No. 751,414. PATENTED FEB. 2, 1904.

H. N. POTTER.

SYSTEM OF LIGHTING BY GAS OR VAPOR ELECTRIC LAMPS.

APPLICATION FILED APR. 30, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

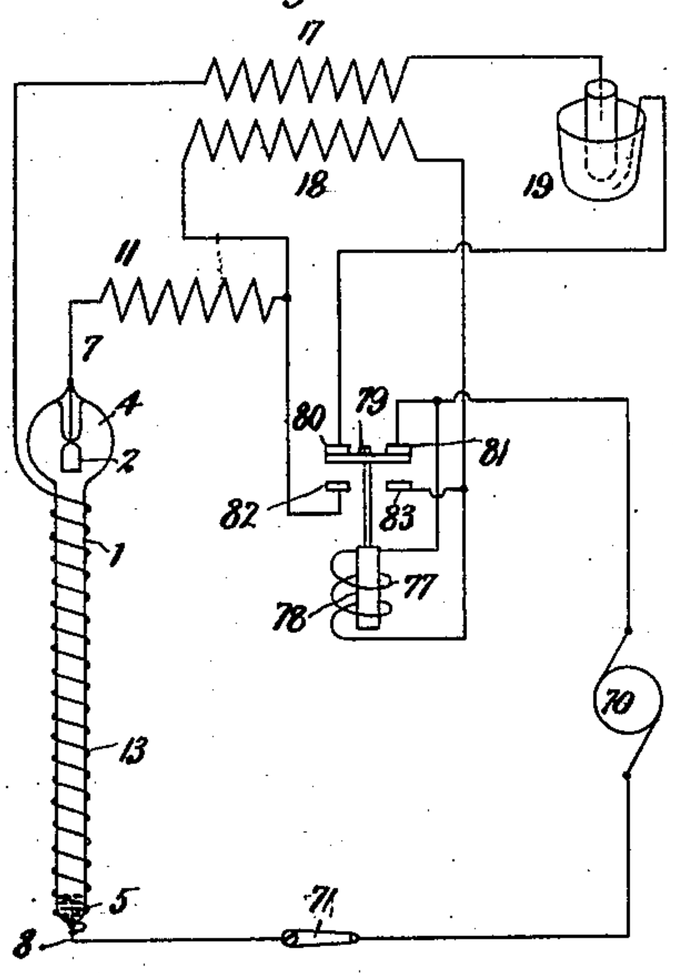


Fig. 2.

