

No. 687,881.

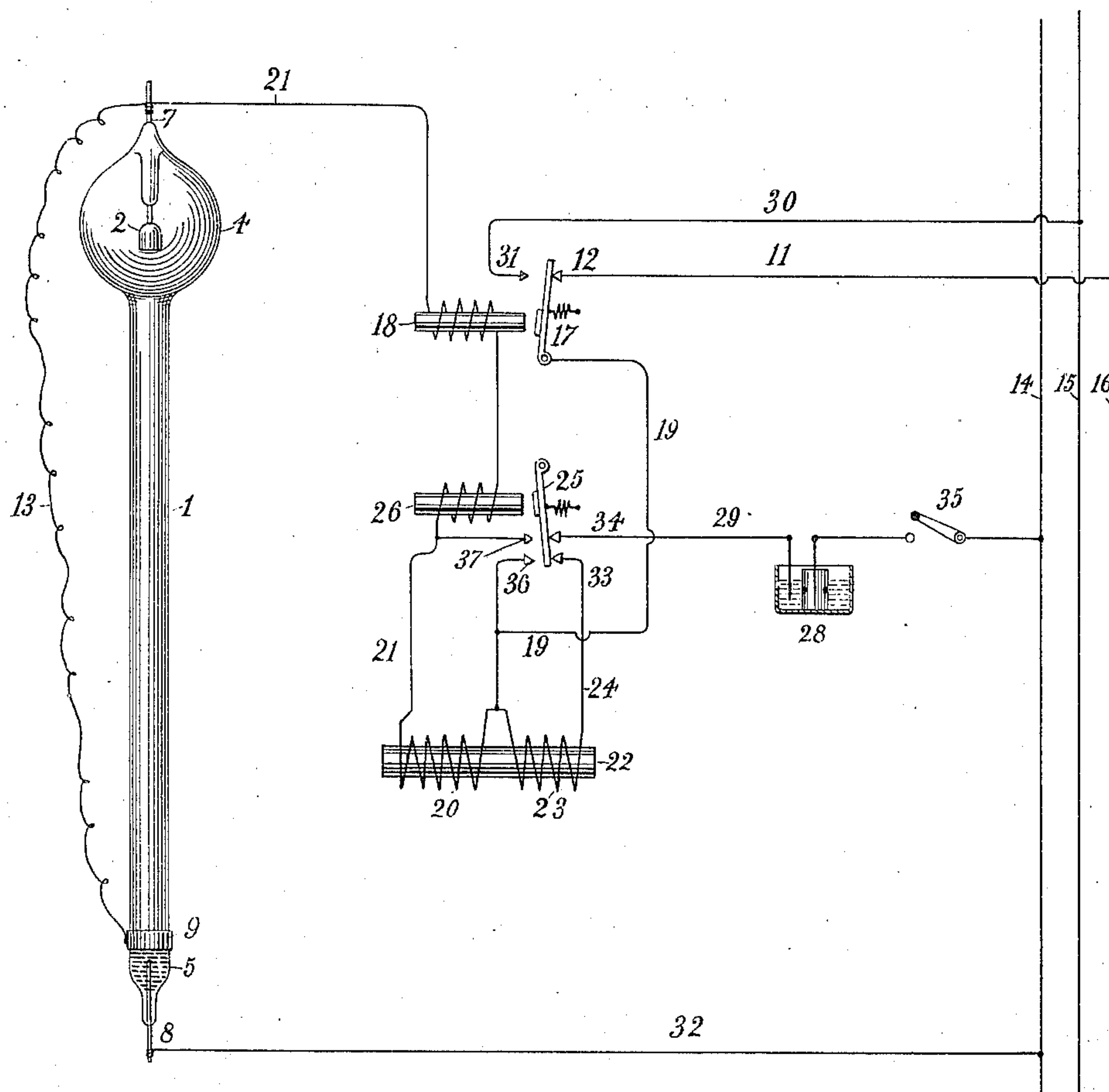
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P. C. HEWITT.

APPARATUS AND CIRCUIT FOR OPERATING ELECTRIC LAMPS.

(Application filed Apr. 5, 1900.)

(No Model.)



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## APPARATUS AND CIRCUIT FOR OPERATING ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 687,881, dated December 3, 1901.

Application filed April 5, 1900. Serial No. 11,610. (No model.)

*To all whom it may concern:*

Be it known that I, PETER COOPER HEWITT, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Apparatus and Circuits for Operating Electric Lamps, of which the following is a specification.

My invention relates generally to a system of circuits and apparatus for operating electric lamps in which a vapor or gas is used as the light-emitting material.

