Sept 1, 1925. 1,551,558

J. H. HALLBERG

REGULATOR FOR MOVING PICTURE PROJECTORS

Filed March 18, 1920 2 Sheets-Sheet 1

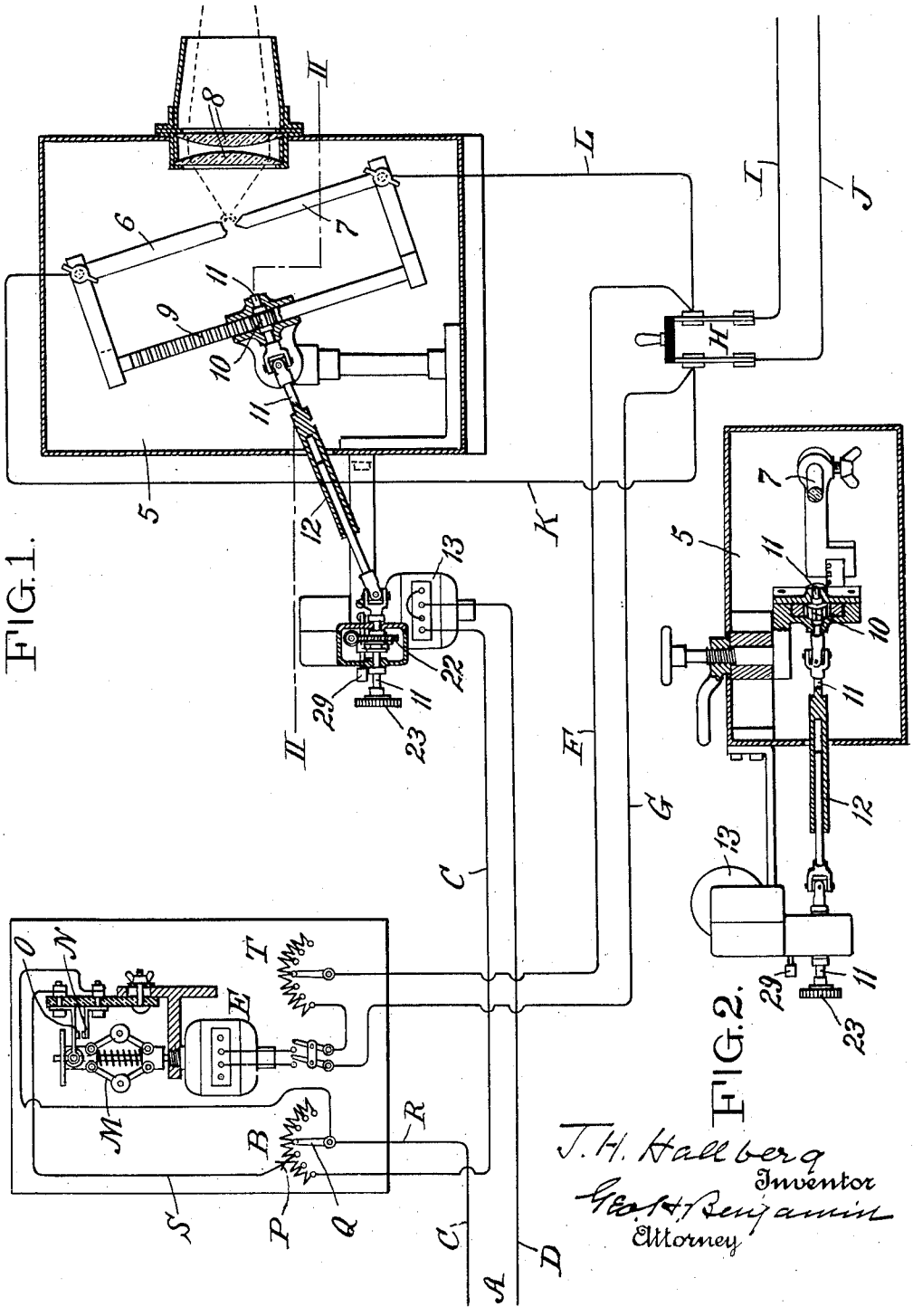

FIG. 1.

FIG. 2.