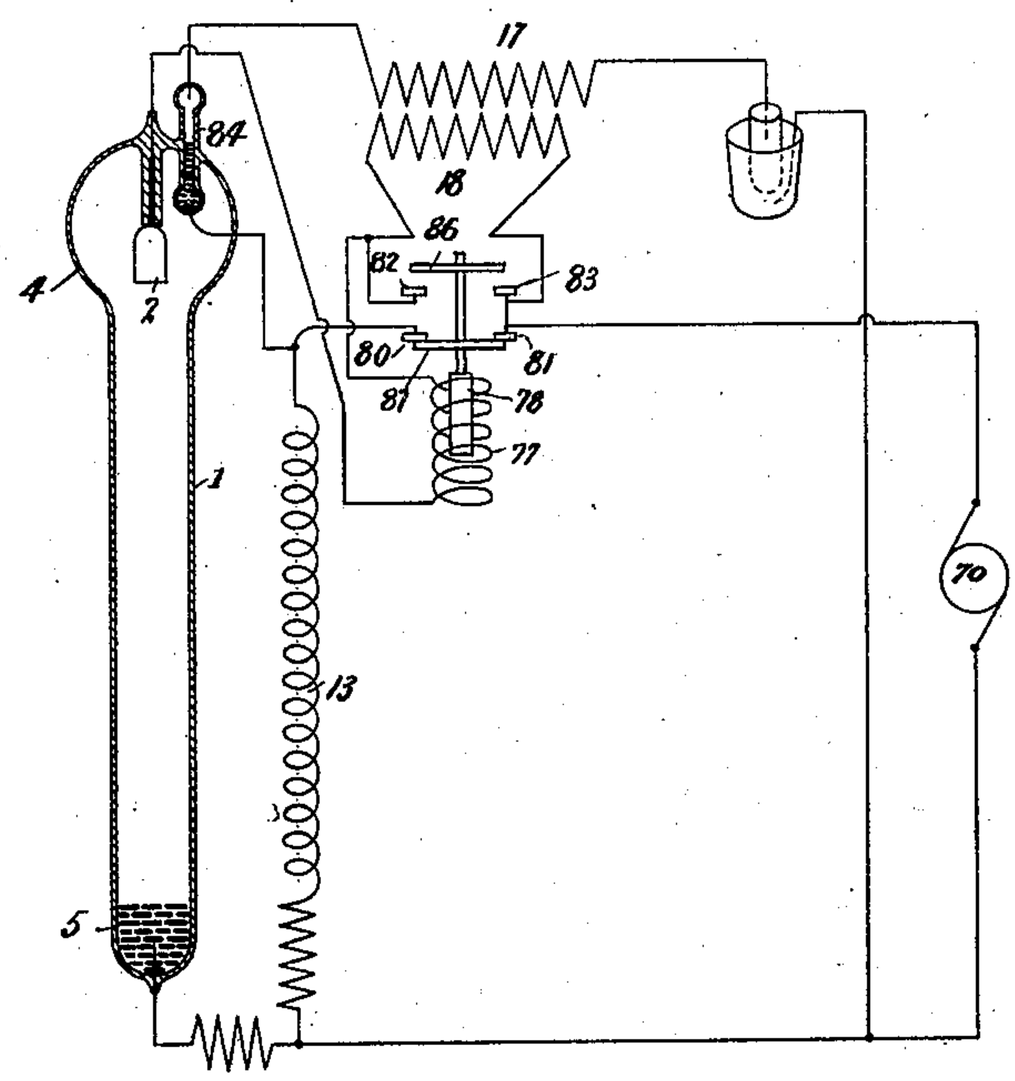
