(No Model.)

E. THOMSON.

ELECTRO MAGNETIC RETARDING DEVICE.

No. 272,353. Patented Feb. 13, 1883.

Fig. 1.

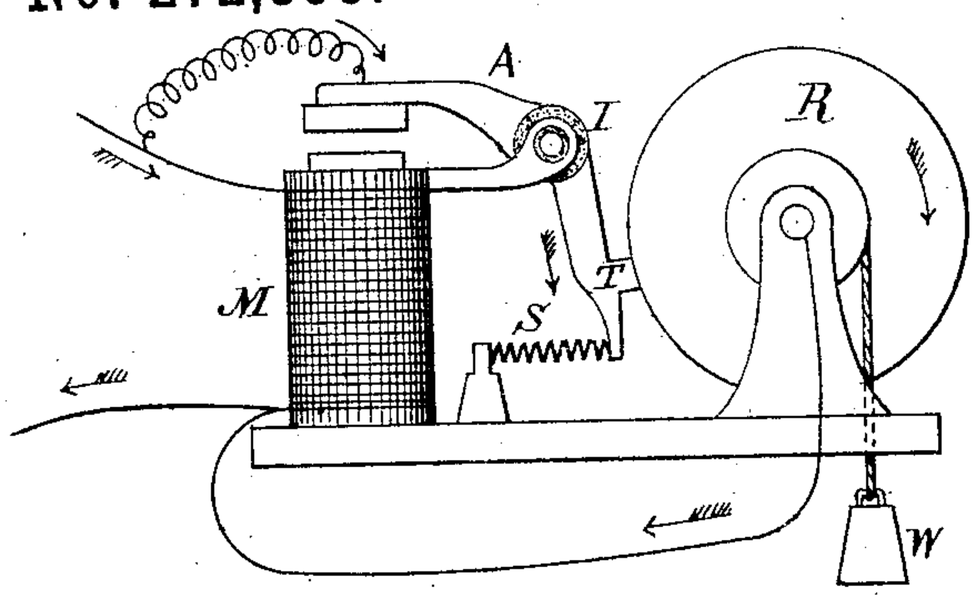


Fig. 2.

