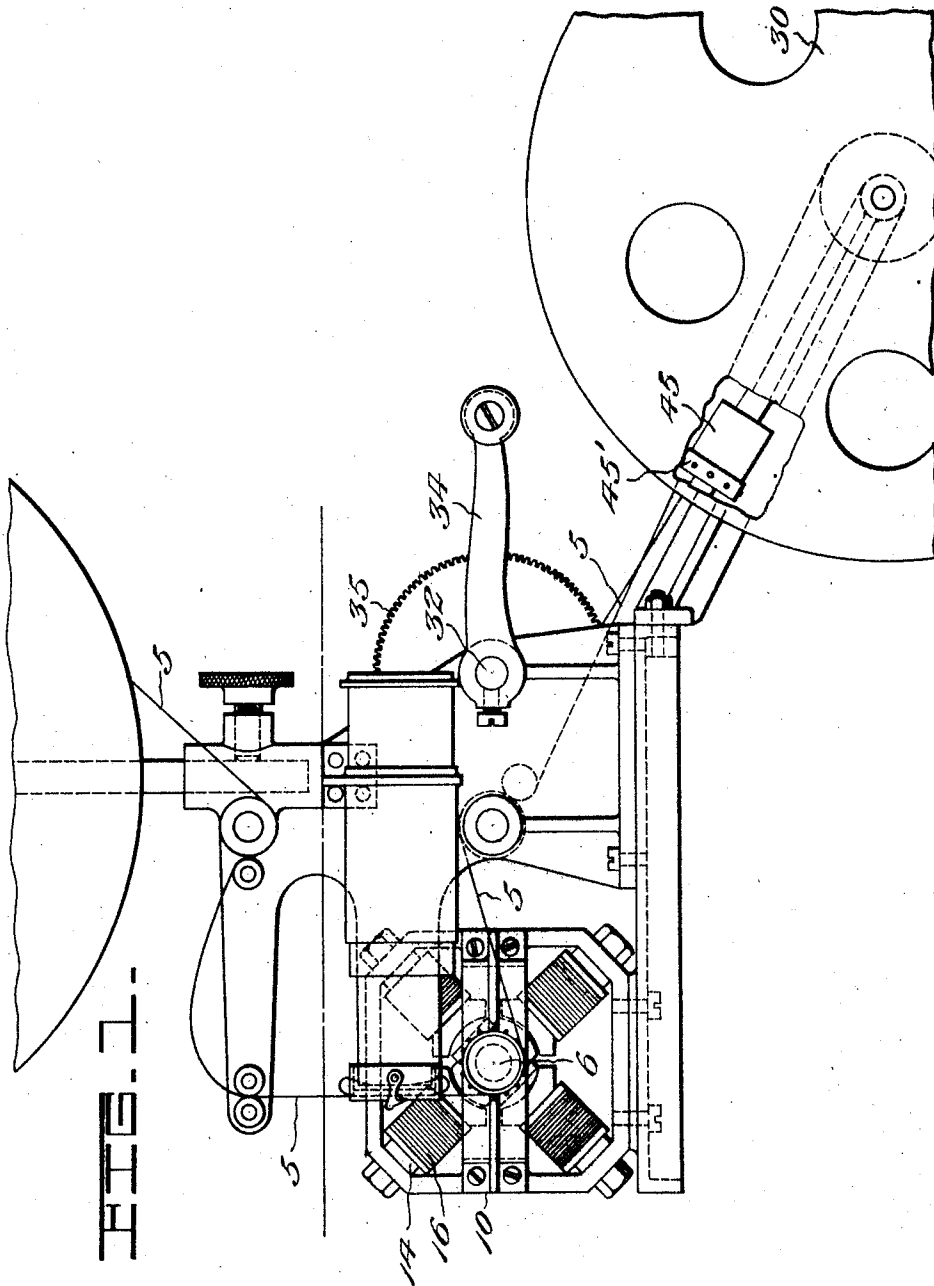


H. M. HILL.
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APPLICATION FILED OCT. 24, 1916.

1,315,224.

