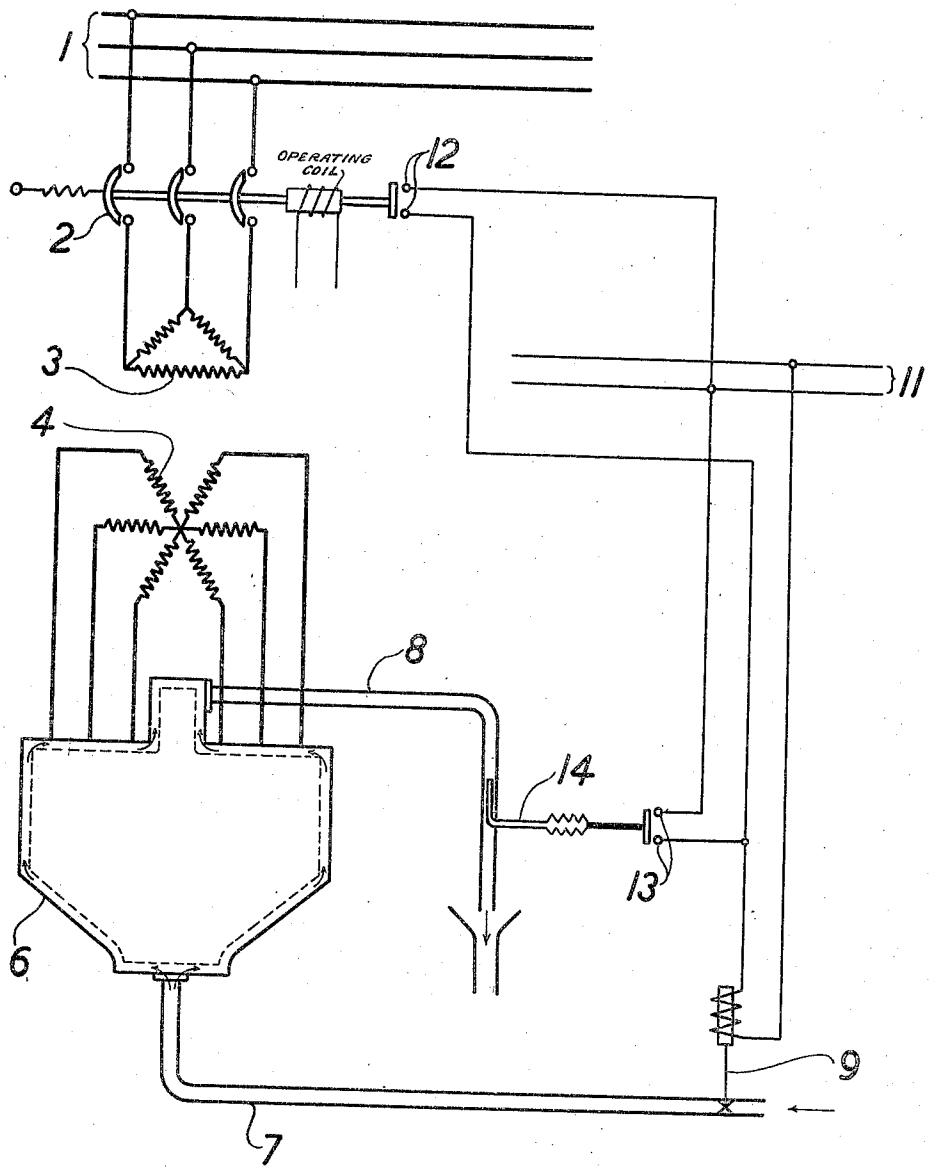
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RECTIFIER COOLING SYSTEM CONTROL

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RECTIFIER COOLING SYSTEM CONTROL

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This invention relates to improvements in electric current rectifying systems employing a rectifier of the metallic arc type and particularly to means for incorporation in such system by which the cooling of the rectifier is controlled.