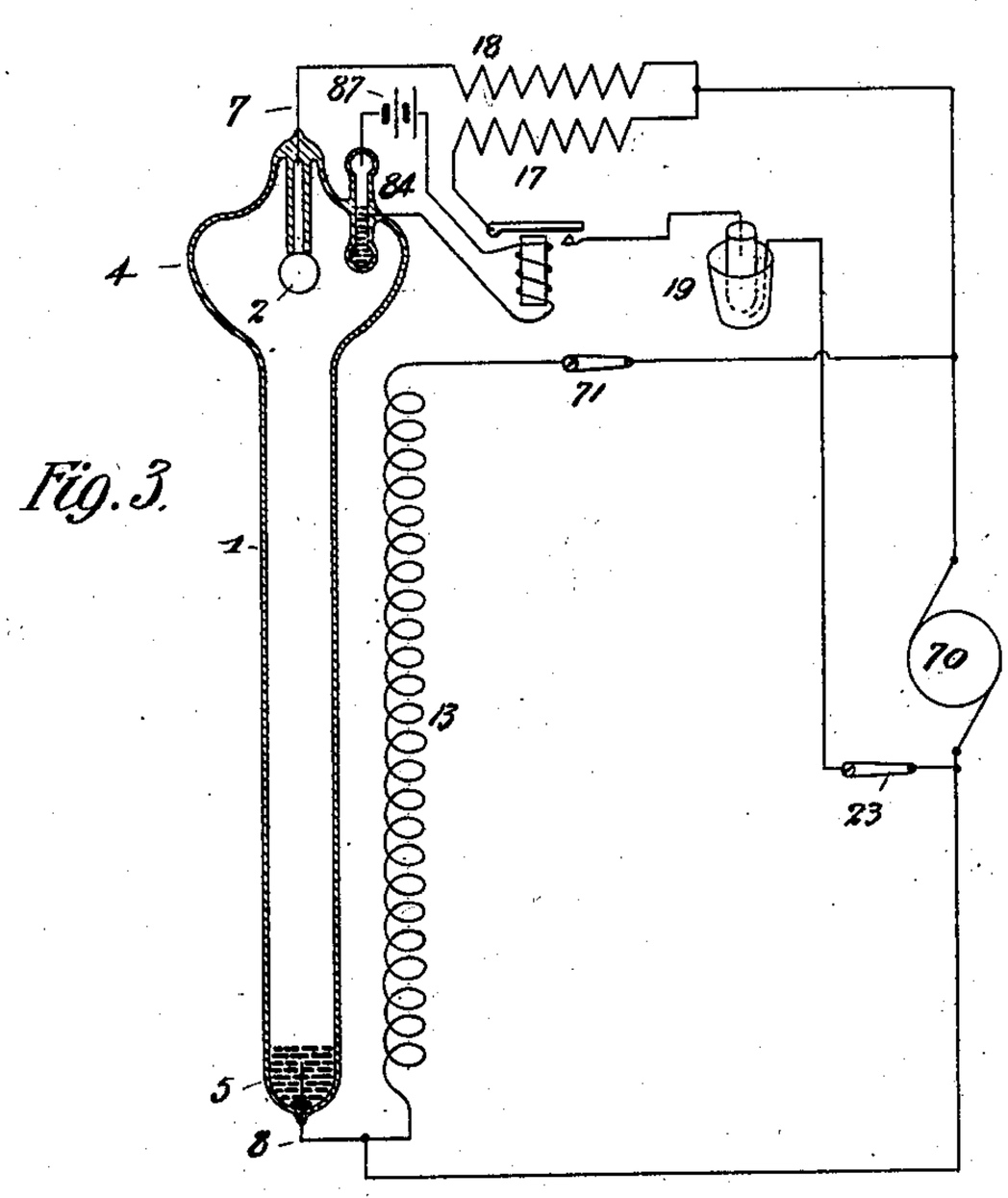