Patented Sept. 9, 1919.
4 SHEETS—SHEET 1.

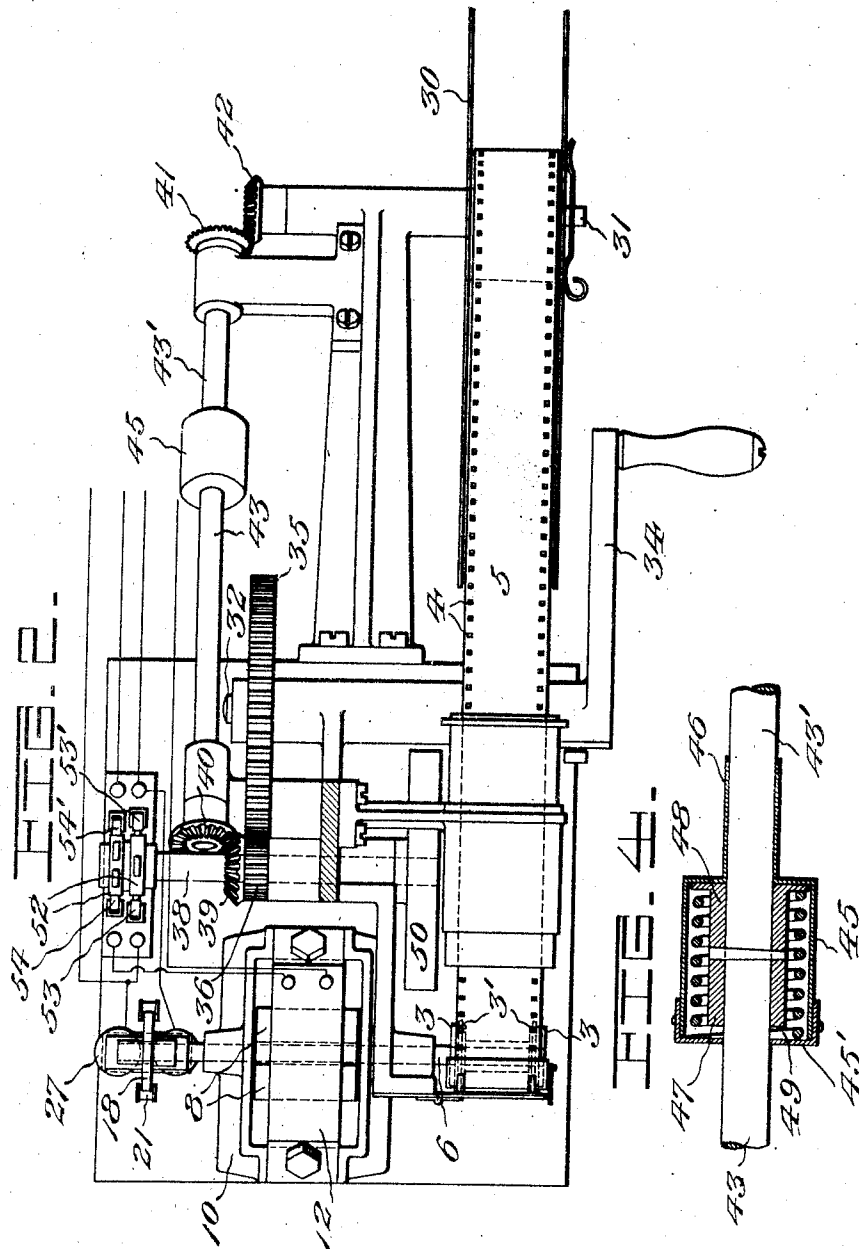


INVENTOR:-
Harry M. Hill,
BY *James L. Hopkins,*
ATTORNEY.