Electric current rectifiers of the metal enclosed type are usually made double-walled to provide a path for the circulation of a cooling medium through the space between the walls. The supply of cooling medium is generally controlled in such way that the supply is shut-off when the rectifier is put out of operation for any reason such as when either the alternating current supply or the direct current output are cut off or when back-fires occur. Such action is not desired because the temperature of the rectifier tank continues to rise for some time due to the condensation of the mercury vapor within the tank after the rectifying action ceases. Such increase in temperature operates the usual protective devices applied to the installation unnecessarily. Complete condensation of the mercury vapor requires a long time, due to the heat of vaporization released, in the absence of a supply of cooling medium and the vacuum within the rectifier may drop too low to permit immediate restarting. The supply of cooling medium should therefore be continued until all the mercury is condensed and the heat released has been removed. In addition to the above, unless the supply of cooling medium to the walls of the tank is continued after operation ceases, mercury may condense on the anodes which are constructed with a separate cooling system, and may cause backfires in the rectifier. It is therefore desirable that the supply of cooling medium be continued automatically after the rectifier has been shutdown until it has reached a temperature at which the supply of cooling water may be safely interrupted without incurring the danger of future disturbances in starting or in operation.

It is, therefore, among the objects of the present invention to provide a control system for the cooling medium supply of an electric current rectifier which will maintain the supply of cooling medium until the rectifier has reached a pre-determined temperature.

Another object of the invention is to provide a control system for the cooling medium supply of an electric current rectifier which will maintain the supply of cooling medium until the rectifier has reached a pre-determined temperature regardless of the fact that the rectifier is no longer in operation.

Another object of the invention is to provide a control system for the cooling medium supply of an electric current rectifier which will automatically maintain a supply of cooling medium until the rectifier is cooled to a pre-determined temperature and will automatically start supplying cooling medium to the rectifier as soon as the rectifier is put into operation.

Objects and advantages, other than those above set forth, will be apparent from the following description when read in connection with the accompanying drawing which diagrammatically illustrates one embodiment of the present invention.

Referring more particularly to the drawing by characters of reference, the reference numeral 1 designates an alternating current supply line which is connected through a circuit breaker 2 with the primary winding 3 of a transformer, the secondary winding 4 of which is connected with and supplies current to the anodes (not shown) of a rectifier 6. The rectifier is made double-walled as indicated by the dotted lines to provide a path for the circulation of a cooling medium which is supplied from a suitable source through a pipe 7. The cooling medium circulates through the space between the walls of the rectifier as shown by the arrows and discharges therefrom through a pipe 8.

An electro-magnetically operated valve 9 is arranged in supply pipe 7 and is arranged to be operated by connection with a source of control current 11 as will be seen hereinafter. When circuit breaker 2 is open, as shown, a pair of auxiliary contacts 12 connected with the coil of the valve 9 is also open. A second pair of contacts 13, also connected in the circuit of the valve coil, are controlled by the expansion and contraction of a thermostatic

element 14 arranged in the outlet pipe 8 for the cooling medium discharging from the rectifier.

The valve 9 is kept open by the energization of the coil thereof when circuit breaker 2 is closed to connect supply line 1 to transformers 3 and 4 and to bridge contacts 12 regardless of the position of thermostatic element 14 and is also kept open by bridging of contacts 13 when thermostat 14 is expanded regardless of the open position of circuit breaker 2. Thus when the rectifier is cold, closing of circuit breaker 2 to put the rectifier into operation automatically opens valve 9 to permit a flow of cooling medium and, when the rectifier is put out of operation and is therefore still hot, expansion of thermostat 13 bridges contacts 13 to retain valve 9 in its open position until the temperature of the cooling water discharged has decreased sufficiently to permit contraction of the thermostatic element.

