

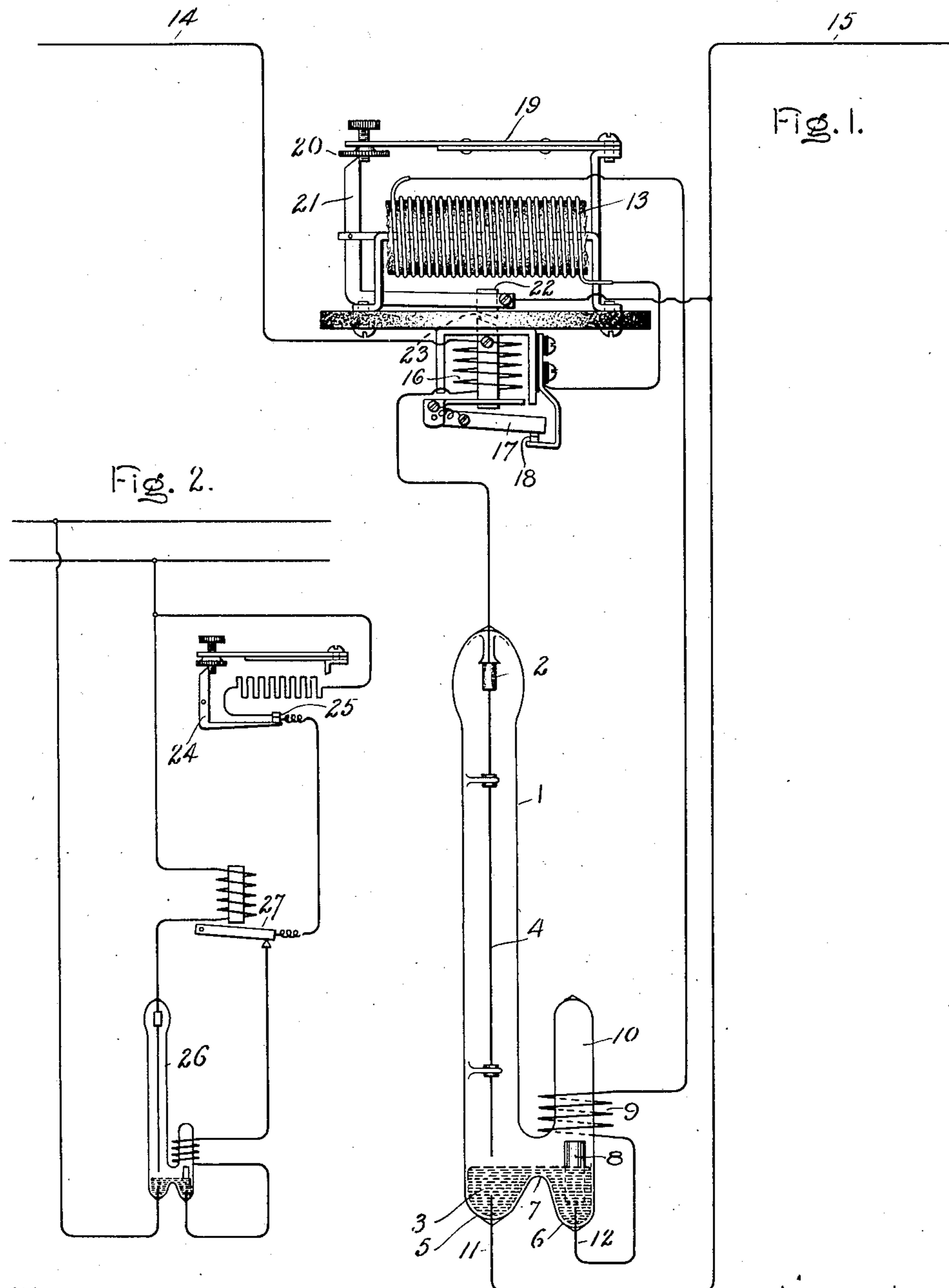
No. 850,279.

