(No Model.)

E. E. RIES.

REGULATING SOCKET FOR INCANDESCENT ELECTRIC LAMPS.

No. 488,835. Patented Dec. 27, 1892.

Fig. 1.

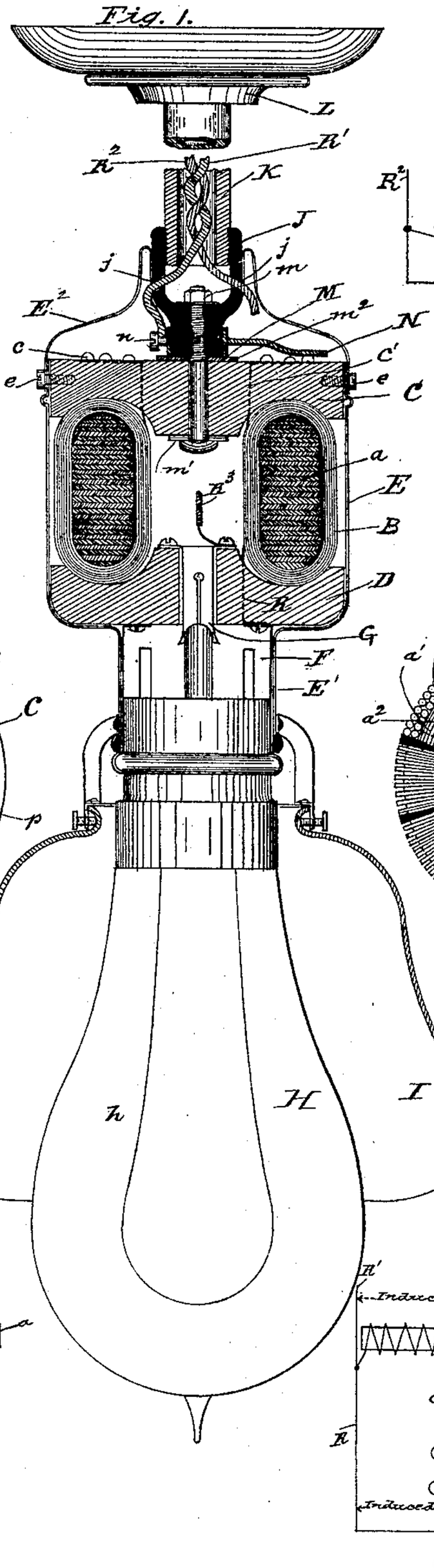


Fig. 2.

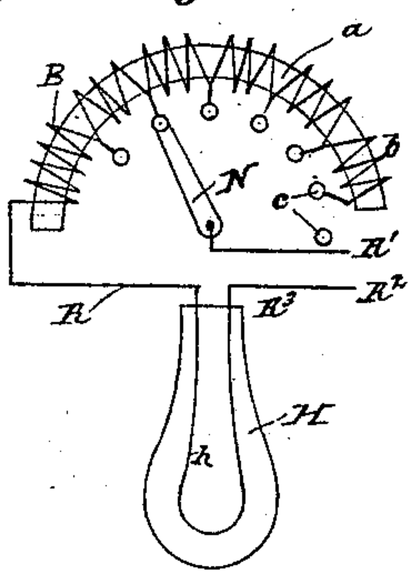


Fig. 3.

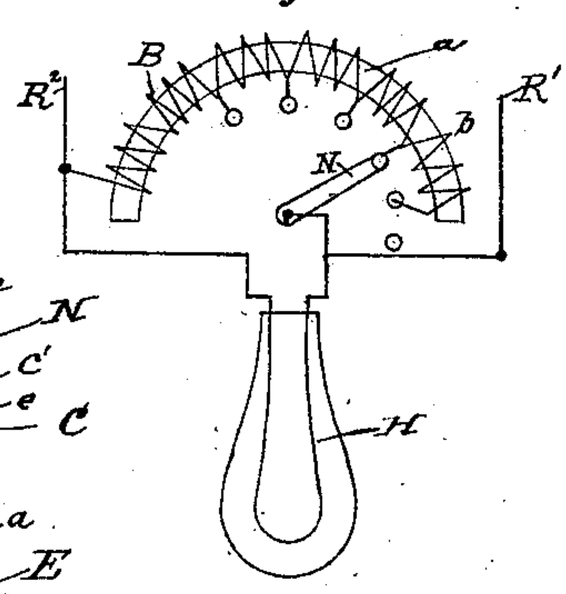


Fig. 4.