In another application filed by me April 5, 1900, Serial No. 11,605, I have described and claimed a lamp which is suited for use upon ordinary commercial circuits and has a conducting-path formed of a gas or vapor properly organized and proportioned.

My present invention relates particularly to a system of circuits for and method of starting certain forms of such lamp by first impressing upon the terminals thereof an electromotive force higher than that with which the lamp is intended to operate.

The accompanying drawing illustrates, partly in diagram, an arrangement of circuits and apparatus for carrying out my invention.

Referring to the drawing, the lamp is represented as consisting of a tube 1, having an enlargement 4 at one end and provided with two electrodes 2 and 5, located within the lamp. The electrodes are respectively connected with leading-in wires 7 and 8. In the present instance the electrode 2 is shown as being of solid material suspended within the chamber 4 and the electrode 5 as consisting of a small quantity of mercury. For the purposes of the present description it will be assumed that the vapor within the lamp is a mercury vapor. I have found that by adding certain other materials—such, for instance, as sulfid of mercury—during the process of manufacturing the lamp a compound or condition is produced within the lamp which facilitates the starting of the lamp and renders it possible to start it with currents of much lower potential than appear to be requisite if such material is not present. I have further found that by placing a conductor—such, for instance, as a band 9, of foil or

other suitable material—near the electrode 5 and connecting it by a conductor 13 with the leading-in wire 7 the starting-currents are more effective.

The lamp starts readily when a current of the proper potential is applied to the terminals of the lamp, and I usually at the same time connect the lamp upon a circuit having the same or a somewhat greater potential than that upon which the lamp is intended to run after it has been started. After the starting higher-potential current has been used to set the lamp in operation it is sometimes desirable to cut it out of circuit or remove it from operation.

In the drawing I have shown the lamp as being connected with a suitable three-wire source of electric currents of, say, one hundred and ten and two hundred and twenty volts or other suitable electromotive forces, this circuit being represented by the conductors 14, 15, and 16. A conductor 11 leads from the conductor 16 to a contact-point 12 of the armature 17 of an electromagnet 18, through a conductor 19 to the coil 20, surrounding the core 22, through a conductor 21, including the coils of two magnets 26 and 18, and thence to the leading-in wire 7. The leading-in wire 8 is connected by a conductor 32 with the main line conductor 14. The conductor 19 is also connected through coils 23, also surrounding the core 22, and by a conductor 24 with one of a pair of contacts 33 and 34, against which the armature 25 of the electromagnet 26 rests when that magnet is not energized. The remaining contact-point 34 of this armature is connected through a suitable circuit-interrupter 28—such, for instance, as the well-known Wehnelt device—with a conductor 29, leading to the main conductor 14. The forward contact-point 31 of the armature 17 is connected by a conductor 30 with the neutral conductor 15 of the three-wire system. The device comprising the coils 20 and 23 and the core 22 may be regarded as the transformer; but any suitable device for changing the potential may be employed. For convenience of reference, however, such devices will be referred to as “transformers.” When it is desired to start the lamp, the circuit through the coil 23 is closed—as, for in-



stance, by a switch 35 in the conductor 29—the armatures 17 and 25 being held away from their magnets in any suitable manner and the circuit closed between the armatures and their respective contacts 12 and 33 and 34. At the same time the circuit through the coil 20 is also closed, so that the difference of potential between the conductors 14 and 16 is applied to the terminals of the lamp through the coil 20. The circuit-interrupter 28 then acts to rapidly make and break the circuit through the coil 23 and induces a higher electromotive force in the coil 20, which is applied to the terminals of the lamp. This electromotive force is sufficient to create such a condition on the part of the vapor of the lamp as to permit currents to flow therethrough under the influence of the difference of potential existing on the main circuit between the conductors 14 and 16. When this current commences to flow, the magnets 18 and 26 are energized, so as to draw forward their respective armatures. This results in opening the contact for the interrupter 28 at the point 12 and connecting the conductor 19 with the neutral wire 15 through the conductor 30, the lamp being now capable of being operated by currents under the difference of potential on the conductors 15 14. The armature 25 is also drawn forward, thus opening the circuit between the conductors 24 and 29. In this manner the lamp will be transferred to one side of the three-wire system and will continue to operate by reason of the currents flowing through the conductors 30 19, conductor 21, to the terminals, thence through the lamp, and from the leading-in wire 8 by means of the conductor 32 to the main conductor 14. The magnet 26 may be made to respond more slowly to the currents than the magnet 18, so as to insure that the connections with the conductor 30 are completed before the connections between the conductors 29 and 24 are broken, so as to avoid a temporary short circuit upon one side of the main circuit.