PATENTED APR. 16, 1907.

T. VAN ALLER.
CUT-OUT FOR VAPOR ELECTRIC APPARATUS.

APPLICATION FILED OCT. 12, 1904.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

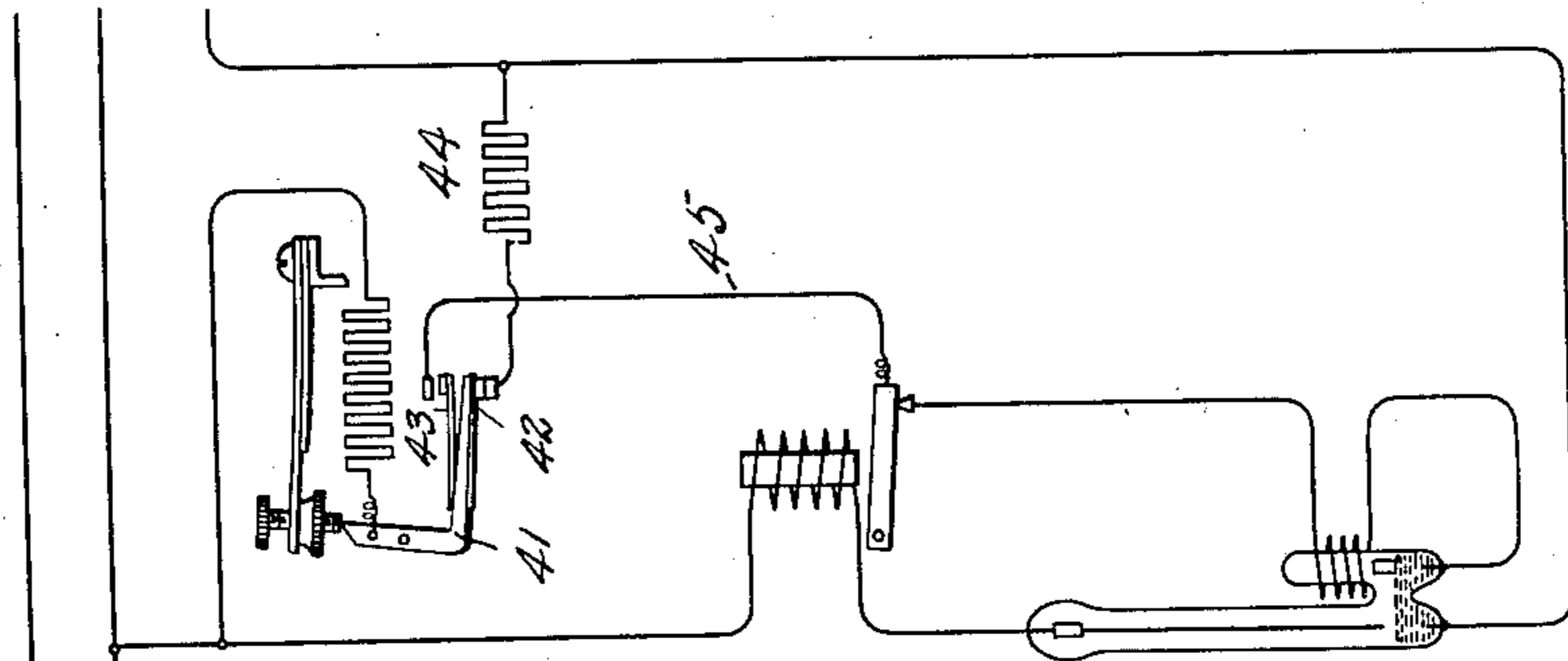
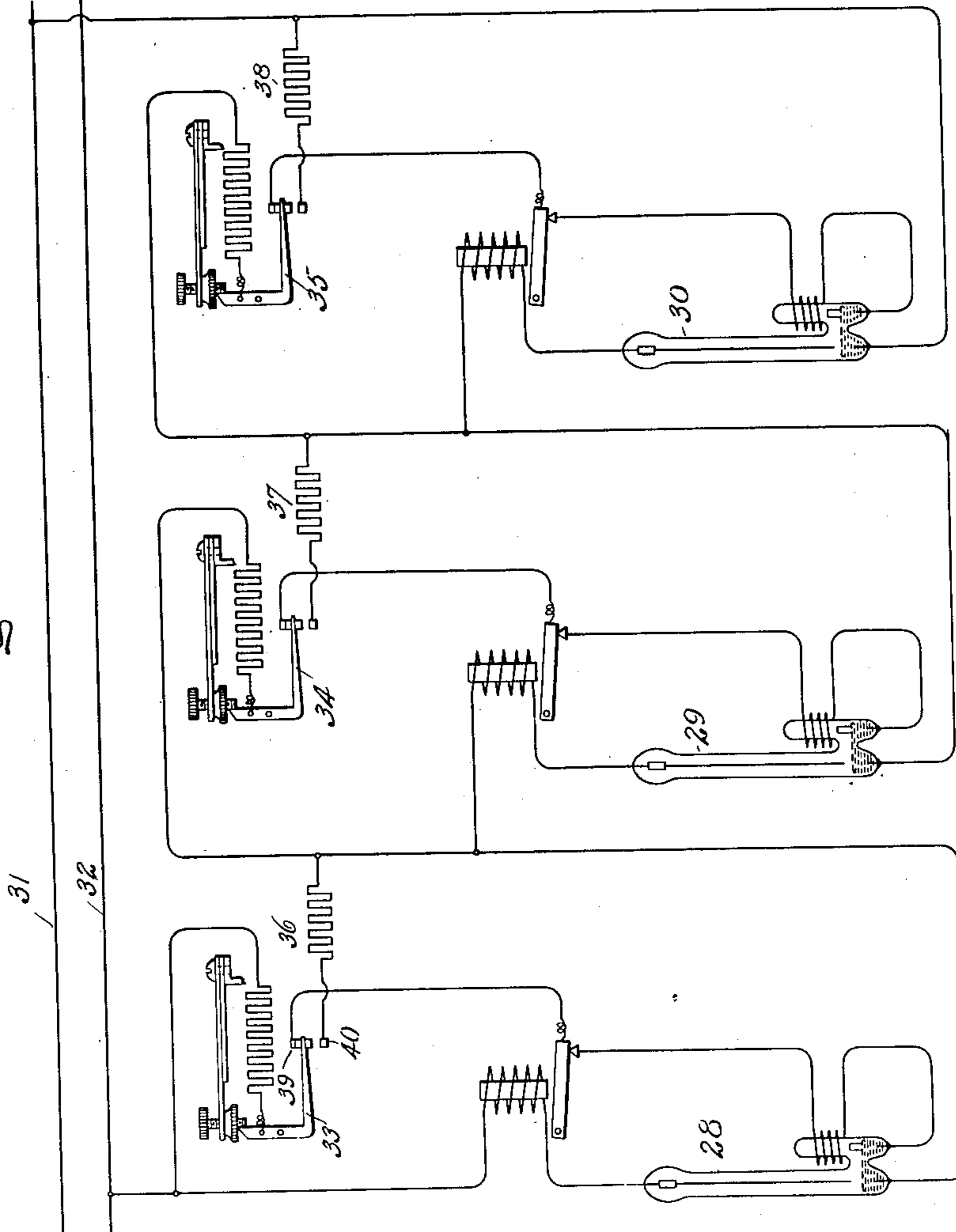


