

No. 650,531.

Patented May 29, 1900.

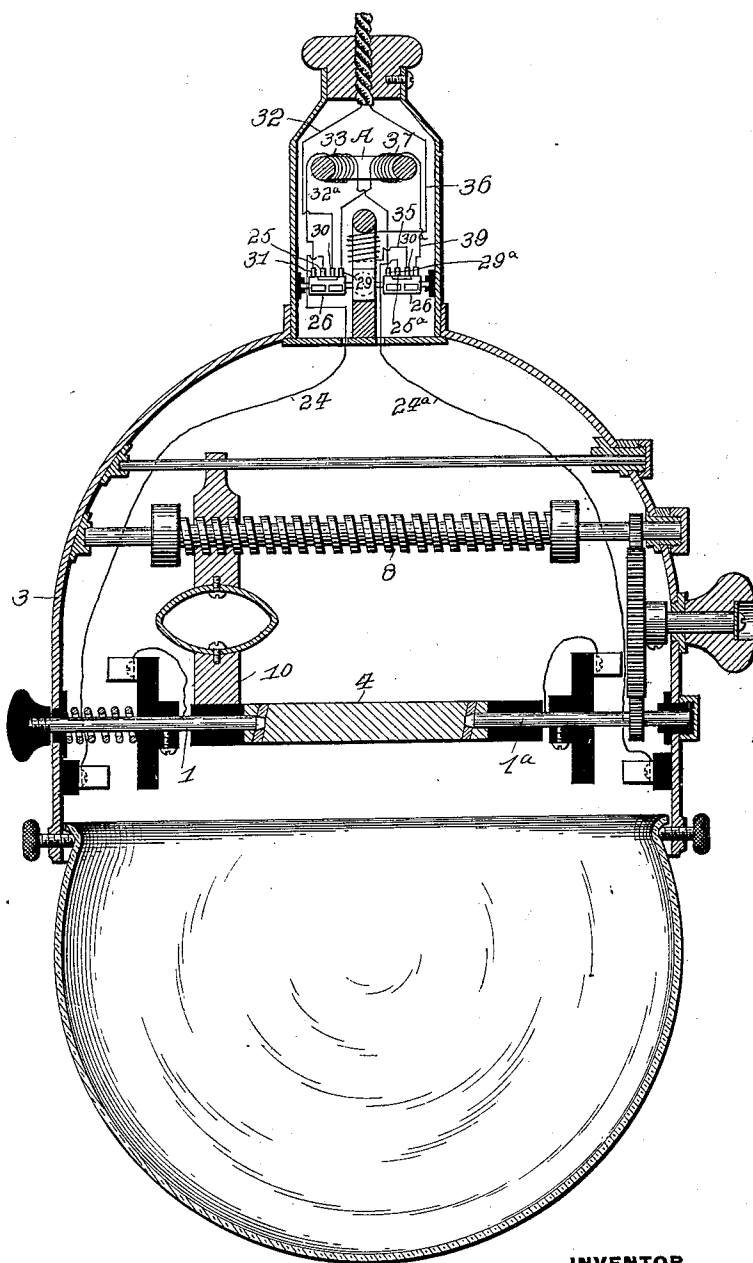
R. A. FESSENDEN.
INCANDESCENT LAMP.

(Application filed Aug. 25, 1899.)

(No Model.)

3 Sheets—Sheet 1.

FIG. 1.