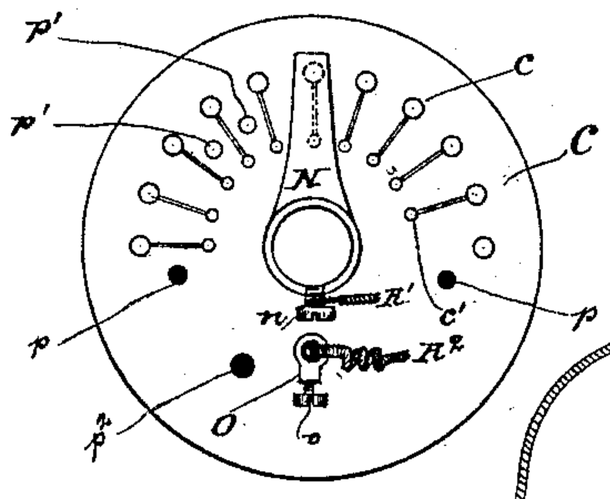


Fig. 5.

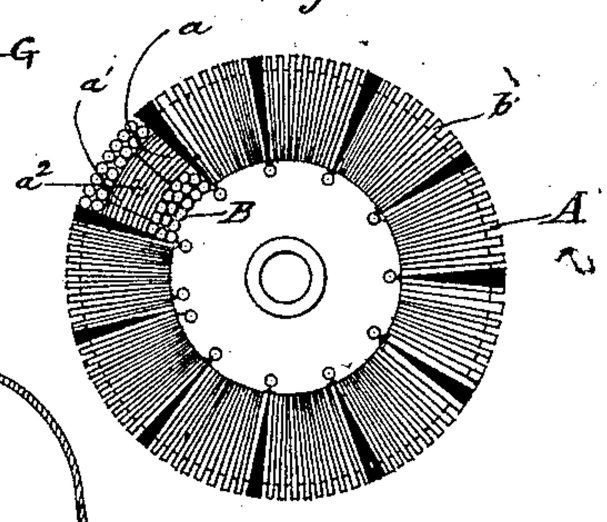


Fig. 6.

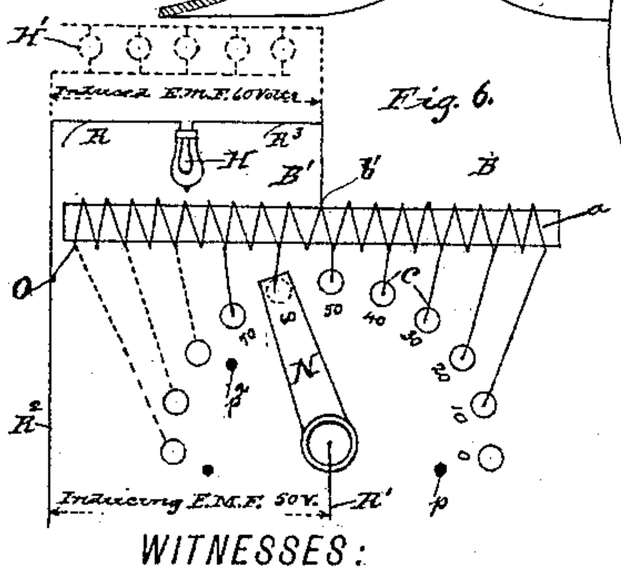
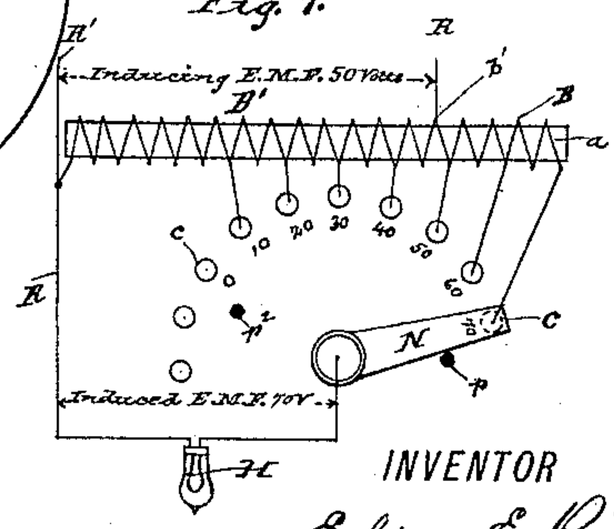


Fig. 7.