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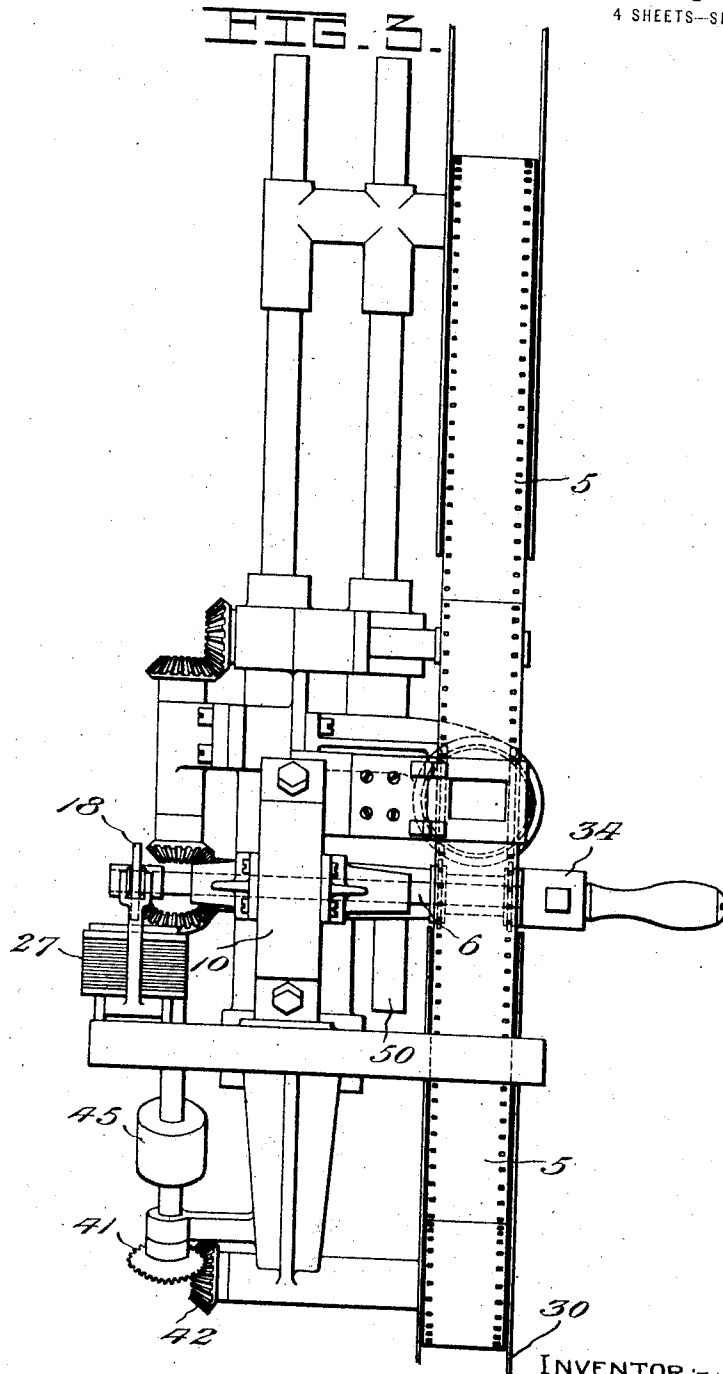


