L. A. HAWKINS.

SYSTEM OF DISTRIBUTION.

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1,131,237.

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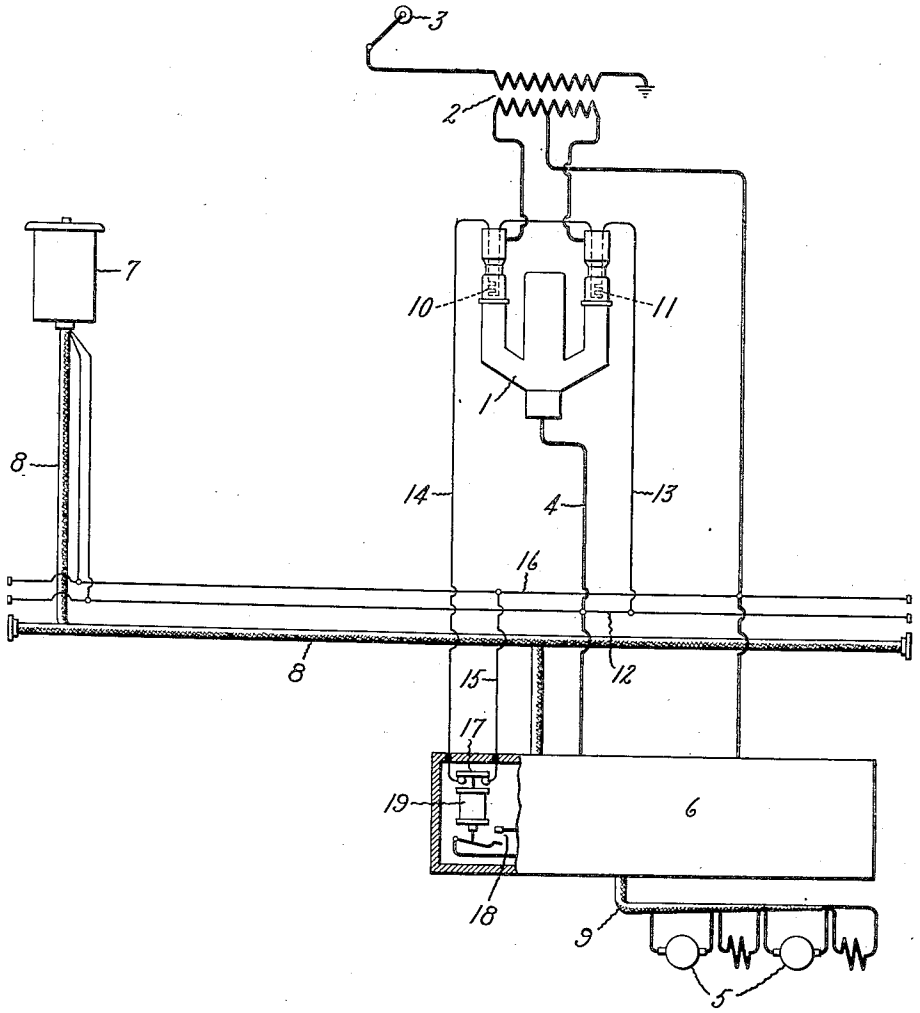

Witnesses:

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UNITED STATES PATENT OFFICE.

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SYSTEM OF DISTRIBUTION.

1,131,237. Specification of Letters Patent. Patented Mar. 9, 1915.

Application filed March 11, 1914. Serial No. 823,872.

To all whom it may concern:

Be it known that I, LAURENCE A. HAWKINS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Systems of Distribution, of which the following is a specification.

The present invention comprises a system of distribution containing a vapor apparatus, such as a mercury vapor rectifier, and its object is to decrease the liability of discharges of undesired polarity, particularly after an idle period when the tendency of an anode temporarily to become a cathode is increased by the condensation of mercury on or around the anode or anodes.

As disclosed in the Story Patent No. 1,118,380, it has been found advantageous to heat the anodes of a mercury vapor rectifier by means of an auxiliary heater independent of the heating action of the arc to prevent the condensation of mercury on the anodes.

In accordance with my present invention the vapor rectifier is provided with means for automatically heating the anodes when the load current in the rectifier is interrupted or reduced below a certain value, as for example, when the rectifier is used for propulsion in electric railways where it is subject to intermittent service. The anodes are thus kept hot during periods of no load without the necessity of running the heaters continually and thus subjecting them to the danger of overheating during periods of full load or overload.