WITNESSES:

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ELIAS E. RIES, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE RIES ELECTRIC SPECIALTY COMPANY, OF SAME PLACE.

REGULATING-SOCKET FOR INCANDESCENT ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 488,835, dated December 27, 1892.

Application filed July 6, 1891. Serial No. 398,579. (No model.)

To all whom it may concern:

Be it known that I, ELIAS E. RIES, a citizen of the United States, residing in Baltimore city, in the State of Maryland, have invented certain new and useful Improvements in Methods of and Apparatus for Regulating Incandescent Electric Lamps and other Translating Devices, (Case B,) of which the following is a specification.

My invention has reference to regulating sockets or holders designed more particularly for alternating or intermittent current incandescent electric lamps, &c., in which the intensity of the light emitted by the lamp is varied by setting up or generating within the lamp socket itself a variable counter electro-motive force or current tending to oppose to a greater or less extent, as desired, the flow of current to the lamp, and thus permit the degree of incandescence of the lamp filament to be readily, effectively and economically controlled, as more particularly set forth and claimed by me in another application [Case A,] of even date, Serial No. 398,578, of which the present application is in the nature of a division.

In the accompanying drawings, in which similar letters of reference refer to similar parts, Figure 1 is a sectional elevation of my improved regulating socket, showing the reaction coil generator and switching mechanism with lamp in position; Fig. 2, a diagram showing the electrical connections when the coil is used as an ordinary counter electro-motive force generator with its sections arranged to be included in series with the lamp or other device; Fig. 3, a diagram showing a method of regulation in which the sections of the coil included in circuit are in parallel with the lamp; Fig. 4, a plan view of the upper insulating disk of the lamp socket showing the arrangement of the switch and terminal contacts; Fig. 5 is a plan view, partly in section, of my improved reaction coil generator represented in section in Fig. 1, showing details of its construction; Fig. 6 is a diagram showing my reaction coil generator with its sections so connected as to permit of increasing as well as diminishing the electro-motive force flowing to the translating device or devices, the switch or regulating lever being in the supply circuit, while Fig. 7 is a similar diagram showing the connections when the switch lever is in the lamp or translating circuit.

In my concurrent application before referred to, Serial No. 398,578, I have shown a regulating socket having a self-inductive or reaction-coil generator designed more especially to produce a smooth, uniform and uninterrupted regulation of the current flowing to the lamp or other device, whereas in the present application I have confined myself to the illustration of my invention in connection with a type of reaction coil in which a step-by-step regulation is produced. I desire it understood, however, that so far as the broader features of my invention are concerned, they are by no means limited to the particular type or forms of counter electro-motive force generators herein referred to, since in connection with the same I may use various other constructions or type of apparatus without departing from the scope of my invention.

Referring to the accompanying drawings, A represents my improved induction or reaction coil, provided with a laminated soft iron core *a*, and a winding B of insulated copper wire. In order to provide an efficient self-inductive action and to facilitate the construction of this coil so as to permit of its being placed within the narrow confines of an ordinary lamp socket or fixture, I have found it expedient to build up the core of two halves, each containing a number of semi-circular soft iron rings so arranged that when placed together their ends will abut and slightly overlap, as shown at a' in Fig. 5, and to wind the coil B in separate sections, *b*, upon a suitable mandrel, from which they are afterward removed and slipped upon the core *a*, or to wind them directly upon each half of the core. When the parts are assembled a pin a^2 is preferably driven through openings punched near the ends of the plates comprising the core *a*, to hold same more firmly together. The two sections of the core at which the pins a^2 are located may either be left unwound or provided with a winding, as shown, placed on by hand. The end of one section and the be-

ginning of the next are joined together so that the entire winding of the coil is in series, and the joined ends of the coil-sections are brought to a series of contact terminals in the manner shortly to be described.