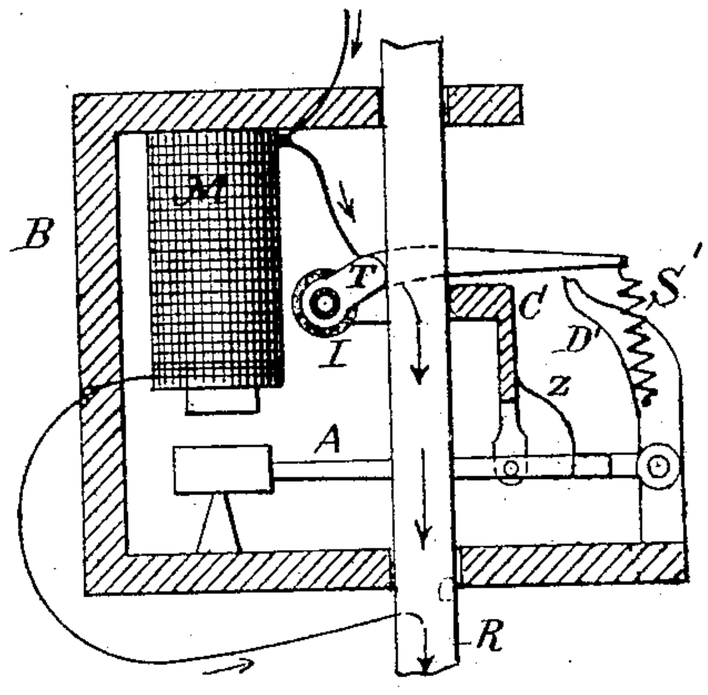
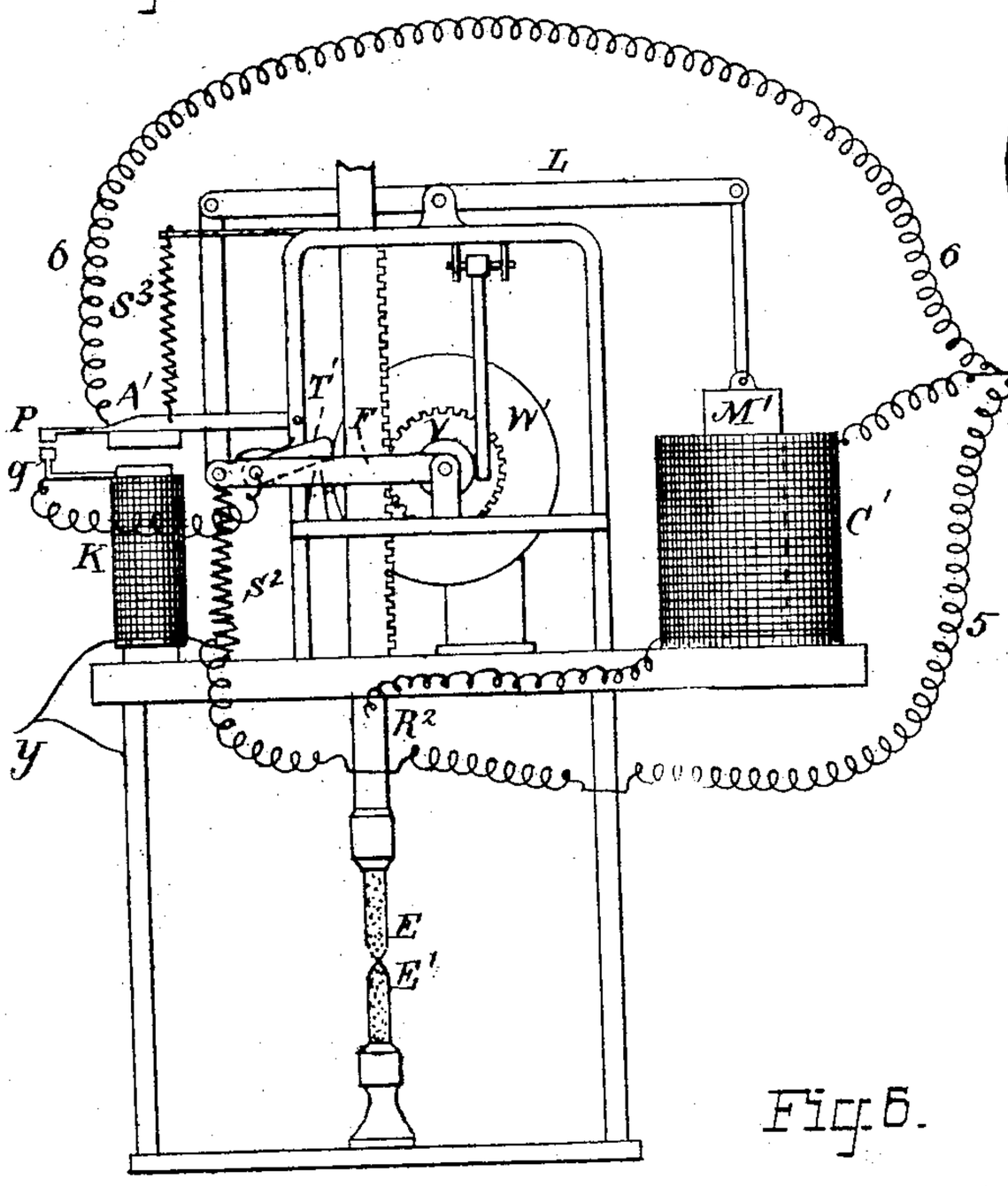


Fig. 3.

Fig. 4.



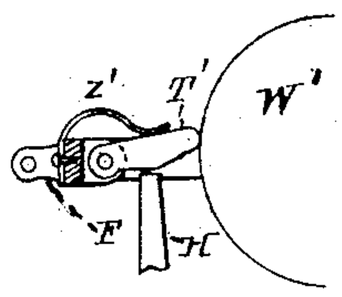
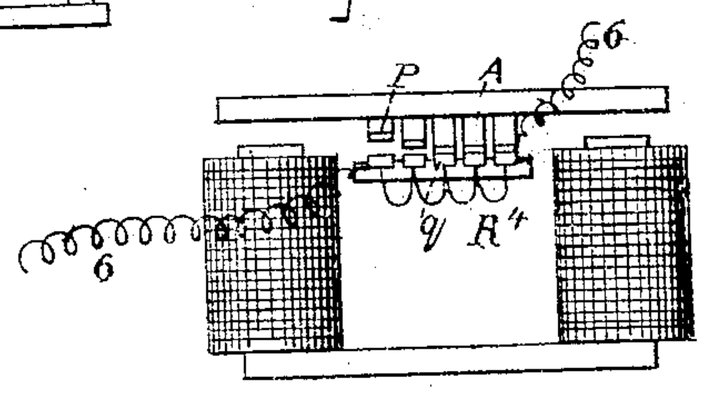


Fig. 5.