WITNESSES:

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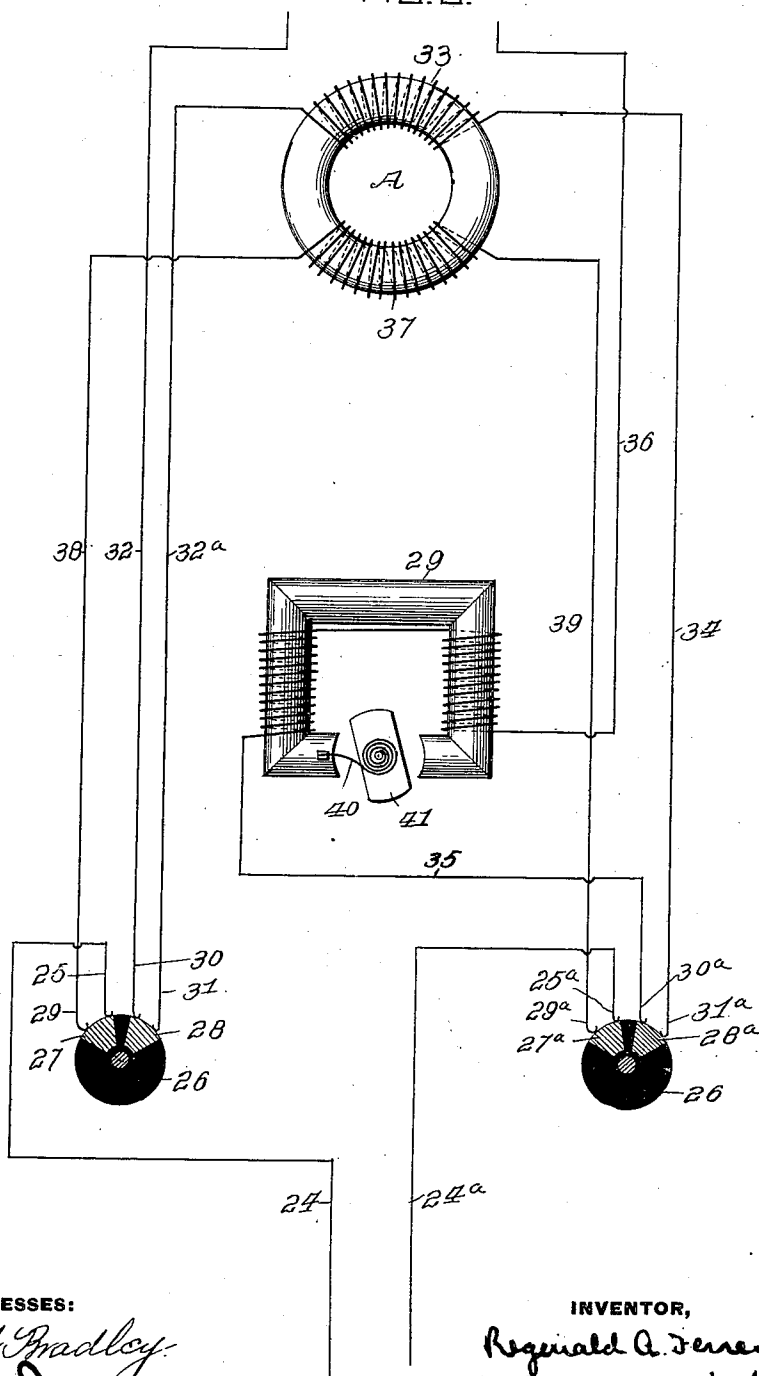
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FIG. 2.