When my improved reaction coil or "converting generator" is to be used in connection with the lamp socket before referred to, it is provided with a disk or cap piece C of wood, fiber or other suitable insulating material, having a series of contact pins or terminals, *c*, ranged in the form of a semi-circle about its center, and provided with a series of small perforations, *c'*, through which the joined wires or loops from the coil-sections *b* pass and are led to a position under the heads of their respective terminals *c*, with which they make electrical connection. A lower disk or base piece D, also of insulating material, is fitted to the bottom of my regulating coil, and an outer enveloping shell, E, secured to the upper disk by screws or pins *e*, *e*, serves to hold the parts firmly together. The disk D serves as a base or support for the lamp-holding contact-cup or receptacle F and the center contact terminal G, which may be of any well known or desirable construction. The enveloping shell E is preferably formed with a guard or casing E' that surrounds the terminal cup F, that holds the lamp H in place, and this guard also serves as a support for the lamp shade I in the usual manner.

Over the center of the upper disk D is an insulating coupling piece J of hard rubber, compressed fiber or other substance, provided with a screw thread by which it is firmly secured to the pipe K of the electrolier or supporting fixture L. The disk D is pivotally secured to the coupling J by means of a central bolt M screwed into the lower portion of the coupling piece and locked therein by a nut *m*, the disk D being free to turn about the lower portion of the bolt M between washers m' m^2. A contact making switch N, having a binding screw *n*, is secured to the lower portion of the piece J and is arranged to come into successive contact with the terminals *c* when the disk C or the socket of which it forms part is moved about its axis. The movement of the disk C, however, is limited by stops *p*, *p*, located in the path of the switch N at the ends of the semi-circular series of contacts, so that it will require but a half turn of the socket, or of the lamp H held by it, to successively bring all of the terminals *c* under the switch N. In addition to the stops *p* *p*, one or more holes p' p' are formed in the disk C at one side of the central position of the switch N, as shown, into which one of the stops *p*, or in lieu thereof an auxiliary stop p^2, may be transferrred and inserted, for a purpose shortly to be described.

The disk C and the regulating mechanism are inclosed by an upper removable casing E^2, normally held in place by a suitable slot, not shown, engaging with the screws *e e*. When the socket is to be attached to its supporting fixture K, the upper casing E^2 is temporarily slipped back over the same, thus exposing the coupling piece J and the terminal screws to which the leading-in wires are to be attached. As will be seen by reference to Fig. 1, the ends of the leading-in wires R' R^2 are passed through openings, *j j*, in the wall of the coupling piece J, and the latter is then firmly screwed to the threaded end of the fixture K. One of the leading wires, R', is then permanently attached to the switch N by means of the binding screw *n*, and the other wire R^2 is similarly secured to the binding post O, [Fig. 4] by the screw *o*, sufficient slack being allowed in the end of the wire R^2 to permit its accommodation to the movement of the disk C.

The operation of my improved regulating socket, so far as already described, will now be understood. When the coil A is to be employed in the usual manner, that is to say, as a simple reaction or choking coil in series with the wires leading to or feeding the lamp, as shown in my aforesaid application, the circuit connections are arranged as illustrated in the diagram Fig. 2. Assuming that the position of the socket is such that the switch N is over the first terminal contact *c* corresponding to the "dead" or open circuit position, at the extreme right of the series of contacts, and the lamp or socket be then rotated so as to bring the lever to the next terminal. Current will then flow from the wire R' to the switch N, to the second contact, *c*, through all of the sections *b* of the winding, thence by means of a conductor R that connects the last coil section with the lamp terminal F, through the lamp filament *h*, and back to the other wire R^2 from the lamp terminal G by way of a conductor R^3 that connects it with the binding post O. The current thus flowing to the lamp through the whole of the winding around the core *a*, will generate a counter-electro-motive force almost equal to the direct electro-motive force supplied to the leading in wires, thereby greatly opposing the flow of current and causing the lamp to burn at its lowest degree of incandescence, which latter is preferably so adjusted that the filament is just visible in the dark, enabling one to readily find his way to the lamp for the purpose of increasing the amount of light given forth by it. As the lamp is rotated still further in the same direction, the number of sections included in circuit therewith are diminished, the counter electro-motive force generated by the coil reduced, and the light given by the lamp correspondingly increased, until when the switch N rests upon the last terminal the entire coil may be cut out and the current flow direct to the lamp, which will then burn at the normal voltage supplied by the circuit. In practice, however, I prefer to leave a few convolutions of the winding in circuit with the lamp as shown in Fig. 2, as I find that a slight amount