Fig. 3.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.

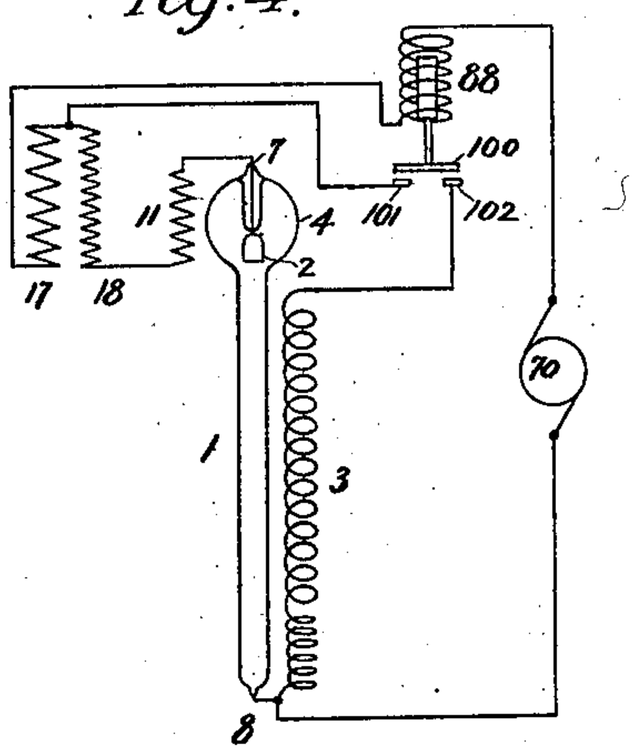


Fig. 5.