It may be desired to short-circuit the coil 20 while the lamp is in operation. This may be done by bridging two contacts 36 and 37 by the armature 25 when in its forward position, these points being respectively connected with the conductors 19 and 21.

In referring to the circuit-interrupter as serving to rapidly make and break the circuit I do not desire to be understood that it is necessary always to repeatedly make and break the circuit, as a single impulse may sometimes be sufficient to start the lamp.

The invention claimed is—

1. The combination with an electric lamp of the character described, of a three-wire supply-circuit, a transformer, circuit connections from the outer wire of the three-wire system through the primary of said transformer, a circuit-interrupter included in said circuit connections, connections from the outer wire of the three-wire system through the second-

ary coil of said transformer, and means for automatically interrupting the connections of the primary coil of the transformer and transferring the connections of the lamp to one side of the three-wire system.

2. The combination with a translating device, of a transformer having two coils connected with each other, means for causing independent time variations in the current traversing one of the coils for inducing currents in the other coil, means for causing the induced currents to traverse the translating device and for simultaneously applying a constant difference of potential to the terminals of the translating device, and means for transferring the translating device, when traversed by currents, to a circuit of lower potential.

3. The combination with a device requiring at different times currents of different electromotive force, of a converter having one terminal of its primary coil connected with one terminal of its secondary coil, means for creating independent time variations in the currents traversing the primary coil, means for simultaneously applying an independent difference of potential to the secondary coil, and means for transferring the device to a circuit of lower potential.

4. In a three-wire electric circuit, the combination of a converter having its two coils connected with each other and with a translating device, circuit connections from the terminals of one of the coils with the terminals of the translating device, connections from the terminals of the other coil with the outer wires of the three-wire circuit, means for producing within the coil electric variations or pulsations independent of the source, and means for transferring the translating device to one side of the three-wire circuit.

5. The combination with a lamp of the character described, of a transformer having two coils connected with each other, means for causing a varying electric current to traverse one of the coils and induce a current in the other coil, means for causing the induced current to traverse the lamp, means for simultaneously applying a constant difference of potential to the terminals of the lamp, and means for interrupting the circuit connections of the primary coil through the agency of currents of lower potential.

6. The combination with a translating device, of a three-wire circuit, means for normally applying the maximum difference of potential of the three-wire circuit to the translating device, means for simultaneously superposing a higher potential thereon, and means for automatically transferring the translating device from the maximum to the lower potential circuit of the three-wire system.

7. The combination with a lamp of the character described, of a three-wire system of electrical distribution, connections from the outer wires of said system with the terminals of the lamp, automatic means for transferring the lamp to one side of the three-wire system when



in operation, and means for producing a temporary higher difference of potential at the terminals of the lamp, comprising a core of magnetizable material and a coil surrounding the same, such coil being permanently connected in the operating-circuit of the lamp.

8. The combination with a lamp of the character described, of a three-wire system of electrical distribution, connections from the outer wires of said system with the terminals of the lamp, automatic means for transferring the lamp to one side of the three-wire system when in operation, and means for producing a temporary higher difference of potential at the terminals of the lamp, comprising a transformer having one of its coils permanently connected in the operating-circuit of the lamp and its other coil temporarily connected between the outer wires of the three-wire system.

9. The combination with an electric translating device, of a circuit of relatively high potential connected thereto at starting, a circuit of lower potential for operating the translating device, means for superposing upon the terminals of the lamp-wire, connected with the starting-circuit, a higher difference of potential, and means for breaking the circuit of the higher potential and supplying the translating device with current from the circuit of lower potential after it has started, substantially as described.

10. The combination with a lamp consisting of electrodes and a gas or vapor path between

them, of a circuit of relatively high potential for starting the lamp, a circuit of lower potential for operating the lamp, means for temporarily superposing upon the lamp, while connected with the relatively high potential circuit, a still higher potential, and an electromagnetic switch initially closing the circuit of higher potential and adapted, when the lamp is started, to be operated by the current flowing through the lamp to break the circuit of relatively high potential and establish the circuit of lower potential, the circuits being retained in such condition by the current traversing the lamp while remaining in operation.

11. The combination with an electric lamp of the character described, of a transformer having its primary and its secondary arranged in multiple between the mains of a three-wire system of distribution, the lamp being in series with the secondary, an open circuit including the said lamp and extending between one of the said mains and the neutral wire, means operated by the current traversing the lamp for breaking the original circuit of the lamp and establishing the initially open circuit from main to neutral.

Signed at New York, in the county of New York and State of New York, this 27th day of March, A. D. 1900.

PETER COOPER HEWITT.

Witnesses:

WM. H. CAPEL,

CHARLES B. HILL.