of self-induction in the lamp circuit acts as a steadying element and is otherwise beneficial to the lamp and socket.

In Fig. 3 I have shown a slightly modified arrangement, in which the connections are such that the coil sections *b* included in circuit by the switch N are connected across the conductors R′ R^2 that feed the lamp, and serve to generate a counter electro-motive force that opposes to a greater or less extent, according to the position of the switch, the current flowing along the said conductors to the lamp H.

Referring now to the diagram view, Fig. 6, it will be seen that the winding on the core *a*, [which is conventionally shown in the form of a straight core for simplicity in illustration,] is divided at the point *b′* by the conductor R^3 into two divisions, marked B and B′ respectively, each division comprising a number of the sections *b* into which the coil is sub-divided. The supply or leading-in wire, R′, is connected to the switch N as described with respect to Figs. 1 and 2 while the other leading-in wire, R^2, is in electrical connection [by means of the binding post O and conductor R,] with the end of the last section of the winding B′ and the terminal F that connects with the lamp H. [See Figs. 1 and 6.] The wire R^3 leading from the other lamp terminal G is, as already explained, connected with the winding B at the point *b′*, or at the contact terminal *c* marked "50" in the diagram, which represents the point *b′*. The limiting stop p^2, before referred to, is now inserted into one of the holes *p′* shown in Fig. 4, so as to prevent the movement of the switch lever N beyond the terminal marked 70 in Fig. 6.

The operation of my reaction coil generator as thus connected is as follows:—Supposing the difference of potential between the supply wires R′ R^2 in Fig. 6 is fifty volts, and the switch N to be in "open circuit" position at the contact marked 0. Obviously no current whatever would flow to the lamp H [or to any other translating device that might be placed in circuit with the division B′ of the winding,] and the latter would be entirely extinguished. If now the switch N be moved onto the contact 10 the entire winding will be placed in circuit with the switch, generating a considerable counter electro-motive force in the division B of the coil which reduces the effective electro-motive force passing therethrough, say to ten volts. The section B′ however, being closed through the lamp H, acts as a secondary to section B, and generates an induced electro-motive force, which, in conjunction with such of the primary current as returns to the conductor R^2 by way of the shunt R^3 and R, supplies the lamp H with sufficient current to make it glow at the lowest desired degree of incandescence, say that due to a potential difference of ten volts. On moving now the switch N to the contacts 20, 30, 40 &c., the length of the division B or the reactive portion of the coil included in circuit is successively reduced, and the number of convolutions in the division B′ with relation thereto correspondingly increased. When the switch N is upon the contact 40, therefore, the inducing potential of fifty volts is still distributed over a larger number of coil sections than the number comprised between the lamp conductors R and R^3, so that the electro-motive force induced in the coil sections B′ by the core *a* is approximately forty volts. When the switch N is moved to the neutral contact "50" the relative length of the inducing and induced coils are equal, the two currents [inducing and induced,] neutralize each other and the current from the switch N flows direct to the lamp. With the switch in this position the entire coil is practically "dead" and the lamp gets the full fifty volt current and burns at its standard candle power, the same as would be the case if all the coil sections in Fig. 2 were short-circuited or cut out by the switch N as previously described. If now, it is desired to temporarily increase the light or energy developed by the lamp H or other device to a point above its normal or standard power, as is often desirable, or to a point above the capacity of the supply circuit in which it is placed, or if it be desired to operate a high voltage lamp or device on a lower voltage circuit, all that is necessary is to move the switch N to the contact terminals 60 or 70 at the other side of the neutral contact 50, as shown. The primary or inducing electro-motive force will then energize the core *a* through a lesser number of coil sections than are included in the lamp or translating circuit, and the lamp or other device will therefore be operated at a potential difference of sixty or seventy volts, respectively, depending upon the ratio existing between the number of coil sections or convolutions included between the binding post or junction O at the end of the coil on the one hand, and the point *b′* and the switch N, respectively, on the other.