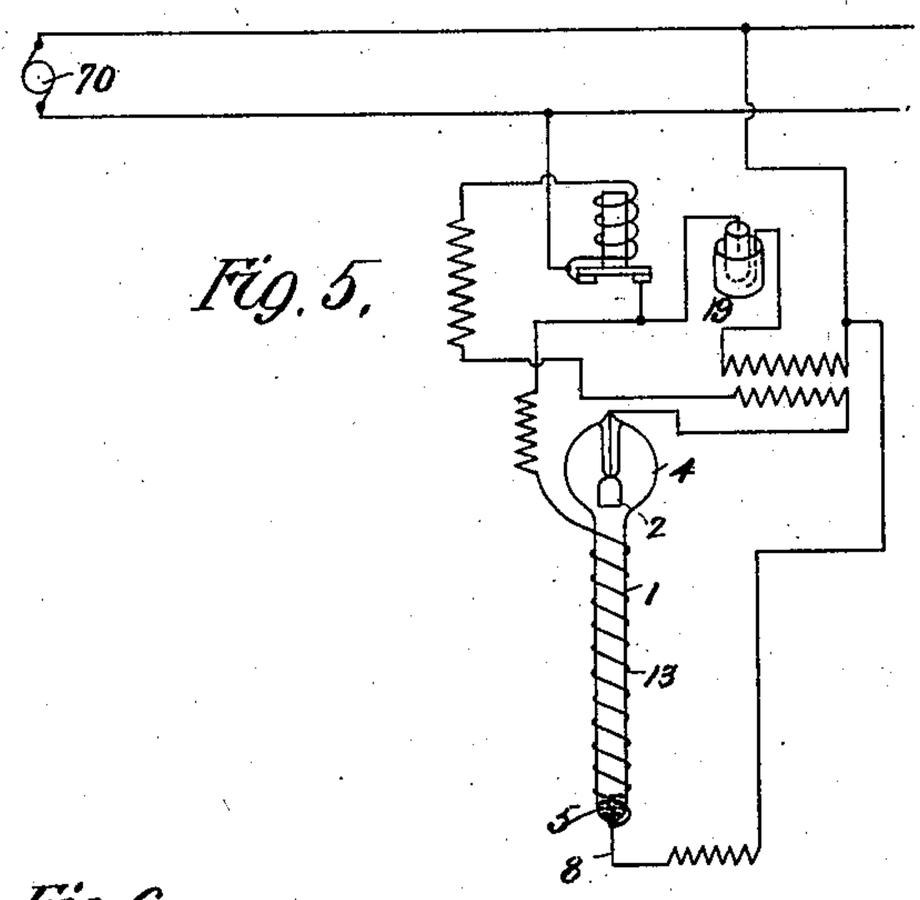
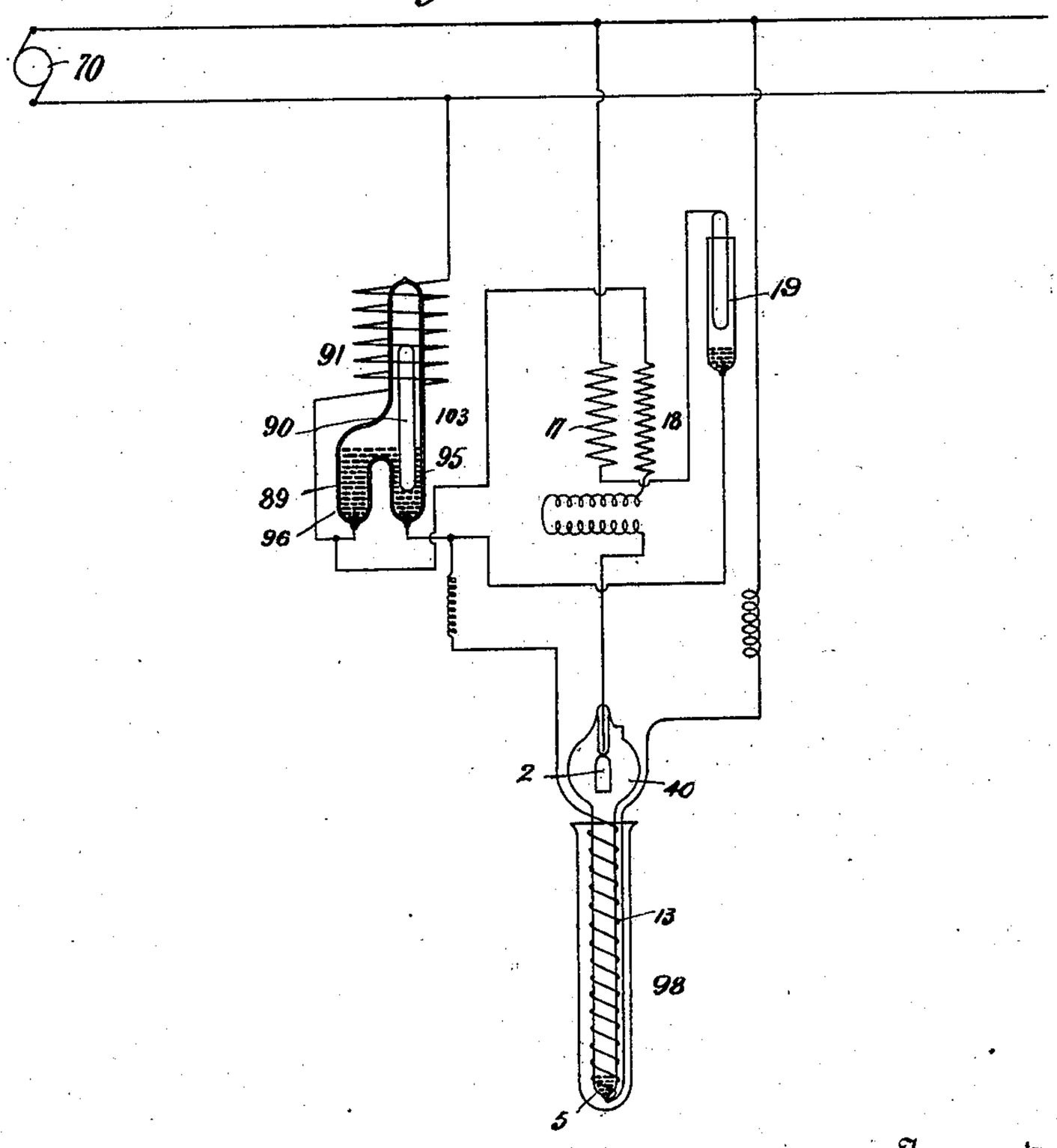