It will be understood that the thermostatic element may be located wherever desired in the path of the cooling medium and also that any well-known type of thermostatic element may be used. It will also be understood that the auxiliary contacts 12 may be so arranged as to be bridged by another portion of the switching equipment in the installation such as the usual direct current output line circuit breaker or any of the relays used to obtain automatic operation of the rectifier as is well known.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

The invention claimed is:

1. In an electric current rectifying system, an electric current rectifier formed to provide a path for the circulation of a cooling medium, a source of electric current supply for said rectifier, means for connecting said current with the rectifier, thermostatic means arranged in conjunction with said rectifier, and a valve arranged in the path of and controlling the flow of the cooling medium, said connecting means and said thermostatic means cooperating to control the operation of said valve.

2. In an electric current rectifying system, an electric current rectifier formed to provide a path for the circulation of a cooling medium, a source of electric current supply for said rectifier, means for connecting said current with the said rectifier, thermostatic means arranged adjacent the path of the cooling medium, a source of control current, and electro-magnetically operated valve arranged in the path of and controlling the flow of the cooling medium, said connecting means and said thermostatic means cooperating to control the operation of said valve.

3. In an electric current rectifying system, an electric current rectifier having double walls to provide for the circulation of a cooling medium therebetween, a source of current supply for said rectifier, a circuit breaker operative to connect the said source of current with said rectifier, thermostatic means arranged adjacent the path of the cooling medium, a source of control current, and an electro-magnetically operated valve arranged in the path of and controlling the flow of the cooling medium, said circuit breaker connecting an operating coil of said valve with said source of control current upon said operating connection of said circuit breaker to open said valve, said thermostatic means connecting the coil of said valve for opening the same with said source of control current at a pre-determined temperature of the cooling medium.

4. In an electric current rectifying system, an alternating current supply line, an electric current rectifier having double walls to provide for the circulation of a cooling medium therebetween, a circuit breaker operative to connect said supply line with said rectifier, thermostatic means arranged in the path of the cooling medium, a source of control current, and an electro-magnetically operated valve arranged in the path of and controlling the flow of the cooling medium, said circuit breaker connecting an operating coil for said valve with said source of control current upon operation of said circuit breaker to connect said supply line with said rectifier, said thermostatic means connecting said coil of said valve to said source of control current at a pre-determined temperature of the cooling medium, said circuit breaker and said thermostatic means operating independently of each other.

5. In combination, an electric current rectifier comprising means effective to permit the circulation of a cooling medium thereabout, a source of electric current supply for the said rectifier, means operative to effect connection of said source with the said rectifier to cause operation thereof, means operative responsive to the connection of said source with the said rectifier and effective upon such operation to control the said circulation of the cooling medium, and means operative in dependence upon the temperature of the cooling medium and effective upon such operation to control the said means for controlling the said circulation of the cooling medium.

6. In combination, an electric current rectifier comprising means disposed to permit the circulation of a cooling fluid thereabout, a source of electric current supply for the said rectifier, a switch disposed to be operated to connect the said source of current

with the said rectifier to cause operation thereof, electro-magnetically actuated means operative upon operation of the said switch to connect the said source with the said rectifier to permit the said circulation of cooling fluid about the said rectifier, and thermostatically actuated means operative in dependence upon the temperature of the cooling medium at and above a pre-determined temperature, the last said means being operative upon said actuation thereof to cause operation of said electro-magnetically actuated means to permit said circulation of the cooling fluid about the said rectifier.

7. In combination, an electric current rectifier having a chamber thereabout to permit the circulation of a cooling fluid therethrough, a source of electric current supply for said rectifier, a switch disposed to be operated to connect the said source of current with said rectifier to cause operation of the latter, an electro-magnetically actuated valve operative to control the said circulation of cooling fluid through the said chamber, means associated with and operated upon actuation of said switch to connect said source with the said rectifier to cause actuation of the said valve to permit flow of said fluid through said chamber, and thermostatically actuated means operative in dependence upon the temperature of the cooling fluid flowing from the said chamber and effective at and above a pre-determined temperature of such said fluid to cause actuation of said valve to permit flow of cooling fluid through said chamber, the said thermostatically means being operative to cause operation of the said valve independently of the operation thereof by said means associated with said switch.

In witness whereof I hereto affix my signature this 21st day of October, A. D. 1930.

HAROLD WINOGRAD.