Fig. 6.



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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF NEW BRITAIN, CONNECTICUT, ASSIGNOR TO THE AMERICAN ELECTRIC COMPANY, OF SAME PLACE.

ELECTRO-MAGNETIC RETARDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 272,353, dated February 13, 1883.

Application filed September 18, 1882. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of New Britain, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electro-Magnetic Retarding Mechanism, of which the following is a specification.

My invention consists of what I term an "automatic retardation feed," accomplished through magnetic action, and adapted to any of the uses for which the ordinary mechanical retarding devices—such as escapements, flies, dash-pots, &c.—are employed, but more especially to attaining a more perfect and steady feed of the carbons in electric lamps.

My invention consists in making the opening of a clutch, brake, detent, clamp, or equivalent device affect an electro-magnet so as to increase its power, thus causing the immediate closing or re-engagement of the clutch, clamp, or detent, which latter is for this purpose connected with and operated by the electro-magnet through the intervention of suitable mechanical devices, this action being, however, immediately followed by a reopening of the clutch or detent and a repetition of the former action. I find that by the rapid opening and closing of a suitable clutch or other device in this manner I can effect a very gradual movement of any mechanism, and that the invention is specially applicable to producing a very gradual feed of the carbon-rod for an electric lamp. It is generally preferable to cause the rapid opening and closing or disengagement and re-engagement of the clutch, clamp, or other device by the short-circuiting or shunting of the operating-magnet when the clutch or other device is closed or in mechanical engagement, and by the breaking of the short or shunt circuit through the mechanical disengagement, thus rendering the electro-magnet active again, so that the clutch or clamp is immediately closed.

My invention may be applied to any clutching, clamping, locking, or stopping device by making the points or surfaces of friction, hold or engagement, a portion of the electrical shunt or short circuit path around an electro-magnet, which, when active, closes said points or surfaces, and, when inactive releases or disengages said surfaces.

Having set forth the general principles of my invention, I will proceed to describe some of the methods that may be employed for carrying the same into practice and some of the applications of the invention to electric lamps.

Figure 1 illustrates in a general way the construction of a retarding mechanism made after the principles of my invention. Fig. 2 illustrates the practical application of the invention to the carbon-rod of an electric lamp. Fig. 3 is a top view of Fig. 2. Fig. 4 shows a special method of effecting the gradual feed of a carbon in accordance with variations in the length of arc. Figs. 5 and 6 are details of construction of the lamp, Fig. 4.

Referring to Fig. 1, R indicates a wheel driven by any power, (here a weight, W,) and connected with any mechanism the movement of which it is desired to retard.

A indicates a lever, mounted at I in a bracket-arm extending from the head of an electro-magnet, M, or in any other suitable support, and carrying at one end an armature and at the other a friction toe, dog, or clamp, T, which latter, when the armature is attracted, will be drawn against the edge of the wheel R with a force sufficient to either retard or to wholly stop the movement of said wheel and any mechanism connected with it. A spring, S, tends to disengage the friction toe or clutch T from the brake-wheel R, and will so disengage it when the electro-magnet M loses its attractive force. The electro-magnet is in circuit with any source of electricity, while the clutch T and the wheel R form, when in contact with one another, a portion of a derived or shunt circuit around the electro-magnet M, as indicated, the effect of closing which circuit is obviously to divert the current from the electro-magnet M and cause it to lose its power.