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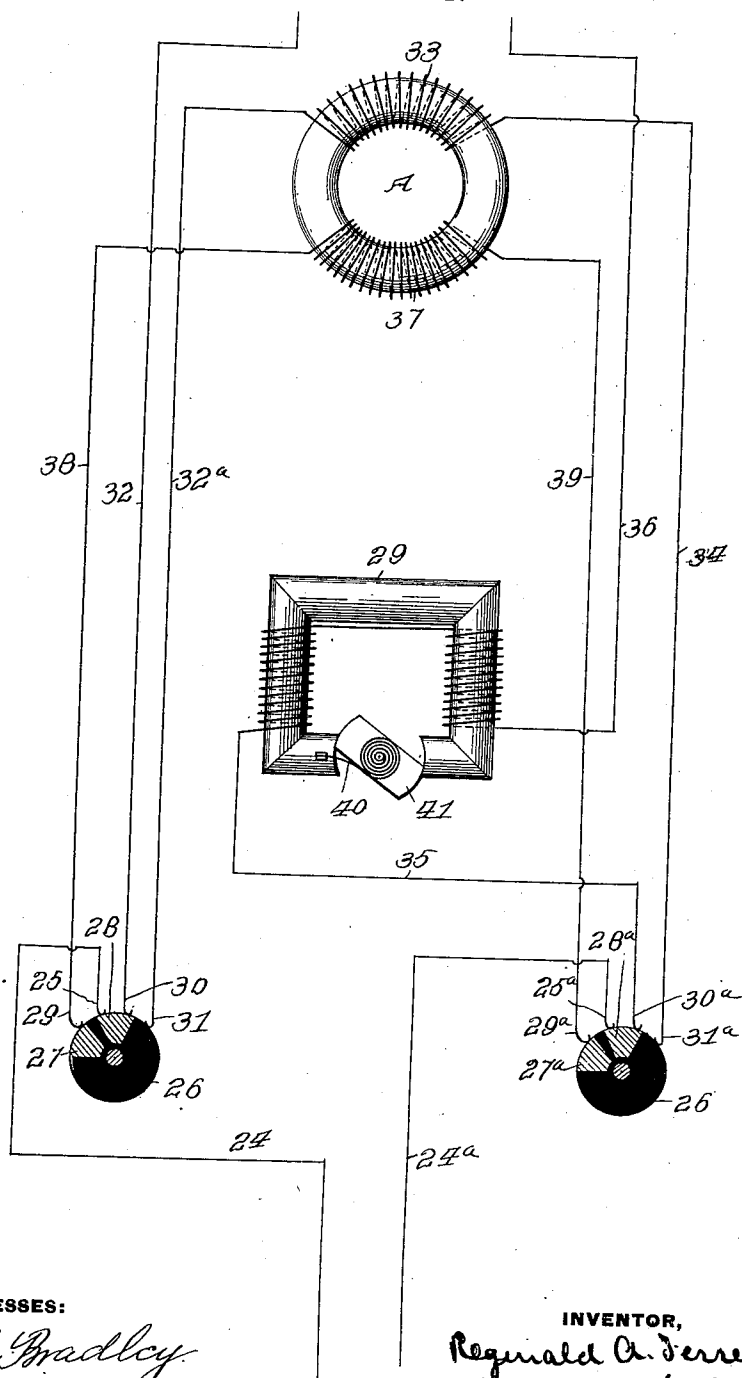
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3 Sheets—Sheet 3.

FIG. 3.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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ONE-HALF TO GRANT MCCARGO, OF PITTSBURG, PENNSYLVANIA.

INCANDESCENT LAMP.

SPECIFICATION forming part of Letters Patent No. 650,531, dated May 29, 1900.

Application filed August 25, 1899. Serial No. 728,422. (No model.)

To all whom it may concern:

Be it known that I, REGINALD A. FESSENDEN, a citizen of the United States, residing at Allegheny, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Incandescent Lamps, of which improvements the following is a specification.

The invention described herein relates to certain improvements in that class or kind of electric lamps forming the subject-matter of an application, Serial No. 726,395, filed August 7, 1899. The distinctive feature of that kind of lamp consists in the employment of a pencil which is rendered incandescent by the passage of an electric current, but requires a preliminary heating to render it at all conductive. After the pencil has been rendered incandescent it can be maintained in such condition by a current of comparatively-low potential. Such low-potential currents would, however, act quite slowly in heating the pencil to incandescence.

One object of the present invention is to provide for the use of a high-potential current for heating the pencil to incandescence and a low-potential current for maintaining the incandescent condition, the change from one current to the other being effected automatically, the automatic change of the circuit being controlled by or dependent upon the conductivity of the pencil. As the conductivity of the pencil increases proportionally to the increase in temperature, it is obvious that more current would flow through the pencil than is necessary to maintain the required incandescence.

