F. CONRAD.

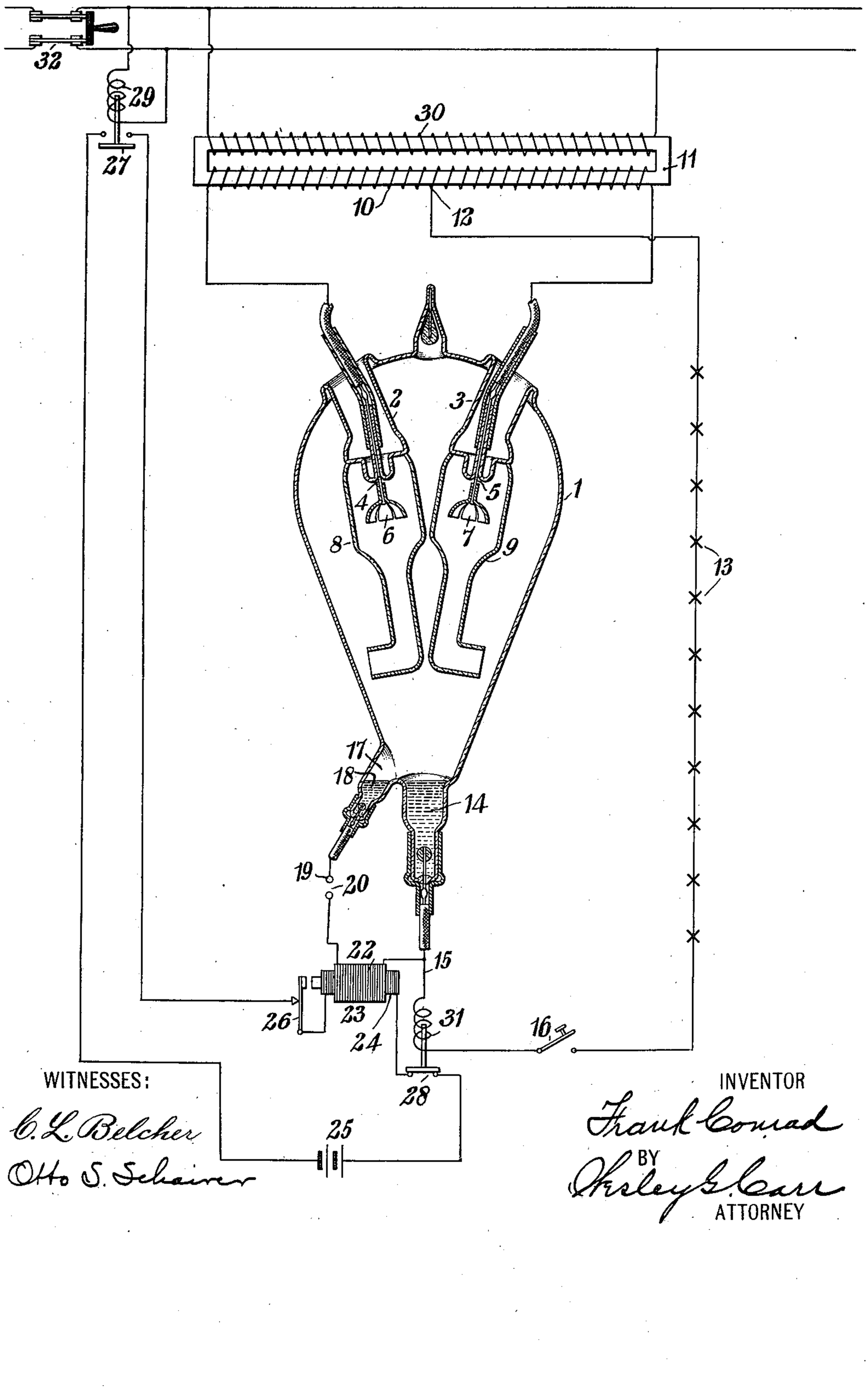
STARTING MEANS FOR VAPOR RECTIFYING DEVICES.

APPLICATION FILED SEPT. 20, 1906.