Theoretically the operation is as follows: When the magnet M is energized the toe T is drawn against the wheel R, stopping its movement. This is accompanied by the closing of the short or derived circuit around the electro-magnet, which therefore loses its power, and

the spring S thereupon separates the toe T from the wheel R, thus releasing the latter, but at the same time breaking the short or derived circuit, so that the magnet M is energized again and draws the toe into engagement with the wheel, whereupon the operation is repeated. In practice these intermittent actions do not in reality take place to the extent of a complete disengagement, but a sufficient release of the toe T is produced to allow a gradual and slow slipping of the wheel R past it, or, in other words, the intermittent action is so rapid as to be imperceptible. The wheel is thus under the control of an automatic friction device, the amount of whose friction is dependent on the more or less complete electrical contact between the toe and the surface on which it bears, which contact is, so to speak, a self-regulating one.

By adjustment either of the retracting spring S or of the electric current supplied to the device, the speed of movement of the wheel R or the extent or degree of retardation may be governed.

In Figs. 2 and 3 the application of the automatic retardation feed to the carbon-carrying rod of an electric lamp is shown.

B indicates a frame, provided at its bottom and top with guide-openings for the carbon-carrier R′, while M indicates the feed-regulating electro-magnet, mounted in the frame and arranged to act upon the armature-lever A, which latter carries or actuates a releasing clutch or clamp. The latter consists of a clamp-body, C, carrying a pivoted clamping-toe, T, pivoted at I, which is made to engage with the carrier R′ and prevent downward movement thereof by means of a spring, S′, but which is disengaged from the rod so as to allow it to feed downward whenever the armature-lever A recedes sufficiently to cause the extension of the clamping-toe to come into engagement with the stop D′. The clamp-body C is pivoted on the lever A, and is held over by a spring, *z*, so that the toe T may open when its extended arm is tilted by the stop. As indicated, the toe T and the surface with which it engages form a portion of a derived or shunt circuit around the magnet M, so that when they are in engagement the magnet is shunted and loses its power, thus allowing the armature to recede, the clamp to descend, and the toe to be released from the rod, so that the latter may move downward, while simultaneously the derived or shunt circuit is broken. The break of the shunt-circuit thus caused is immediately followed by the restoration of the magnet's power and a consequent lifting of the clutch and re-engagement thereof with the rod, the operation being rapidly repeated, as before explained, so that a slow feed of the rod ensues. The extent and nature of this feed are of course governed by the adjustment of the parts and by the strength of the current supplied to the magnet M, said supply being governed, in accordance with the consumption of the carbons, by any suitable arrangement of devices, or by the special arrangement to be presently described in connection with Fig. 4.

In the arrangement of circuits shown in Fig. 2, the magnet M is represented as forming a portion of the direct circuit, including the carbons; but such special arrangement is by no means the only one that might be adopted in practice, and the path of the current would be a matter that would admit of many variations, with variations in the form and construction of the clutching or clamping devices.

In Fig. 4, R^2 indicates a carbon-carrying rod, and E E′ respectively the positive and negative electrodes of the lamp. W′ is a disk or wheel mounted in any suitable manner in a frame-work, and connected with a gear-wheel, V, which latter engages with a rack upon the side of the carbon-carrier R^2, so that the movements of the latter may be governed by the movements of the wheel or disk. With the edge of the wheel or disk engages a pivoted clutch or clamping-toe, T′, (seen more clearly in Fig. 5,) which is mounted in a swinging frame, F, actuated through a lever, L, by a main-circuit coil C′ and core M′.

The toe T′ is normally held in engagement with the disk by a spring, *z*′, but is disengaged therefrom by a stop, H, whenever the frame F is lowered sufficiently. The toe T′ and the surface of the disk form a portion of a derived or branch circuit around the lifting-magnet C, and for this purpose the toe is to be suitably insulated from the frame of the lamp by any suitable means.

S^2 is the ordinary retractor, acting in opposition to the main-circuit magnet C′.

K is an electro-magnet in a derived circuit around the electrodes E E′. Its armature A′ carries a series of spring-contacts, *p*, electrically connected to one another, and arranged, as indicated in Fig. 6, to make contact successively, when the armature is attracted, with a series of contacts, *q*, insulated from one another, but forming the terminals of the loops of a resistance-wire, R^4, or other suitable resistance device supported in any desired manner. As will be readily understood, as the number of points *p* in contact with the points *q* increases the resistance interposed by the high-resistance wire R^4 diminishes. The wire R^4 forms, when contact is established between *p* and *q*, a portion of the derived circuit which passes around the coils C′ and includes the clutch or clamp T′ and the clamp-surface of the disk W′. S^3 indicates the ordinary retractor applied to the armature-lever A′.