By reference to Fig. 6, it will be noticed that the limiting stop p^2 is placed so that when the switch N is moved to its full distance, a number of the coil sections in the division B′ will still be in the supply circuit to generate a counter electro-motive force sufficient to prevent an excessive flow of current through the same. I usually wind this portion of the coil with larger size wire, since by the cutting out of the preceding sections it is called upon to carry heavier currents. In addition to the lamp H, other lamps or translating devices, shown in dotted lines at H′, may be operated and controlled by my improved regulating coil at the same time.

In Fig. 7 I have shown a modification of the arrangement shown in Fig. 6, in which the switch or regulating lever N is located in the lamp or translating circuit instead of the supply circuit. In many cases this arrangement is to be preferred, since the inducing or supply-circuit connections are thus perma-

nently fixed and the regulation is performed in the local circuit. An additional advantage over the arrangement previously described, as will be seen by reference to the drawings, is that as the number of sections or the length of wire included in circuit is decreased, the volume of current flowing through the same is diminished, thus rendering the operation of the coil more uniform. All that is necessary at any time to increase or diminish the range of regulation of the socket or coil to suit the requirements of any particular lamp or translating device is to place the stops p and p^2 in the proper position to include the requisite number of terminal contacts c in the path of the switch N.

From what has been said it will be evident that my improved regulator is adapted to a wide range of work, being capable, as it is, of increasing as well as diminishing the normal electro-motive force or current supplied to one or more translating devices and of varying as desired the energy developed by the same, in a most economical, simple and efficient manner. I desire it understood therefore, that while I have shown my invention as applied more particularly to regulating sockets for incandescent electric lamps, I do not limit myself to such use, since I may apply the same equally well to regulating apparatus of different types, designed and adapted to control the flow of current to alternating or intermittent current translating devices of various kinds, either singly or in groups, as well as to other purposes. It will also be understood that while I have illustrated this portion of my invention as applied to regulating sockets of the "keyless" type, so that the regulation may be effected by turning the lamp itself, thus avoiding the necessity of reaching above the same or around its shade for the usual key provided in ordinary lamp sockets, I do not restrict myself to its application to such sockets, but may apply the same to any other type of socket, among others to a type in which the socket and its regulating coil are stationary, and the regulating switch or key movable.

Having now fully described my invention, I claim and desire to secure by Letters Patent:—

1. A regulating apparatus for alternating current incandescent lamps and other translating devices, the same comprising a socket or holder for the translating device, a magnetizable core housed within the socket and having a winding arranged to be connected across the terminals of the supply and translating circuits, a series of contacts to which intermediate portions of the winding are connected, and a switch arranged and adapted to vary the length of the winding included in the supply and translating circuits, respectively, substantially as set forth.

2. A regulating apparatus for alternating current incandescent lamps and other translating devices, the same comprising a socket or holder for the translating device a magnetizable core housed within the socket and having a winding arranged to be connected across the terminals of the supply circuit, a series of contacts to which intermediate portions of the winding are connected, a connection from one end of the winding to one side of the translating circuit, and a switch in the other side of the translating circuit arranged and adapted to traverse the said contacts and thereby vary the length of the winding included in said translating circuit, substantially as set forth.

3. A potential or current regulating apparatus for alternating current incandescent lamps and other translating devices, the same comprising a socket or holder for the translating device a reaction or counter electro-motive force coil housed on the socket and having one end of its winding permanently connected with both the supply and translating circuits, a switch for cutting in and out more or less of the winding of the coil, and a connection between an intermediate point of the coil and the other side of the supply or translating circuit, in that portion of the coil which is traversed by the switch, substantially as and for the purpose set forth.