Another feature of my invention consists in deriving the heating current from the rectifier itself, so that a load is maintained at all times sufficient to keep the arc going, thus making it unnecessary to maintain an exciting arc or to provide special means for restarting the arc after every interruption of the load current. This feature of my invention is not necessarily limited to utilizing the heating current for maintaining the arc. Any other load could be thrown on instead. But since the heating current is required just at the time when the auxiliary load is needed to maintain the arc, simplicity of arrangement and efficiency of operation are conserved by utilizing the heating current as part at least of the auxiliary load.

The accompanying drawing illustrates diagrammatically one embodiment of my invention in connection with a motor control system.

By reference to this diagram it will be seen that the rectifier 1 receives alternating current from the secondary of a transformer 2, the primary of which is connected between a trolley 3 and ground. The rectifier may be of the metal-walled type described in the above Story patent and in British Patent #15,392 of 1913, but my invention is not limited to any particular type of rectifier. The cathode or direct current load circuit 4 is connected to the motors 5 through the usual contactor system, as, for example, the system shown in Patent No. 687,060 to Perry.

The contactor box is indicated at 6, the connections being made to the motors 5 and the controller 7 by conductors all but two of which are indicated for the sake of simplicity as being included in the cables 8 and 9. The various connections from the controller to the contactors and the motors are already well understood.

The anodes of the rectifier are provided with heaters 10 and 11, shown by dotted lines. These heaters may be connected in series to any convenient source of energy, but preferably they are arranged to be supplied from the rectifier itself. The circuit comprises the conductors 12, 13, 14, 15 and 16, including a switch 17, which is interlocked with a contact 18 in the motor circuit such that the heater circuit is closed before the motor circuit is opened and vice versa. When the contactor magnet 19 is energized to close its contact in the motor circuit, the heating circuit is interrupted by the lifting of the switch 17. Thus the contactor 19 which controls the heating circuit may be any contactor of the ordinary motor control system which does not close until after the motor circuit is closed and which remains closed as long as the master controller is in running position. Thus, for instance, in Patent No. 687,060, Perry, which illustrates a simple form of contactor control, the right hand contactor R^s in Fig. 4 might be used, as contactor 19 of this application, to open contact 17 and thereby to control the heater circuit, just as in the patent it controls the resistance R^h. If that contactor R^s were so used, the heater cir-

cuit would be open when the master controller was in either running position, *i. e.*, full series or full parallel, and would be closed the rest of the time. In my particular arrangement of contactor control, it will be obvious to anyone skilled in the art, from the above explanation, which contactor may advantageously serve as contactor 19 of this application. It is obvious that if desired the energy supply for the anode heating circuit may be entirely independent from the rectifier circuit. Energy may be supplied from the transformer directly, or from a storage battery. By supplying the heating circuit from the rectifier itself, however, the arc may be kept alive when the motor circuit is opened. As disclosed in the above-mentioned Story patent the heaters may consist of insulated armored wire and preferably are operated in mercury so as to insure a uniform temperature at which mercury will not condense.

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

1. The combination of a current supply circuit, a load device consuming energy intermittently, a vapor electric device in said circuit, and means for automatically maintaining the anode or anodes of the vapor device heated when the load device is idle.

2. The combination of a vapor electric device, an energy supplying circuit therefor, a main load device consuming energy intermittently, an auxiliary load device, and means for automatically inserting said auxiliary load device in circuit with the vapor electric device when the main load device is deënergized.

3. The combination of a vapor electric rectifier, electrical means for heating the anode or anodes of said rectifier, an electrical translating device in the direct current circuit of said rectifier, a control device for varying the energy taken by said translating device and for closing the circuit of said heating means when the energy taken by the translating device falls below a predetermined minimum.

4. The combination of a source of alternating current, a mercury vapor rectifier connected thereto, said rectifier having anodes provided respectively with electric heaters, a load device supplied with direct current by said rectifier and a controller provided with contacts arranged to substitute the anode heating circuit in place of the load device when the load device is deenergized.

5. The combination of a metal-walled, high powered mercury rectifier having anodes of solid material, means for heating the anodes of said rectifier, a load device taking energy intermittently from said rectifier, and means for automatically energizing said heating means when the load current is reduced below a value insufficient to maintain the rectifier anodes heated to a temperature at which mercury will not condense thereon.

In witness whereof, I have hereunto set my hand this 10th day of March 1914.

LAURENCE A. HAWKINS.

Witnesses:
E. P. EDWARDS,
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