The circuits are as indicated. Starting from the point *x*, the main or principal circuit passes first to the coils of the lifting and feed-controlling magnet C′, thence to the frame of the lamp and the upper-carbon carrier, to the lower carbon, and to the point *y*. A second circuit, 5, includes between the points *x* and *y* the derived-circuit magnet K. A third circuit, 6, passes to the springs *p* and (when *p*

and *q* are in contact) to the resistance R^4, the insulated clutching-toe T′, the disk W′, and the frame of the lamp, at this point joining the main or principal circuit. The circuit 6 is a shunt or derived circuit to the coils of the magnet C′.

The operation will be apparent from the description already given. The carbons being in contact, the derived-circuit magnet K has not sufficient power to close the shunt 6, so that when the current passes the coil C′ acts to lift the lever F and clutch T′, and the latter, by rotating the disk, causes a separation of the electrodes E E′. As the carbons burn away the electro-magnet K increases in power, and by bringing the springs *p* successively into contact with the points *q* causes the current to be diverted from the coils of C′ to an extent depending upon the length of the arc, so that the clutch is allowed to come into contact with the stop H, and thus be disengaged from the disk W′. The current thus diverted passes through the clutch-surfaces, and being alternately interrupted and restored, as before explained, causes, by the resultant rapid magnetization and demagnetization of the main-circuit magnet C′ M′, a slow retardation feed of the wheel W′ and the carbon-carrier.

I do not limit myself to any particular construction of clutch or clamp, the essence of my invention consisting, as before explained, in making the closing of the clutch by a magnet cause a diversion of the energizing-current from said magnet. Other applications of my invention besides to electric lamps may be readily made whenever a slow retarded movement of any mechanism is desired, either to accord with the varying strength of an electric current or not.

I make no claim herein to the lamp mechanism and the varying shunt device shown in Figs. 4 and 5, as those are described in a prior application filed by me.

What I claim as my invention is—

1. The combination of a clamp, clutch, or detent, an actuating electro-magnet therefor, and means for closing a derived or shunt circuit around said magnet automatically at the instant that the parts of the clamp, clutch, or detent are brought into engagement.

2. An automatic retardation-feed device consisting of a clamp, clutch, or detent, an actuating electro-magnet therefor, and a shunt or derived circuit to said electro-magnet, formed through the surface of engagement of the clamp, clutch, or detent.

3. The combination of a friction-wheel, a clamp engaging with and controlling the movement thereof, an actuating electro-magnet for said clamp, and a shunt or derived circuit around said electro-magnet formed through the surface of engagement of the clamp and wheel.

4. An automatic retardation-feed device consisting of a clamp, clutch, or detent, and an actuating electro-magnet therefor, having a shunt or derived circuit through the surface of engagement of the clamp, clutch, or detent.

5. The combination of a friction-wheel, a clamp engaging with and controlling the movement thereof, an actuating electro-magnet, and a shunt or derived circuit through the surface of engagement of the clamp and wheel.

6. The combination, substantially as described, of a friction-wheel, a carbon-carrier connected thereto, a clutch device acting upon the friction-wheel, an electro-magnet in circuit with the carbon and operating the clutch, and a derived circuit around said electro-magnet, a portion of which circuit is through the frictional contact-surface of the clutch and wheel.

7. The combination of a carbon-carrier, a clutch or clamp actuated by an electro-magnet in the main circuit, an electro-magnet in a derived circuit around the arc, a variable resistance device actuated thereby, and a shunt or derived circuit around the clamp electro-magnet, said circuit including the variable resistance and the surfaces of engagement of the clamp.

8. The combination, with the feed-controlling electro-magnet and the clutch mechanism actuated thereby, of a derived or shunt circuit passing through a variable resistance automatically controlled in accordance with the length of the arc, and through the surfaces of engagement of the clamp mechanism.

Signed at New Britain, in the county of Hartford and State of Connecticut, this 12th day of September, A. D. 1882.

ELIHU THOMSON.

Witnesses:

E. WILBUR RICE,

ROB. B. HAINES, Jr.