4. A potential or current regulator for alternating current incandescent electric lamps and other translating devices, the same comprising a socket or holder for the translating device, a core within the socket provided with a winding divided into suitable lengths or sections and having one of its ends connected with one side of the supply and translating circuits, a "neutral" connection from an intermediate point or section of the winding to the other side of the supply or translating circuit, a series of contacts or terminals connecting with and representing the divisions or sections of the winding on both sides of the "neutral" connection, and a switch arranged to traverse the said contacts and thereby increase or diminish the normal electro-motive force or current flowing from the supply circuit to the translating device or devices, substantially as set forth.

5. A regulating socket for alternating current incandescent lamps and other translating devices, the same comprising a lamp-holding receptacle or casing containing a magnetizable core having a winding divided into sections, a series of contact terminals within the said casing to which the ends of the sections are connected, and a switch, also supported within said casing, designed and adapted to traverse said contacts and to include more or less of the said sections in circuit, substantially as set forth.

6. A regulating socket for alternating current incandescent lamps and other translating devices, the same comprising a holder or receptacle for the lamp or other device, an inclosing case for the same, a reaction or counter electro-motive force coil within the said casing and having its winding divided

into sections normally connected in series with each other and with the lamp or other device, a series of contacts within the said inclosing case to which the coil sections are connected, and a switch designed and adapted to turn on and off the supply of current and to include more or less of the said coil sections in the lamp or supply circuit, substantially as set forth.

7. A regulating socket for alternating current incandescent lamps and other translating devices, the same comprising a holder or receptacle for the lamp or other device, an inclosing case for the same, a magnetizable core within the said case having a winding arranged to be connected across the terminals of the supply conductors leading to the socket, a series of contacts within said case in electrical connections with different portions of said winding, and a switching mechanism arranged and adapted to traverse said contacts and to establish and close the lamp or translating circuit through a greater or less length of the said winding, substantially as and for the purposes set forth.

8. A potential-increasing regulating apparatus for alternating current translating devices, comprising a socket or holder for the translating device, a self inductive coil or counter-electro-motive force device housed within the socket and having a single winding separated by a conductor into two divisions, a series of contacts connecting with different portions of the winding at each side of the dividing conductor, a switch arranged to traverse said contacts, and circuit connections, substantially such as described, whereby when the switch is moved over the contacts at one side of the dividing conductor the electro-motive force supplied to the translating device or devices is increased above that of the supply circuit, and when moved over the contacts at the other side of the dividing conductor it is reduced below that of the supply circuit, substantially as set forth.

9. A socket for incandescent electric lamps, comprising a lamp holder or receptacle, an inclosing case for the same, and a closed iron ring or core within said case, provided with a self-inductive winding designed and adapted to be included in circuit with the lamp when the latter is placed in its holder.

10. A socket for incandescent electric lamps containing a closed iron ring or core wound with insulated wire arranged and adapted to be included in series with the lamp, and a switch for opening the lamp circuit and for closing it through said winding, substantially as described.

11. A socket for incandescent electric lamps containing a closed iron ring or core, said core having a winding divided into a number of sections the ends of which are brought to a series of contact terminals arranged within the lamp socket, and a switch forming part of the socket and arranged and adapted to include more or less of the said sections in the lamp circuit.

12. A regulating socket for alternating current incandescent lamps and other translating devices containing a divided iron ring or core wound with separate coils or sections, a series of contact terminals within the socket to which the ends of said sections are connected, and a circuit-closing switch arranged to traverse the said terminals and to include more or less of the coils in the translating circuit.

13. In a regulating socket for incandescent electric lamps, &c., the combination, with the lamp holder or receptacle and its inclosing case, of a counter electro-motive force generator or converter inclosed thereby and arranged to have all or a portion of its winding included in the lamp or translating circuit, said generator or converter having its core built up of separate sections connected and assembled to form a closed laminated ring or core, substantially as and for the purpose set forth.

14. In a regulating socket for incandescent electric lamps, &c., the combination of the coil A, the contacts *c*, the switch N, and the exchangeable limiting stops p, p^2, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ELIAS E. RIES.

Witnesses:
LEOPOLD RIES,
JNO. T. MADDOX.