975,399. **Patented Nov. 15, 1910.**

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

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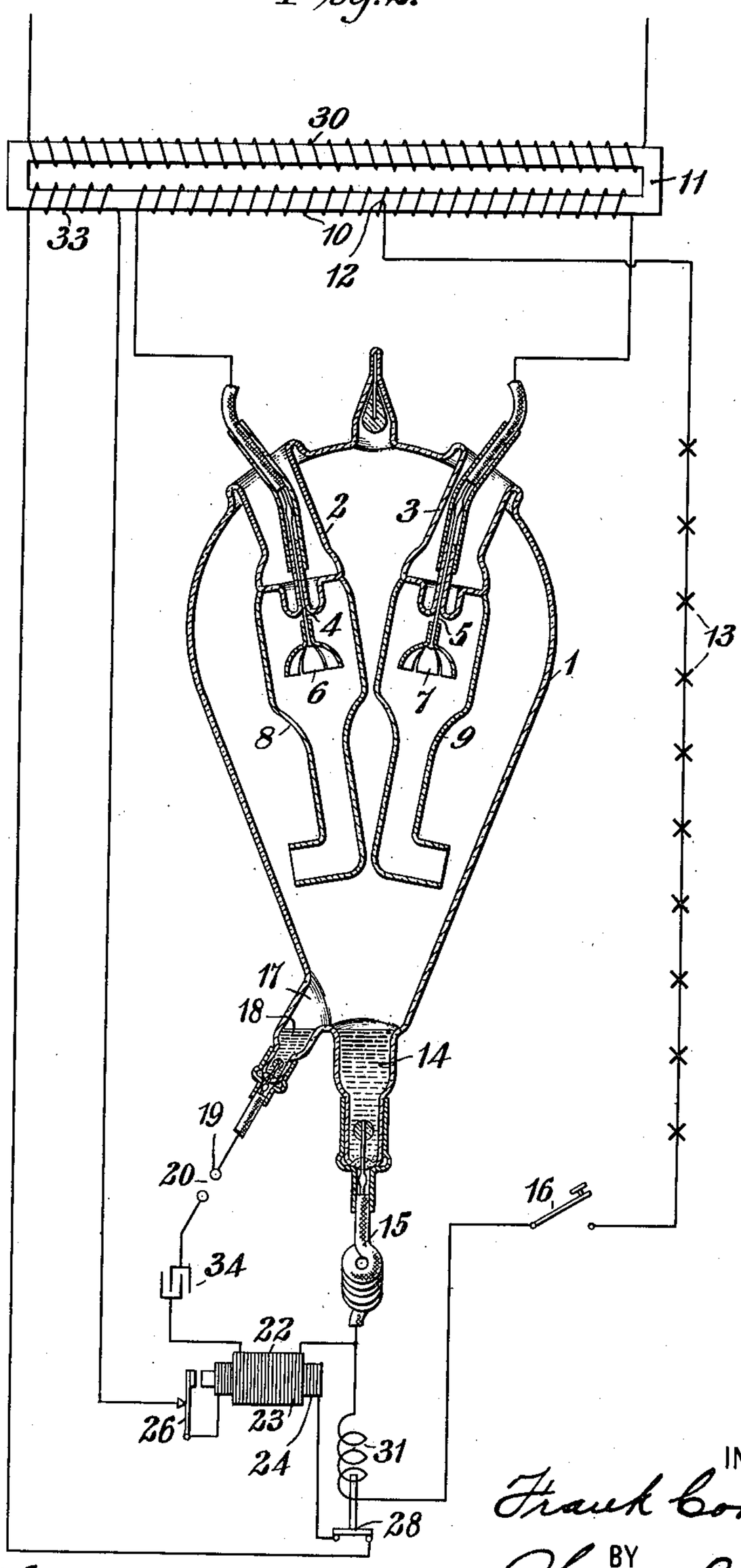
2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

FRANK CONRAD, OF SWISSVALE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

STARTING MEANS FOR VAPOR-RECTIFYING DEVICES.

975,399. Specification of Letters Patent. Patented Nov. 15, 1910.

Application filed September 20, 1906. Serial No. 335,527.

To all whom it may concern:

Be it known that I, FRANK CONRAD, a citizen of the United States, and a resident of Swissvale, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Starting Means for Vapor-Rectifying Devices, of which the following is a specification.

My invention relates to rectifiers for alternating current, and particularly to those in which a vapor is utilized as the rectifying agent.

The object of my invention is to provide means whereby the rectifying process, in devices of the character indicated, may be started automatically when the direct current circuit is established.

Starting of the rectifying process in mercury vapor rectifiers or converters has heretofore been the result of a manual operation which has usually consisted in tilting the receptacle for the mercury vapor so as to cause arcing by spilling mercury from one portion of the receptacle to another. When such a rectifier is connected to a direct current distributing circuit that is subject to interruption, as, for instance, to an arc lamp circuit, the rectifying process must be started after each interruption. The devices have consequently required constant attendance.

According to the present invention, starting of the rectifying process is effected automatically upon establishment of the direct current circuit, and the rectifier is maintained in substantially continuous operation, even when connected to a circuit that is subject to interruption.

Figure 1 of the accompanying drawings is a diagrammatic view of a system and a vertical sectional view of a device that embody my invention, and Fig. 2 is a similar view of a modification of the invention.

A substantially pear-shaped receptacle 1, from which the air has been exhausted and that is filled with mercury vapor, is provided in its upper, larger end with inwardly extending tubular projections 2 and 3 through the lower ends of which project conductors 4 and 5 that support substantially cup-shaped terminals 6 and 7. Surrounding terminals 6 and 7, within the receptacle 1, are tubular extensions 8 and 9 of the projections 2 and 3 having substantially hook-shaped lower extremities, the open ends of which are directed away from each other. The terminals 6 and 7 form the positive terminals of the device and are connected, by means of conductors 4 and 5, to the secondary winding 10 of a transformer 11, the middle or another intermediate point of which is connected, by means of a conductor 12, to one terminal of a suitable direct current distributing circuit, such, for instance, as that which supplied a series of arc lamps 13. In the lower end of the receptacle 1 is a pool of mercury 14 that forms the negative terminal of the device and is connected, by means of a conductor 15, to the remaining terminal of the direct current distributing circuit, a switch 16 being provided for opening and closing the said circuit.