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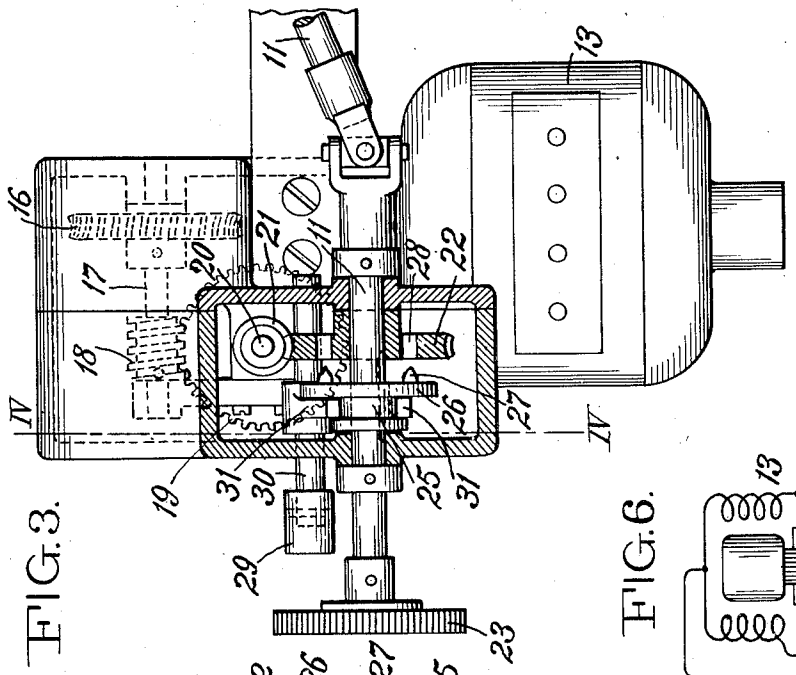

FIG. 3.

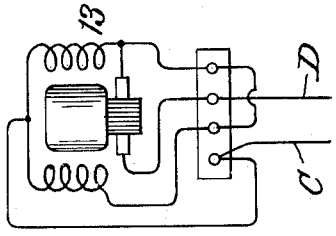

FIG. 6.

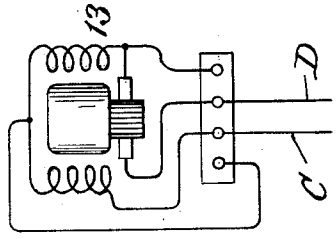

FIG. 5.

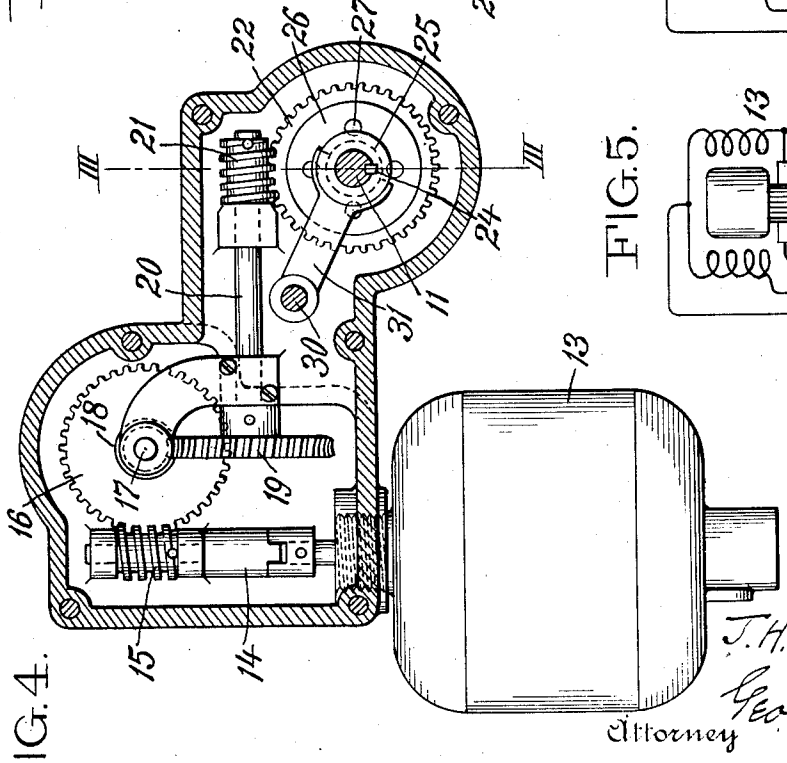

FIG. 4.

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Patented Sept. 1, 1925. 1,551,558

UNITED STATES PATENT OFFICE.

