved intermittent movement for feeding the films of moving picture machines and constitutes a division of my prior application No. 138,504, filed December 22, 1916.

15 The principal object of the invention is to provide a movement in which the ratio of the period of movement to the period of rest is smaller than has heretofore been practical without damage to the film, and which will at the same time place no greater strain on the film than that produced by the ordinary Geneva movement of 3 to 1 ratio. It has long been known to be desirable to make the periods of rest as long as possible compared with the periods of movement, within such limits, of course, as the film can stand without undue wear. The advantages of the longer period of rest and shorter period of motion are principally that more light is secured on the screen with the same candle power consumption, the picture appears steadier and of greater definition, and the flicker may be reduced by the use of a shutter having a number of the so-called flicker blades for increasing the number of interruptions of light.

25 In the majority of commercial machines, however, intermittent movement of the film has been accomplished by an ordinary Geneva gear of 3 to 1 ratio, that is, a gear in which each revolution of the driving member effects a quarter of a revolution of the driven member, the period of movement of the driven member occupying one quarter of the period of a complete revolution of the driving member. As the film is usually provided with four sprocket holes to the picture, it is customary to provide the sprocket with sixteen teeth so that each quarter revolution of the sprocket will advance the film the length of one picture.

My improved intermittent gear consists also of a Geneva couple and also gives to the

driven member a quarter revolution at each operation, whereby it may be employed with the ordinary sprockets now in use, but in my improved gear the driven member of the couple is so modified that the entire movement of the driven member takes place in less than a quarter revolution of the driving member, whereby the period of rest is prolonged with respect to the period of movement and the above enumerated advantages are obtained. The shortening of the period of movement is not, however, obtained at the expense of the film, but in my improved geneva the curve of acceleration is substantially the same as that of the ordinary geneva and the maximum velocity attained may also be no greater than the ordinary geneva, whereby under the same tension at the aperture the faster movement is obtained without greater strain on the film.

30 In the accompanying drawings I have illustrated an example of my improved geneva modified to give a ratio of rest to movement which will permit the use of a shutter having its flicker blades so arranged and proportioned as to substantially eliminate the flicker from the picture, but it will be understood, as hereinafter explained, that the ratio of the period of movement to the period of rest may be altered without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In said drawings,

Figure 1 is a side elevation of the modified Geneva couple;

Fig. 2 is a vertical section of the Geneva couple;

Fig. 3 is a diagrammatic view showing the relative angular velocity of the driving and driven members of the couple during their period of engagement.

Referring particularly to Figs. 1 and 2 of said drawings, 1 represents the driving member and 2 the driven member. The driving shaft, which is indicated at 3, is to be rotated continuously at a uniform speed and the driven shaft 4 will be rotated intermittently through one quarter of a revolution with intervening periods of rest, as will be later described.

My improved gear may be termed a modified Geneva gear, the driving member consisting as in an ordinary Geneva gear, of a

disk having on one side a projection 7 carrying a driving pin 5 engaging the slots 6 of the driven member 2, which is similar in appearance to the usual star wheel. Between the slots 6, the edges of the star wheel are curved inward on a radius equal to the radius of the driving disk to form a locking engagement between the two parts of the couple when the driven member is at rest.

In the type of gear shown, the disk is of a greater thickness than the star wheel, and at the side having the projection 7, the disk is cut away to a depth equal to the thickness of the star wheel so that the projection and the pin may pass behind the star wheel to bring this pin into the slot 6 to be engaged.

It will be understood that when installed in a moving picture machine the film feed sprocket is rigidly attached to the shaft of the star wheel and that the sprocket is arranged beneath the aperture against which the film is held with a constant pressure by spring pressed guides or "tension shoes". The pressure of the springs against the film produces a constant braking effect, tending to increase the load on the gear during the period of acceleration and working in opposition to the momentum of the sprocket and thereby assisting the gear during its retarding movement.