It is a further object of the invention to provide for the automatic regulation of the current.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a sectional elevation of a lamp embodying my improvement. Figs. 2 and 3 are diagrammatic views of the circuits for the high and low currents and illustrative of the manner of changing the circuits and for regulating the flow of the current.

In the practice of my invention the pencil

4, which is preferably formed of magnesias, kaolin, or other material requiring a preliminary heating to render it conductive, is mounted on pins 1 1^a, which are rotatable in suitable bearings in the case or shell 3. The pencil when formed of a material requiring preheating may be preliminarily heated by a lamp, or a conducting-path may be formed along the pencil from terminal to terminal, as described and claimed in an application, Serial No. 728,423, of even date herewith. As set forth in this application, a block 10 of graphite or other conducting material neutralizable at high temperatures is attached to a carrier-block mounted on a threaded rod 8, by the rotation of which the graphite block is caused to rub along the pencil, the pencil being by preference rotated during the movement of the block, thereby forming a strip or coating of conducting material on the pencil continuous from terminal to terminal. In lieu of the construction of lamp thus generally stated the form of lamp set forth in application, Serial No. 728,423, or any other suitable construction may be employed.

The terminals of the pencil are electrically connected by wires 24 and 24^a to contact-springs 25 25^a, forming parts of a circuit-changer. This circuit-changer may be of any suitable construction capable of being operated by a small electric mechanism. A desirable form of such circuit-changer consists of a cylinder 26, of insulating material, secured on the armature-shaft of an electric motor 29, and having contact plates or blocks 27 27^a and 28 28^a. These plates or blocks are so constructed and arranged that in one position of the cylinder 26 the plates 27 27^a will electrically connect the springs 25 25^a with similar contact-springs 29 29^a, and the plates 28 28^a will electrically connect spring contact-plates 30 30^a with similar plates 31 31^a, respectively, and in the other position of the roller the blocks or plates 28 28^a will electrically connect the plates 25 25^a with the plates 30 30^a, respectively.

In describing the operation of the lamp it will be supposed that a current of one hundred volts is sufficient for maintaining the desired incandescence, and that the pencil has been preliminarily heated or a conducting-

path formed along the same for the preliminary heating by the current, and that the several parts are in the position shown in Figs. 1 and 2. The normal current will flow along wire 32, contact 30, plate 28, contact 31, wire 32^a to coil 33 of the converter A, wire 34, contact 31^a, plate 28^a, contact 30^a, wire 35, the field of motor 29, and return-wire 36. The converter is so constructed that a current of a higher potential is induced in the coil 37. The terminals of this coil are connected by wires 38 and 39 to the contact-springs 29 29^a. As these contacts are electrically connected by the plates 27 27^a to the contacts 25 25^a, which, as stated, are connected to the terminals of the pencil, the induced or high potential current will flow through the preheated pencil; or first through the conducting-path on the pencil and then through the pencil. The field of the motor is so constructed as not to be materially excited except by a current equal to the normal current supplied to the lamp. Hence as long as the pencil presents any considerable resistance the motor will not be excited sufficiently to shift its armature 41 and the cylinder 26 against the tension of the spring 40. As soon as the resistance of the pencil is reduced by the heating of the same the motor will be excited and the armature-roller shifted to bring the plates 28 28^a in contact with the springs 25 25^a and 30 30^a, thereby cutting out the converter and permitting the normal current to flow through the pencil. As the conductivity of the pencil increases as its temperature is increased it follows that more current would flow through, thereby increasing the temperature and permitting an additional flow of current. This anomalous condition, however, can be prevented by the interposition of suitable inductances interposed in the circuit. The motor itself forms an automatically-adjustable inductance to maintain a constant current through the pencil. As is well known, the closure of the magnetic circuit or field by the movement of the armature into alinement with the poles of the motor will cause an increase of inductance in the field of the motor. This inductance increases proportionally to the approach of the armature to a position of alinement with the poles, so that by properly adjusting the spring 40 the amount of current flowing through the pencil can be made constant.