JOSEF HENRIK HALLBERG, OF NEW YORK, N. Y.

REGULATOR FOR MOVING-PICTURE PROJECTORS.

Application filed March 18, 1920. Serial No. 366,954.

To all whom it may concern:.

Be it known that I, JOSEF HENRIK HALLBERG, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Regulators for Moving-Picture Projectors, of which the following is a specification.

My invention relates more particularly to the method and means employed to control the feed of the carbons of the lamp, and compensate for mechanical imperfections. Various methods and means have hitherto been employed to control the feed of the carbons of such lamps, but none have proved sufficiently permanently sensitive to insure good results. The object, therefore, of my invention is a construction where the feed of the carbons will be uniform, continuous and permanent as long as the lamp is fit to use.

The accompanying drawings will serve to illustrate my invention in which Fig. 1 is a general diagram showing the parts, circuit connection, etc.

Fig. 2 is a horizontal section on line II—II of Fig. 1.

Fig. 3 is a section on line III—III of Fig. 4.

Fig. 4 is a section on line IV—IV of Fig. 3.

Figs. 5 and 6 are diagrams respectively showing the circuit connections to motor employed with D. C. and A. C. current.

In the drawings, 5 is a projector lamp of the usual construction, with carbons 6—7, and condensing lenses 8. The carbon 6 is adapted to be fed towards carbon 7 by the rack 9 and pinion 10, driven in one direction by shaft 11, having a telescopic joint 12. The shaft 11 is driven by motor 13 which is supplied with current from a constant potential alternating or direct current source, or it may, if desired, be connected across the arc, or as in Fig. 1, from a constant potential source generally indicated at A, through adjustable rheostat B, by conductors C, D.

It will be understood that by means of the rheostat the speed of the motor may be set to operate at any speed desired. I prefer to set the speed so that the feed of the carbons will be slightly slower than the carbon consumption. It will be evident that the rheostat may also be used to regulate the energy to overcome any difference in friction at the reduction gears at the motors, or in the carbon feeding rack pinion, etc., and thus insure the desired speed of feed unaffected by mechanical disturbances due to wear of parts, etc.

The speed of motor 13 is transmitted through clutch shaft 14, carrying worm 15, to gear 16, to shaft 17, to worm 18, to gear 19, to shaft 20, through worm 21 and gear 22, to shaft 11. On the rear end of shaft 11 is a hand wheel 23, by reason of which shaft 11 may be rotated and carbons adjusted. The gear 22 is loose on shaft 11. Mounted loosely on shaft 11 and capable of sliding motion thereon through a key 24 is a collar 25, having a plate 26, carrying tapered projections 27, adapted to enter the openings 28 in gear 22, when pushed forward by means of knob 29 and rod 30, connected to sliding collar 25 by means of forked arm 31.

In Fig. 3 the knob 29 is drawn out and the shaft 11 may be rotated in either direction.

The taper projections 27 are of such design that if for any reason the carbons stick or are burned out, they will be disengaged from gear 22 and thus break mechanical connection between feeding motor 13 and lamp carbons.

The feed of the carbon and mechanical variation of mechanism is regulated as follows:—

E is a motor connected across the conductors F—G, connected across switch H, connected to conductor I, J, which feeds D. C. to lamp carbons 6—7 through conductors K. L.

To the shaft of the motor E is connected a governor M, adapted to move one of two contacts N, O, respectively connected through rheostat B to conductors C, D.

The motor E it will be understood is extremely sensitive to changes in voltage at the arc, and as the friction of this motor is negligible, the motor will respond very quickly to voltage changes at the arc. When the voltage increases, the speed of the motor is correspondingly increased and under the action of the governor the contacts N, O brought together, which cuts out a portion of the resistance of the rheostat nor-

mally in circuit with motor 13, thus causing motor 13 to speed up, depending upon the position of the contact clip P on rheostat, relative to rheostat handle Q. The normal circuit is from source of energy A, by conductor C, through conductor R to rheostat handle Q, thence through the portion of the rheostat at the left, by conductor C to one terminal of motor 13, thence through motor and by opposite terminal, by conductor D to source of energy A. The circuit controlled by the governor is from source of energy A, by conductor C, through conductor R to handle Q, to contact point N to contact point O, by conductor S, to the portion of the rheostat at the left of the clip P, by conductor C to one terminal of motor 13, through motor to opposite terminal and by conductor D, back to the source of energy.