The receptacle 1 is provided, near its lower end, with a protuberance 17 containing a pool of mercury 18 that is separated from the pool 14 by only a short space. A conductor 19 connects the pool of mercury 18 with one terminal of a discharge gap 20, the secondary winding 22 of an inductive discharge device 23 being connected between the other terminal of the gap and the conductor 15. In Fig. 1, primary winding 24 of the device 23 is supplied from a suitable source of direct current, such as a battery 25, and included in circuit therewith is a suitable interrupting device 26, a normally open switch 27 and a normally closed switch 28. The switch 27 is provided with an operating magnet winding 29 that is connected in circuit with primary winding 30 of the transformer 11, so that switch 27 is closed only when the primary winding 30 is energized. This switch 27 is provided for the purpose of interrupting the circuit of the winding when the transformer 11 is disconnected from the supply circuit, so that the direct current source may not supply current continuously when the rectifier is not in operation. The switch 28 is provided with an operating magnet winding 31 that is connected in the main direct current circuit and becomes energized to open the switch 28 and, consequently, the primary circuit of the discharge device 23 when the rectifier is in operation.

In order to start operation of the rectifier, primary winding 30 of the transformer should be first connected to the supply circuit by closing a switch 32, and the switch 16 should also be closed, whereupon switch

27 closes and establishes a circuit through the winding 24. A discharge then occurs between the terminals of the gap at 20 and between the pools of mercury 14 and 18, the arc thus established within the receptacle 1 between the pools of mercury enabling ready starting of the rectifying process. The winding 31 then becomes energized and opens the switch 28, thereby interrupting the circuit of the winding 24. The circuits should be so arranged that the discharges will be from the pool 18 to the pool 14, in order to preclude all possibility of the pool 18 becoming the negative terminal of the device. The discharge gap device 20 serves the usual function of increasing the intensity of the discharge between the pools of mercury 14 and 18, and also assists in preventing direct current from traversing the winding 22.

In Fig. 2, the primary winding 24 of the discharge device 23 is supplied from a small auxiliary secondary winding 33 that is provided for the transformer 11, in which case no means are necessary for opening the circuit of the winding 24 when the rectifier is not in operation. However, since the discharge may occur in either direction between the pools 14 and 18, on account of the alternating character of the primary current, it may be advisable to include a condenser 34 in series circuit with the winding 22, in order to prevent the pool 18 from becoming the negative terminal of the device and establishment of the direct current circuit through the winding 22.

Obviously, the structural details of the device and the circuit arrangements and connections may be varied considerably without altering the mode of operation of the invention or departing materially from its spirit, and I desire that all such modifications shall be included within its scope.

I claim as my invention:

1. A vapor rectifying device for alternating current comprising a receptacle for the vapor, a negative terminal, and an auxiliary terminal, in combination with means for causing electrical discharges between the auxiliary and negative terminals, said means comprising inductively related primary and secondary circuits the latter of which is connected between the negative and auxiliary terminals, a condenser in the secondary circuit, and means for opening the primary circuit after the rectifying process has begun.

2. A vapor rectifying device for alternating current comprising a receptacle for the vapor, a negative terminal, and an auxiliary terminal, in combination with means for causing electrical discharges between the auxiliary and negative terminals, said means comprising inductively related primary and secondary circuits the latter of which is connected between the negative and auxiliary terminals, a discharge gap and a condenser in the secondary circuit, and means for opening the primary circuit after the rectifying process has begun.

3. A vapor rectifying device for alternating current, comprising a receptacle for the vapor, a negative terminal, and an auxiliary terminal, in combination with means for causing electrical discharges between the auxiliary and negative terminals comprising a primary and a secondary circuit, means for opening the primary circuit when the alternating current circuit of the device is not established, and means for opening the primary circuit when the direct current circuit is established.

4. A vapor rectifying device for alternating current comprising a receptacle for the vapor, a negative terminal, and an auxiliary terminal, in combination with means for causing electrical discharges between the auxiliary and negative terminals, said means comprising inductively related primary and secondary circuits the latter of which is connected between the negative and auxiliary terminals, a discharge gap in the secondary circuit, and means for opening the primary circuit after the rectifying process has begun.

5. A vapor rectifying device for alternating current comprising a receptacle for the vapor, a negative terminal and an auxiliary terminal, in combination with means for causing electrical discharges between the auxiliary and negative terminals, said means comprising inductively related primary and secondary circuits the latter of which is connected between the negative and auxiliary terminals, an interrupter in the primary circuit, and means for opening the primary circuit after the rectifying process has begun.

In testimony whereof, I have hereunto subscribed my name this 13th day of September, 1906.

FRANK CONRAD.

Witnesses:
OTTO S. SCHAIRER,
BIRNEY HINES.