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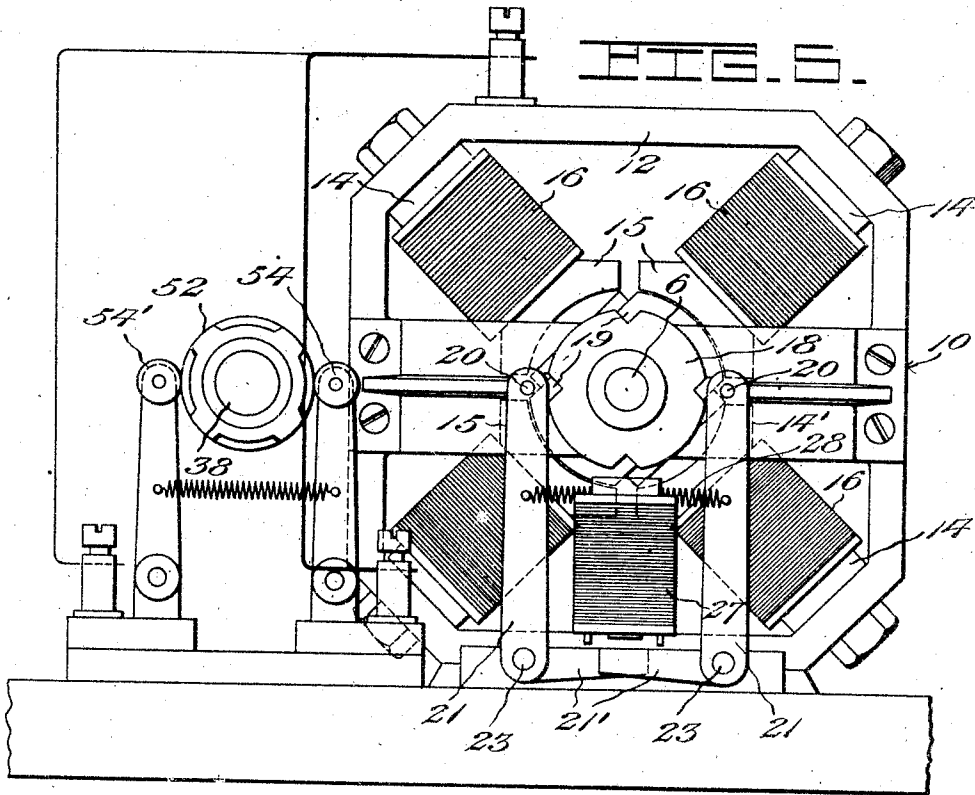


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UNITED STATES PATENT OFFICE.

HARRY M. HILL, OF ST. LOUIS, MISSOURI.

MOTION-PICTURE-PROJECTING MACHINE.

1,315,224.

Specification of Letters Patent.

Patented Sept. 9, 1919.

Application filed October 24, 1916. Serial No. 127,470.

To all whom it may concern:

Be it known that I, HARRY M. HILL, a citizen of the United States, residing at the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Motion-Picture-Projecting Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in motion picture projecting machines and relates more particularly to the means for advancing and controlling the position of the film.

One of the main objects is to provide apparatus arranged to impart a positive intermittent traveling motion to a film without danger of vibration of the film while at rest, so as to insure the production of a perfect picture, the film being fed equal distances without the slightest variation and positively locked in the position of rest.

A further object is to provide an independent film feeding mechanism separate from the take-up winding means and yet controlled thereby so as to be maintained in synchronism therewith at all speeds. In this manner I am enabled to produce a rapid active movement of the film in an even manner and with the avoidance of jerking, thereby preventing any sudden or undue strains upon the film. I am enabled to attain these objects by providing independent electro-magnetic means for advancing the film and for holding it locked in the position of rest or exposure.

In the drawings, Figure 1 is a side elevation of a machine embodying my invention; Fig. 2 is a top plan view of the same; Fig. 3 is a front elevation of the same; Fig. 4 is an enlarged detail of the shaft-coupler employed between the main driving-gear and the driving-gear of the take-up reel; and Fig. 5 is an enlarged view of the motor and locking mechanism in side elevation.

As shown in the drawings, the film-feeding mechanism comprises the usual sprockets 3 whose teeth 3' engage the marginal perforations 4 of the film 5, the sprockets being mounted upon the shaft 6 which carries the projections or segments 8 constituting the armature of the electric motor 10. The motor is of a well-known type in which the yoke frame 12 carries the field magnets 14 having pole pieces 15 surrounding the ar-

mature and provided with field windings 16 which may be energized successively to produce the rotation of the armature.