The operation of my device is as follows:—

The motor 13 is set to run at a slower speed than is required to satisfy carbon consumption, and the motor E at a speed to normally do nothing but to vary speed by variation of voltage at the arc to cut out, or in resistance to motor 13, and thus obtain in practice absolute, constant and uniform feed of carbons with the arc voltage maintained within a fraction of a volt, and very steady.

In Fig. 1 a second rheostat T is shown in series with motor E. The object of this arrangement is to permit the operator to change the voltage across the arc.

When more resistance is cut into the circuit of motor E, it requires a higher voltage to give motor E the speed to operate governor and close contacts, which is equivalent to increasing the arc voltage to be maintained. On the other hand, if resistance is cut out it requires less voltage at the arc to have the motor E actuate contacts, and it will, therefore, "tease" the motor 13 oftener, until the carbon separation has been decreased to represent the lower voltage called for by the adjustment of the resistance.

In this specification I have described mechanism, such as may be employed to carry my method into effect. I wish it understood, however, that I do not in any wise limit myself to the particular mechanism employed for feeding the carbons of the projector lamp, for reducing the speed of the motor which operates the carbons, for actuating the carbons independently of the carbon actuating motor, for throwing the motor, actuating the carbons, out of mechanical relation with the carbons, for opening and closing circuits to change the resistance of the motor which actuates the carbons, or for "teasing" the motor which actuates the carbons, as well as the circuit connections, as many changes may be made therein without departing from the intent of my invention.

Having thus described my invention, I claim:

1. In a projector lamp, the combination of carbons, a motor for operating the carbons, means for conveying current to the motor and adapted to operate such motor at a speed less than is required to compensate for carbon consumption at the arc, a second motor, means for conveying current to the second motor through conductors connected across the arc, and means controlled by variations of speed of said second motor, and adapted to cut resistance in and out of the circuit actuating the first named motor, and thereby vary its speed and feed of carbons in accordance with variations of voltage at the arc.

2. An arc lamp, having a pair of carbons, a feeding mechanism for the same, and automatic means controlling the rate of feed, comprising a motor, adapted to drive the feeding mechanism at a speed less than normal, and a separate controlling device, responsive in its movements to the voltage across the carbons, and adapted to intermittently increase the speed of the motor, and the feed for the carbons, above that corresponding to normal.

3. In an arc lamp, a feeding mechanism for the carbons, a continuously rotating motor, adapted to feed the carbons at less than their normal rate, and a controlling device adapted to increase intermittently the rate of feed of the carbons, comprising a continuously rotating motor, the speed of which is proportional to the voltage across the carbons, a centrifugal device driven thereby, contacts actuated by the centrifugal device, and a rheostat, adapted to be thrown into and out of the motor circuit, by the centrifugal device, upon predetermined speeds of the controlling device, and adapted to control the speed of the first-named motor.

4. An arc lamp, comprising a pair of carbons, a feeding mechanism therefor, two independent continuously rotating motors, one a driving motor, and the other a controlling motor, means whereby the motors will co-act to control the voltage maintained between the carbons, the driving motor adapted to feed both the carbons simultaneously at less than normal rate, and the controlling motor adapted to intermittently increase the speed of the driving motor, to a predetermined fixed higher speed than that of normal, and for such periods of time as compensate for the lack of feed of the carbons, when at its lower speed.

5. An arc lamp, having a pair of carbons and a feeding mechanism therefor, a driving motor, adapted to feed the carbons at two predetermined speeds, separate means for determining each speed, and automatic

means responsive to the degree of separation of the carbons, adapted to increase the speed of the driving motor, for varying periods of time, to maintain a uniform voltage across the carbons.

6. An arc lamp, having a pair of carbons, a feeding mechanism therefor, comprising a continuously running motor, feeding the carbons at less than normal rate, and a speed controlling device, comprising a continuously running shunt motor, a centrifugal device driven by the latter motor, adapted to increase the speed of the feeding motor, to a predetermined fixed amount, at a predetermined increased voltage across the carbons.

7. An arc lamp, having a pair of carbons, and a feeding mechanism therefor, a motor driving the feeding mechanism at less than normal rate, a rheostat in series with the motor field, and automatic means adapted to shunt the resistance interpolated by the rheostat when the electromotive force across the carbons raises to a predetermined voltage

In testimony whereof, I affix my signature.

JOSEF HENRIK HALLBERG.