Fig. 6.



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No. 751,414. Patented February 2, 1904.

UNITED STATES PATENT OFFICE.

HENRY NOEL POTTER, OF NEW ROCHELLE, NEW YORK, ASSIGNOR TO COOPER HEWITT ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SYSTEM OF LIGHTING BY GAS OR VAPOR ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 751,414, dated February 2, 1904.

Original application filed May 28, 1901, Serial No. 62,182. Divided and this application filed April 30, 1903. Serial No. 154,911. (No model.)

To all whom it may concern:

Be it known that I, HENRY NOEL POTTER, a citizen of the United States, and a resident of New Rochelle, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Systems of Lighting by Gas or Vapor Electric Lamps, of which the following is a specification.

My invention relates to circuits and apparatus which may be used in operating gas or vapor electrical devices; and it also includes an improved heating arrangement for apparatus of this class, as will fully appear in the specification which follows.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a diagram of a system of circuits adapted to the above-named purposes, together with a detail view of a single gas or vapor electric lamp and my heating arrangement combined therewith; and Figs. 2, 3, 4, 5, and 6 illustrate various modifications of the system shown in Fig. 1.

The present application is a division of an application filed by me on the 28th day of May, 1901, Serial No. 62,182. In another division of the same original application, such division being numbered 145,173, dated February 26, 1903, claims are made upon the vapor apparatus in its direct relations to the heater without regard to the system of circuits including the same.

In the first figure of the drawings, 1 represents a transparent tube—say of glass—constituting the main portion of the container for a suitable conducting gas or vapor. In the present instance I have illustrated a lamp in which the cathode (shown at 5) is a mass or puddle of mercury, while the anode (appearing at 2) is of iron. A bulb or enlargement 4 is formed at the upper end of the tube 1 to serve as a cooling-chamber. Leading-in wires 7 and 8 are connected, respectively, to the anode 2 and the cathode 5. I surround the body of the lamp or a suitable portion thereof with a heater-wire 13, which will generally be a German-silver wire wound upon the outside of the tube. I generally wind such a wire more closely where it is outside the mercury cathode, as the latter, owing to its large specific heat, can absorb considerable heat, and unless extra heat is provided the duration of starting of the lamp will be unnecessarily prolonged.

In the system illustrated in Fig. 1 the lamp itself and the heater-wire are arranged in separate parallel circuits supplied by a suitable generator 70, the heater-wire circuit including also a suitable electrolytic or other interrupter 19 and the primary 17 of a suitable starting-transformer, the secondary 18 of which is in the lamp-circuit. The said lamp-circuit also includes a ballast resistance 11 or may include such a resistance. In the lamp-circuit is also included the actuating-coil 77 of an automatic switch, the core 78 of the said coil being connected to a contact-piece 79, which in the position illustrated in the drawings bridges two contact-terminals 80 and 81. When the core is drawn in and the contact-piece 79 is carried downward, the latter makes contact with two terminals 82 and 83 and breaks contact with the terminals 80 and 81. In the common circuit of the lamp and the heater-wire is located a switch 71, which may be operated by hand. Under the conditions illustrated in Fig. 1 the switch 71 is closed and the lamp is supposed to be started, current passing from the dynamo 70 through the contacts 81, 79, and 80, thence through the interrupter 19, the primary 17, the heater-wire 13, and back to the dynamo. By the discharge of the secondary 18 the lamp is started and the lamp-circuit takes current, whereupon the coil 77 is energized and the switch is automatically operated to break the heater-circuit and establish a new lamp-circuit with the secondary of the transformer cut-out.

Under certain conditions of operation the lamp will not start until the heater-wire has increased the lamp-temperature to a condition where it will readily start.

In Fig. 2 I have shown a device which is

intended to relieve the interrupter of the necessity of uselessly operating during the preliminary period wherein the heater has not yet brought the tube to such a temperature as will permit it to be started. For the sake of clearness I have here represented the heater-wire 13 as removed from the outside of the tube 1. I have also shown in the open portion of the lamp near the anode a small thermostat 84 of the usual mercury-thermostat type, whose function it is to close the primary circuit of the starting-transformer when the lamp has been heated up to a point where it will certainly start. Thus the circuit containing the interrupter and the starter primary will be inactive until the necessity for its action intervenes. In this arrangement the core 78 carries two contact-plates or contact-pieces 86 and 87, one of which, according to the position of the core, is adapted to make or break contact with the terminals 80 and 81 and the other of which is adapted to make or break contact with the terminals 82 and 83. The action is the same as that already described in connection with Fig. 1—that is to say, when the lamp is started the circuit of the heater and the starting primary is opened and the starter secondary is short-circuited.