Fig. 3.



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UNITED STATES PATENT OFFICE.

TYCHO VAN ALLER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CUT-OUT FOR VAPOR ELECTRIC APPARATUS.

No. 850,279.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed October 12, 1904. Serial No. 228,146.

To all whom it may concern:

Be it known that I, TYCHO VAN ALLER, a subject of the King of Denmark, residing at Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Cut-Outs for Vapor Electric Apparatus, of which the following is a specification.

My present invention relates to cut-out or safety devices, and while capable of numerous other applications is of particular value in connection with vapor electric lamps or the like. Lamps of this character sometimes fail to start when thrown into connection with the electric-supply circuit, and it is one of the functions of my invention to cut such a lamp out of circuit in case it fails to start within a reasonable time after being put in connection with the supply-circuit. Possible injury to the lamp and its appurtenances is thus prevented.

The novel features which characterize my invention I have endeavored to point out with particularity in the appended claims. The invention itself, however, will be better understood by reference to the following description, taken in connection with the accompanying drawings, in which—

Figure 1 represents my invention as applied to a constant-current circuit including a mercury-vapor lamp. Fig. 2 is a modification showing the application of my invention to a constant-potential lamp. Fig. 3 shows my invention applied to a number of vapor electric lamps supplied in series from a source of electric current of constant potential; and Fig. 4 a portion of Fig. 3, modified by the application of a different form of switch or contact device.

The particular form of mercury-vapor lamp which I have shown in connection with a cut-out arrangement of my invention is of that type known as the "side-branch" lamp, in which the main arc is started by first starting a small auxiliary or branch arc located in a shunt or side-branch circuit. My invention is of course applicable to other forms of vapor electric devices than that which I have herein shown by way of illustration.

In Fig. 1 the lamp chosen as an example consists of a main tube 1, of glass or other suitable material, provided with upper and lower electrodes 2 and 3, of graphite and mercury, respectively. A filament 4, of carbon,

depends from the electrode 2 into proximity to the electrode 3 and is of assistance in starting the lamp. The mercury body 3 entirely fills the two adjacent cups 5 and 6 and covers to a slight depth the bridge 7, separating these cups or pockets. A displacement-float 8, of or containing magnetic material, operates as a core for a solenoid 9, surrounding a tubular extension 10, communicating with and located laterally of the main tube 1. When the solenoid 9 is energized, the float 8 is raised, and thereby lowers the level of the mercury, so as to lay bare the top of the bridge 7, and thus divide the mercury into two bodies. Electrical connections are made with these bodies of mercury by means of leading-in conductors 11 and 12, connected to the outside circuits of the lamp.

The controlling devices for the lamp are indicated at the top of Fig. 1. They include, first, a starting resistance 13. When current is first turned on to the lamp from the constant-current-supply circuit 14, this current traverses the resistance, passes through the magnet 9, then through the body of mercury 3, and out to the return-main 15 of the circuit. This current, acting upon the solenoid 9, lifts the plunger or core 8, and thereby causes a separation of the mercury over the bridge 7. The current thus flowing then gives rise to an arc between the separated bodies of mercury, and under normal conditions this arc operates to start up the main arc in the tube 1 between the electrodes 2 and 3 in a manner well understood in the art. If this main arc starts promptly, then the current by which it is supplied passing through the winding 16 of a cut-out magnet in series with the electrodes 2 and 3 energizes this magnet, lifts the armature 17, and breaks the circuit of the current through the side branch, which includes the resistance 13, magnet 9, and the leading-in connection 12. This break in the circuit takes place at the contacts 18.

In case the lamp fails to start after a predetermined period the resistance 13 rises in temperature to a point such that the heat given off therefrom by radiation or convection operates upon a thermostat to short-circuit the lamp. This thermostat consists of the usual heat-responsive member 19, of juxtaposed strips of metal of different coefficients of expansion. In the normal position

this member 19 by means of an adjustable stop 20 holds a switch-arm 21 in open-circuit position. This switch-arm carries a contact 22, cooperating with a fixed contact 23. One
 5 of these contacts is connected to one terminal of the lamp and the other to the other terminal. Thus it will be seen that if current flows in the side branch of the lamp for a certain predetermined length of time, which can
 10 only happen if the main-arc current in the lamp fails to start, and thus fails to energize the side-branch cut-out 16, then the resistance 13 by heating the thermostat 19 will release the switch-arm 21, and thus short-circuit the
 15 lamp by the contacts 22 and 23. The lamp then remains out of circuit until the thermostatic cut-out has by manual means been placed again in position to operate. This may be done by an attendant after the
 20 trouble with the lamp has been investigated.