In my improved driving gear the slots 6 are not radial to the driven shaft, but are inclined to the radial at an angle determined by the ratio of the diameters of the driving and driven parts. To express it otherwise, the angle of the slot 6 to the radial is determined by the angular value of the portion of the circumference of the driving disk engaged by the concave locking faces of the star wheel, the angle being such that the sides of the slot to be engaged by the driving pin are tangential to the arc of movement of the driving pin. In the example shown, the entire 90 degrees movement of the star wheel takes place in 54 degrees of movement of the driving disk. By means of this construction the movement of the star wheel begins with a zero velocity and is slowly accelerated through the first part of its movement, the rate of acceleration growing gradually greater until the maximum is reached, which velocity is maintained substantially uniform for a portion of the movement, the movement being then retarded with a more rapid decrease in speed than the rate of acceleration.

As illustrated graphically in Fig. 3, the star wheel moves through only about 5 degrees of its total 90 degrees during the first quarter period of movement of the driving pin wheel; during the second equal period of the driving disk the movement of the star wheel is about 22 degrees. In the third period of movement of the driving disk the

star wheel moves through about 40 degrees, while in the final period of movement, during which the velocity is decreased, the star wheel moves through about 23 degrees, when it is brought to rest by the engagement of one of its locking faces with the periphery of the driving disk. During the 40 degree period of movement, the velocity of the star wheel is almost uniform, the increasing distance of the point of engagement of the pin and the slot from the center of the driven shaft being compensated for by the more effective angle of the slot.

I have determined that the overstrain of the film is caused by a too rapid acceleration of the film against the starting friction imposed by the film guides, as much as by an excessive maximum velocity. By my improved gearing, the acceleration at starting is very slow, and the maximum velocity is kept down by provided a long period of substantially uniform maximum velocity between the periods of acceleration and retardation.

With the ordinary Geneva gear, in which the slots in the star wheel are radial to the axis of rotation, the maximum velocity occurs only for the moment that the pin is at the bottom of the slot. Hence, the period of movement at the maximum, or approximately maximum, velocity is so short that the total period of movement to effect the same advance of the film is much longer than required with my improved gear without exceeding the same actual maximum velocity.

By determining the inclination of the slots of the geneva with relation to the momentum of the sprocket and attached parts and the braking effect of the tension guides, the film may be brought to rest at the completion of the movement without jar or tendency to overrun the sprocket in a period of movement quite as brief as illustrated in the drawings, thereby leaving a long period of movement for the accelerating period so that the film will not be strained at any part of its movement.

I have chosen for illustration a Geneva gear having the angular proportions above described for the reason that it has been found that a shutter having three blades of equal width and three intermediate light openings also of equal width will substantially eliminate the flicker from the picture when given one complete revolution for each intermittent movement of the film, so that one blade obscures the aperture during the period of movement of the film and the other two blades cross the aperture and interrupt the light during the interval that the picture is stationary. By means of causing the movement of the film to take place in less than 60 degrees of the complete revolution of the driving member, a shutter may be used having blades and light openings of

60 degrees each, so that the screen will be illuminated more than half the time.

It will, however, of course, be understood that by differently proportioning the parts a different ratio of the period of movement to the period of rest may be obtained, as desired.

I claim:

1. In an intermittent driving and locking gear consisting of a Geneva couple having a driven member with four driving slots equidistantly disposed around the axis thereof, concave locking faces interposed between the two driving slots and occupying substantially the entire periphery of the driven member between the slots, said slots being at an angle to the radial to produce a greater period of acceleration than retardation of the driven member, substantially as described.

2. An intermittent driving and locking

gear consisting of a Geneva couple having a driven member with four slots inclined to the radial to be substantially tangential to the path of movement of the driving pin when the driven member is stationary.

3. An intermittent driving and locking gear consisting of a Geneva couple having a driven member with four slots inclined to the radial to be substantially tangential to the path of movement of the driving pin when the driven member is stationary, and having the diameters of the two parts so proportioned to each other that the movement of the driven member through a quarter revolution takes place during substantially less than a quarter revolution of the driving member.

Signed at New York in the county of New York and State of New York this 13th day of October, 1917.

W. BROWN MORTON.