The locking mechanism which positively holds the film during the period of rest or exposure comprises a disk 18 carried by a shaft 6 and provided with a plurality of oppositely disposed pairs of notches 19 which are engaged successively by pins 20 carried at the ends of bell-crank levers 21 pivoted at 23. These levers are connected by a spring 28 which normally forces them toward each other so that the pins 20 will engage the notches 19 to prevent the shaft 6 and the film-feeding mechanism carried thereby from rotation. The lever arms 21 are forced apart to withdraw the pins 20 from the notches 19 when the shorter arms 21' are attracted and drawn upwardly by the electro-magnet, to permit the motor to rotate the armature. It is to be understood that the armature is provided with an appropriate number of segments or projections to produce a torque or turning movement when the field windings are successively energized, as is well known, without further description.

The take-up reel 30 may be operated by suitable power mechanism or mainly as I have indicated for purposes of illustration. As I have shown in Fig. 2, the drive shaft 32 may be operated by means of a hand-crank 34 and carries a gear 35 which meshes with a pinion 36 on the shaft 38. Power is transmitted from the shaft 38 to the shaft 31 of the reel 30 through the pairs of bevel-gears 39, 40, and 41, 42 and the intermediate shaft 43. In order to provide for a slip or variation in the relative movement of the reel shaft 31 in proportion to the amount of film wound thereon, I separate the intermediate shaft into the parts 43 and 43' which are connected by means of a slip-clutch or coupler, shown in detail in Fig. 4. This coupler comprises a housing or shell 45 having a collar 46 fixed to the shaft 43'; and sleeves 47, 48 within the housing mounted upon the respective shaft members and a coiled spring 49 surrounding said sleeves and bearing at opposite ends against the cap 45' of the housing and a flange on the sleeve 48 respectively, thereby constituting an elastic connection between the shaft members. The cap 45' is fixedly mounted on the shell 45. The sleeve 48 is loosely

mounted on the shaft 43'; the sleeve 47 being fixedly mounted on the shaft 43. Shaft 43' is driven by the contact established through the pressure of the terminals of the spring 49 against the inner faces of the shell 45 and the cap 45'. In order that the rotation of the parts may be rendered more uniform, I provide a balance-wheel 50 on the shaft 38.

As previously stated, the film-feeding mechanism which is electro-magnetically actuated, is controlled by a commutating device carried by the operating mechanism of the take-up reel so that it will operate synchronously therewith at all speeds. For this purpose I have illustrated in a conventional manner a commutating device comprising rings 52 mounted upon the outer end of the shaft 38 and provided in the usual manner with conducting and insulating peripheral portions adapted to cooperate with pairs of brushes 53, 53' and 54, 54' bearing thereon to control the circuit connections from a suitable source of electric power to the motor field coils so that they will be energized successively to produce rotation of the film-feeding mechanism at the proper intervals and simultaneously energizing the magnet 27 to release the locking pins 20 from the notches of the locking disk 18 as will be understood by engineers and those familiar with the ordinary commutating mechanism connected with electric motors of this type.

The advantages which are derived from the use of electro-magnetic means for advancing the film and holding it positively in locked position during the period of rest or exposure, will be appreciated by those who are familiar with the requirements of film-controlling mechanism. Inasmuch as the electrically actuated mechanism operates instantly upon the closing of the contacts at the commutating device the locking pins 20 will be instantly withdrawn from the notches 19 and at the same instant the field magnet of the motor which was simultaneously energized will exert a torque upon the adjacent armature segments to produce a rotation of the sprockets 3. If desirable, the commutator contacts may be so arranged as to energize the successive field coils just prior to the actuation of the magnet 27 which releases the locking pins 21, thereby establishing the torque just prior to the unlocking of the film-feeding shaft. It would be apparent to those familiar with electrical apparatus that the film will be moved instantly from one position of rest to the next position in which the subsequent pose of the picture is exhibited, leaving each picture exhibited for the maximum of time and consuming a minimum of time in removing a picture and substituting the subsequent one; but at the same time I am enabled to adapt

the torque of the motor to the pull required upon the film without subjecting the latter to the sudden jerking action which is produced when the movement is produced by the sudden release of a spring under tension. In fact, if it is desired, under any conditions to cause a momentary initial acceleration of the moving parts other than that produced by the sudden movement of the armature from a period of rest, I may predetermine the character of the initial torque and acceleration by proportioning the magnetic and electrical elements of the motor in a manner well understood by engineers.