Where the lamp to which my invention is to be applied is to be used on a constant-potential circuit, then it is evident that the thermostatic cut-out device cannot operate
 25 to short-circuit the lamp, but must effect the desired result by other means. Thus in Fig. 2 I have represented a thermostatic cut-out device with its switch-arm at 24. This switch-arm is arranged so that when dropped
 30 it will separate the contacts 25 in the side-branch circuit of the lamp 26. The usual magnetic cut-out for the side branch, which operates when the lamp starts normally, is indicated at 27. The general features of ar-
 35 rangement of the lamp in Fig. 2 is much the same as in Fig. 1, so that no further description of details seems necessary. It will be observed, however, that both in Fig. 1 and
 40 Fig. 2 the thermostat operates to cut the lamp out of circuit only in case the main arc fails to start.

In cases where a number of mercury-vapor lamps of the type described are to be run in series across a constant-potential circuit I
 45 use an arrangement very similar to that shown in Fig. 1. Inasmuch as one or more lamps could not be cut out of circuit without entailing a considerable rise in current value, I cause the thermostat to be so arranged as
 50 to shunt the lamp by an equivalent resistance rather than to short-circuit it, as in Fig. 1. Thus in Fig. 3 I have shown three lamps 28, 29, and 30 in series with each other across the constant-potential-supply mains 31 and
 55 32. The thermostatic switch-arms of the respective lamps are indicated at 33, 34, and 35 and operate when in one position to close the circuit of the side branches and when in the other position to substitute for the side
 60 branch equivalent resistances 36, 37, and 38.

Instead of using the switch-arm 33, which in passing from one contact, as 39, to the co-

operating contact 40 causes a break in the circuit, I may use a contact arrangement such as shown in Fig. 4. In this case the
 65 switch-arm 41, corresponding, for example, to the switch-arm 33 in Fig. 3, carries two spring-mounted contacts 42 and 43. When the switch-arm is thrown from one position to the other, one of the spring-mounted con-
 70 tacts engages its cooperating fixed contact before the other spring-mounted contact leaves the other fixed contact. The resistance 44 is thus substituted for the side-branch circuit 45 without interrupting the
 75 flow of current in the lamp-circuit.

It is evident that various modifications in the embodiments of my invention may be made without departing from the spirit thereof, for which reason I do not wish to be
 80 limited to the exact details shown and described.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a vapor electric de-
 85 vice having a main circuit and an auxiliary-arc-starting circuit, a magnetic cut-out device energized by current in the main circuit, and a time-limit cut-out device responsive to current in the auxiliary-arc-starting circuit.
 90

2. The combination of a vapor electric device, a circuit for producing a starting-arc in said device, and means for automatically interrupting the starting-arc after an interval in case the device fails to start.
 95

3. The combination of a vapor electric device, a starting-arc circuit, a main circuit, and cut-out devices one responsive to current in the main circuit and the other responsive to current in the starting-arc circuit.
 100

4. The combination of a vapor electric apparatus, a starting resistance therefor, and a thermostat responsive to heat generated in said resistance and operating upon failure of the apparatus to start to close a circuit about
 105 said apparatus.

5. The combination of a vapor electric apparatus, and a time-limit device for closing a circuit about said apparatus in the event of a failure of the apparatus to start within a pre-
 110 determined time.

6. The combination of a vapor electric device, an auxiliary-starting-arc circuit, means for cutting out the starting-circuit when the apparatus commences to operate, and auto-
 115 matic means for closing a circuit about said device in case it fails to start.

In witness whereof I have hereunto set my hand this 11th day of October, 1904.

TYCHO VAN ALLER.

Witnesses:

EDWARD. WILLIAMS, Jr.,
 HELEN ORFORD.