It will be readily understood that a suitably-wound electromagnet of the ordinary form and having its armature yieldingly held from the poles of the magnet may be employed for controlling the current to the pencil.

In the construction shown the axis of movement of the armature is at right angles to the longer magnetic axis of the armature and also intersects the magnetic circuit; but the invention is not limited to such a specific arrangement, as other constructions having the axis of armature movement intersecting the magnetic circuit will readily suggest them-

selves to the skilled mechanic. Hence I desire to include within the scope of the claims any arrangement of the movable armature wherein the axis or a prolongation of the axis will intersect the magnetic circuit.

As regards that portion of the invention set forth herein relating to the control of the current to the pencil, the invention is not limited to any specific construction of lamp and shape or construction of the pencil or body to be heated by the current.

I am aware that an inductance has been used in connection with arc-lamps, said inductance being controlled in part by changes of the current in the circuit of the lamp and in part by the resistance in the arc due to the movement of the pencils, and I am also aware that a resistance formed of exceedingly-fine wire has been arranged in series within incandescent lamps, said resistance being variable through the heating effect of the current. These constructions differ radically from that employed by me, as in my improved lamp the inductance mechanism is controlled solely by the conductive or continuance pencil for blower, and the adjustment of the inductance for varying currents is effected through a mechanical shifting of the parts of the inductance mechanism, such movement being effected and controlled by the current in the circuit.

I claim herein as my invention—

1. In an incandescent lamp, the combination of a pencil, two circuits, one of said circuits carrying normally a current of relatively-higher potential than that carried by the other circuit, and an automatic circuit-changer for connecting the terminals of said pencil to said circuits in succession, substantially as set forth.

2. In an incandescent lamp, the combination of a pencil, a circuit for normal currents, a circuit for currents of higher potential than the normal circuit and a circuit-changer for connecting the terminals of the pencil with said circuits in succession, the operation of the circuit-changer being controlled by changes of conductivity of the pencil, substantially as set forth.

3. In an incandescent lamp, the combination of a pencil, a feed-circuit for normal currents, a converter, an automatic circuit-changer adapted in one position to connect the terminals of the exciting portion of the converter with said circuit and the other terminals of the converter with the pencil and in the other position to connect the feed-circuit to the terminals of the pencil, substantially as set forth.

4. In an incandescent lamp, the combination of a pencil, a feed-circuit, a motor included in said circuit, a converter and a circuit-changer operated by the motor and adapted in one position to connect the feed-circuit to the terminals of the exciting portion of the converter and the terminals of the excited portion of the converter to the pencil and in

its other position to connect the feed-circuit direct to the terminals of the pencil, substantially as set forth.

5 In an incandescent lamp, the combination of a pencil or body capable of being heated by an electric current, an electromagnet in series in the circuit of the pencil or body, and an armature movable by the magnet and in accordance with the degree of excitation of
10 the latter, whereby the current is controlled by the relative positions of the armature and the poles of the magnet, said armature being so arranged that a line coinciding with its axis of movement will intersect the magnetic
15 circuit, substantially as set forth.

6. In an incandescent lamp, the combination of a pencil or body capable of being heated by an electric current, an electromagnet in series in the circuit of the pencil or body and
20 an armature movable by the magnet and in accordance with the degree of excitation of the latter, whereby the current is controlled by

the relative positions of the armature and the poles of the magnet, the armature having its axis of movement at an angle to its longer
25 magnetic axis, substantially as set forth.

7. In an incandescent lamp, the combination of a pencil or body capable of being heated by an electric current, a circuit for normal currents, a circuit for currents of a potential
30 different from that of the normal currents, a motor connected in series in the circuit for normal currents and a circuit-changer operated by the motor and adapted to connect the pencil-terminals with said circuits in succe-
35 sion whereby said motor operates to control the current in the normal circuit, substantially as set forth.

In testimony whereof I have hereunto set my hand.

REGINALD A. FESSENDEN.

Witnesses:

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M. S. MURPHY.