By the described means the successive periodic movements of the film may be controlled with accuracy and the intervals of rest and movement so timed that the use of a shutter is dispensed with, thus eliminating the loss of illumination and other well-known disadvantages incident to the use of the shutter. The adaptation of electro-magnetic means for the actuation of the film-feeding mechanism not only simplifies the construction of the driving mechanism rendering it less liable to get out of order, but also provides for a more sensitive and accurate control of the movements of the film.

I have described in detail the particular mechanism illustrated in the accompanying drawings for the purpose of clearly disclosing an embodiment of my invention, but it is evident that various changes and modifications may be made therein within the scope of my invention.

Having thus described my invention, what I claim as new and desire to have secured to me by the grant of Letters Patent, is—

1. In a motion picture projecting machine, a film-engaging sprocket; a shaft carrying said sprocket; an armature mounted on said shaft; and electro-magnetic means for imparting step-by-step rotation to said armature.

2. In a motion picture projecting machine, a film-engaging sprocket; a shaft carrying said sprocket; an armature mounted on said shaft; and a series of electro-magnets arranged to impart step-by-step rotation to said armature.

3. In a motion picture projecting machine, a film-engaging sprocket; a shaft carrying said sprocket; an armature mounted on said shaft; electro-magnetic means for imparting step-by-step rotation to said armature; and for locking said armature in fixed position.

4. In a motion picture projecting machine, film-feeding mechanism, comprising a film engaging device, electromagnetic means for actuating said device, an electrically controlled locking device for positively holding said mechanism during periods of rest or

exposure and commutating means for simultaneously controlling the operation of said actuating device and said locking device.

- 5 5. In a motion picture projecting machine, a film-engaging sprocket; a shaft carrying said sprocket; an armature mounted on said shaft; electro-magnetic means for imparting step-by-step rotation to said armature, in combination with a take-up reel, a shaft
- 10 carrying said reel, and suitable means connecting said sprocket-carrying shaft and said reel-carrying shaft to secure synchronous operation of said shafts at varying speeds.
- 15 6. In a motion picture projecting machine, a film-engaging sprocket; a shaft carrying said sprocket; an armature mounted on said shaft; a series of electro-magnets arranged to impart step-by-step rotation to said armature, in combination with a take-up reel, a
- 20 shaft carrying said reel, and suitable means connecting said sprocket-carrying shaft and said reel-carrying shaft to secure synchronous operation of said shafts at varying
- 25 speeds.
7. In a motion picture projecting machine, a film-engaging sprocket; a shaft carrying said sprocket; an armature mounted on said

shaft; electro-magnetic means for imparting step-by-step rotation to said armature; 30 and for locking said armature in fixed position, in combination with a take-up reel, a shaft carrying said reel, and suitable means connecting said sprocket carrying shaft and said reel-carrying shaft to secure synchro- 35 nous operation of said shafts at varying speeds.

8. In a motion picture projecting machine, a film-feeding mechanism, comprising a film engaging device, electromagnetic means for 40 actuating said device, an electrically controlled locking device for positively holding said mechanism during periods of rest or exposure and commutating means for simul- 45 taneously controlling the operation of said actuating device and said locking device, in combination with a take-up reel, a shaft carrying said reel, and suitable means con- 50 necting said sprocket-carrying shaft and said reel-carrying shaft to secure synchronous operation of said shafts at varying speeds.

In testimony whereof I hereunto affix my signature.

HARRY M. HILL.