In Fig. 3 I have shown another arrangememt embodying the same feature of thermostatic control; but I here operate the controlling-switch of the starter primary by means of a local circuit, including a battery 87. In this drawing I show manually-operated switches 23 and 71, although these switches might obviously be made automatic in their operation. Fig. 4 illustrates a remarkably simple arrangement. With this system of circuits I employ a combined cut-out and interrupter 88, consisting of a coil and a core, the latter being connected to a contact-piece 100, adapted to bridge two contacts 101 and 102. The form illustrated is diagrammatic of a combined cut-out and interrupter, many variations of such devices being possible. The contacts are shown apart, the heater-wire circuit being interrupted. Normally before the lamp starts or the system is set in operation the contact-piece 100 will bridge the coöperating contact-pieces 101 and 102, and there will be a complete circuit from the dynamo through the coil 88, the starter primary 17, the contacts 101, 100, and 102, the heater-wire 13, and thence back to the dynamo. The passage of current through this circuit ruptures it by lifting the contact-piece 100; but it is immediately restored, and a rapid automatic interruption and closure of the circuit takes place. The heater receives current whenever the circuit is closed, and the starter secondary 18 receives an impulse every time the circuit is broken, so that the lamp-tube is heated directly by whatever secondary discharge occurs and also indirectly by the heater-wire 13, the combined action being eventually sufficient to start the tube, whereupon the coil 88 holds the interrupter-contacts apart. The primary and secondary of the starter are so proportioned and disposed that they may operate as the ballast for the lamp, although I have shown in Fig. 4 an extra ballast 11 in series with the starter.

Fig. 5 illustrates another arrangement of circuits controlled by a single switch, this arrangement being generally the same as that illustrated in Fig. 4, except that a separate interrupter 19 is employed in connection with the switch. In this arrangement, however, the starter primary as well as the interrupter and the heater is cut out by the action of the switch when the lamp has begun to operate.

In Fig. 6 I have shown another arrangement of circuits and a modified form of interrupting device, which I have found operative. The peculiar feature of this interrupter is that the break occurs between two surfaces of mercury. Special attention is called to that part of the apparatus shown near the left of the figure, where a coil 91 surrounds a tube 103, containing mercury 89 in two chambers or compartments 95 and 96. A core 90 is arranged within the tube and extends into the mercury in the chamber 95. The position of the core is controlled by the coil 91. When the core descends, it causes the mercury to overflow from one compartment, 95, to the other, 96, thereby establishing a circuit to the heater 13 and the electrolytic interrupter 19. When the core 90 is lifted on the passing of current through the lamp, the mercury in the two compartments flows apart, thus breaking the circuits of the heater, the interrupter, and the starter primary and leaving the lamp in condition for continued operation. I have also shown in this figure of the drawings an outer tube 98, preferably of ground glass, which is slipped over that part of the lamp upon which the heater-wire is wound. This is a very satisfactory way of hiding the heater-wire, and as it hinders convection it also causes the lamp to start more quickly.

The interrupter 19 may be of the well-known Wehnelt type, or it may be any other suitable device adapted to cause very rapid interruptions of the circuit.

I claim as my invention—

1. In a system of lighting by gas or vapor electric lamps, a lamp of the class described, a transformer whose secondary is in series with the lamp, a heater, an interrupter and the primary of the transformer in shunt to the lamp, in combination with automatic means for cutting out the heater, the interrupter and the transformer primary, when the lamp begins to operate.

2. In a system of lighting by gas or vapor electric lamps, a lamp of the class described, a transformer whose secondary is in series with the lamp, a heater, an interrupter, and

the transformer primary in shunt to the lamp, and a controlling device for the shunt circuit or circuits brought into operation automatically when the lamp begins to operate.

3. In a system of lighting by gas or vapor electric lamps, a lamp of the class described, a transformer whose secondary is in series with the lamp, a heater, an interrupter and the transformer primary in shunt to the lamp, and an electromagnetic device in the main lamp-circuit, adapted to break the shunt circuit or circuits when the lamp begins to operate.

Signed at New York, in the county of New York and State of New York, this 24th day of April, A. D. 1903.

HENRY NOEL POTTER.

Witnesses:

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