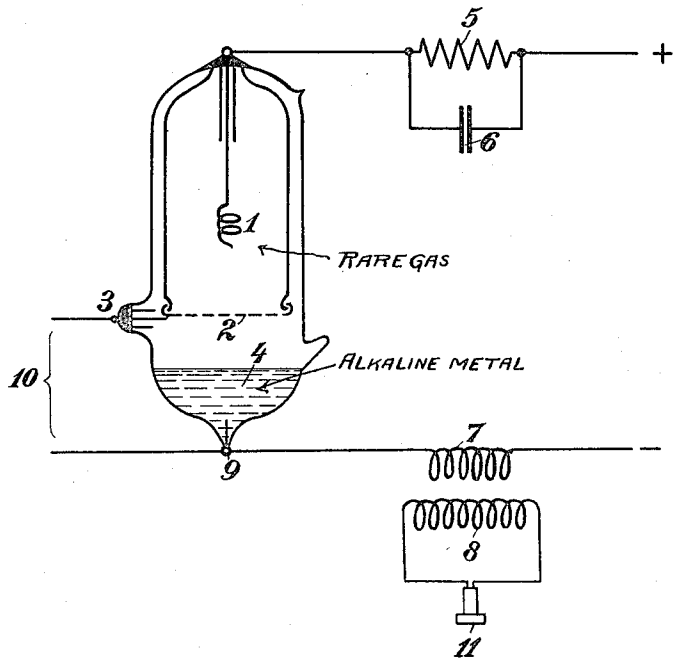
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F. SCHRÖTER

GAS RELAY

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# UNITED STATES PATENT OFFICE.

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## GAS RELAY.

Application filed October 5, 1920. Serial No. 414,934.

(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

*To all whom it may concern:*

Be it known that I, FRITZ SCHRÖTER, a citizen of Germany, residing at Schmargendorf, near Berlin, Germany, have invented certain new and useful Improvements in Gas Relays (for which I have filed applications in Germany 9, 2, 1915, Pat. No. 299,654; Belgium, 21, 10, 1919, Ser. No. 226,568; Denmark, 9, 10, 1919, Ser. No. 2771/19; England, 7, 7, 1920, Ser. No. 19,377; France, 29, 6, 1920, Pat. No. 518,238; Holland, 30, 3, 1920, Ser. No. 14,405; Italy, 30, 5, 1920, Ser. No. 288–97; Norway, 18, 10, 1919, Ser. No. 18,122; Sweden, 6, 10, 1919, Pat. No. 48,500; Japan, 30, 6, 1920, Ser. No. 58,263), of which the following is a specification.

The object of the invention is to produce a relay, in which an incandescent cathode and a source of heating current to be kept exactly at a constant voltage are avoided and which may be operated with a lower degree of evacuation of the discharge vessel than the Lieben relay. Further an occlusion of gases by the products of disintegration of the cathode is avoided.

On the drawing is shown a preferred embodiment of the invention.

In a suitably shaped vessel is provided between an anode 1 and a cathode 4 a grid like auxiliary electrode 2 with a lead-in conductor 3. According to the invention the cathode 4 consists of an alkaline metal or an alloy containing alkaline metals such as sodium, potassium or the like and the gaseous medium in the discharge vessel consists of rare or inert gases, such as argon, neon, helium, krypton or the like, or a mixture of such gases. The current circuit to be controlled is connected to the anode 1 and the cathode 4. In this circuit are inserted a resistance 5 shunted by a condenser 6 and a winding 7 of a transformer. As a source of voltage a continuous current line of 220 volt will be sufficient for operating the relay. For the ignition of the relay the lead-in conductors of the anode and the auxiliary electrode are temporarily put in contact. The controlling circuit 10 is connected at 3 and 9 to the auxiliary electrode and to the cathode respectively. A telephone 11 may be connected to the winding 8 of the transformer for reproducing the amplified sounds for instance in case circuit 10 carries feeble telephone currents.

The introduction of the alkaline metal into the vessel is effected in an atmosphere of hydrogen.

The theoretical basis of the invention consists in the low potential drop at cathodes consisting of alkaline metals and in the small electric cohesion of inert gases. The use of these facts for the purpose of the invention is based upon the consideration that on account of the great mobility of their electrons inert gases must be particularly well adapted for amplifying electric currents by the acceleration and retardation of electrons and the experiments undertaken in this line have confined this consideration. Further on account of the low potential drop at alkaline cathodes the usual voltages of electric supply mains will already be sufficient for operating the relay, although the auxiliary electrode forms a variable obstacle against the passage of the current. Since the occlusion capacity of the disintegration products of alkaline metals is only small, the life of the relay is further considerably increased, compared to that of the Lieben relay. Another essential feature of the novel device consists in the fact that the vessel need not be evacuated to such a high degree as the Lieben tube, the required high velocity of the electrons being already obtainable with inert gases or vapours usually employed in this type of relay. Further the amalgams of mercury used in the Lieben relay are avoided and thereby also the undesired sensitiveness of this relay against variations of temperature, which variations cause a variable pressure of the vapour.

The ignition of the relay may be brought about by establishing a contact between the leading-in wires of the anode 1 and the grid 2. Thereby, the grid wire 3 becomes connected to the positive pole of the current supply, so that the full potential difference of this supply exists between the electrodes 2 and 4, which is sufficient to ignite the relay.

The ignition may also be effected by momentarily connecting the terminals 3 and 9.

The resistance 5 referred to hereinbefore

is provided for the purpose of limiting the current, and the capacity 6 for the purpose of compensating the pulsations of the current and the inductive resistance of the windings in resistance 5.

The device will operate exactly in the same manner as relays of this type known in the art are usually operated, for instance such as the Lieben relay. The currents which are received by the relay over the circuit 10 produce variations of potential between the grid 2 and cathode 4, by which corresponding variations of the current emitted by cathode 4 occur and which are made perceptible in the anode circuit by suitable means, for instance by the telephone 11, shown in the drawings.

I claim:—

1. In an electric gas relay the combination with an evacuated vessel of an anode, a grid, a cathode consisting of alkaline metal and a gaseous medium consisting of an inert gas inclosed in said vessel.

2. In an electric gas relay the combination with an evacuated vessel of an anode, a grid, a cathode consisting of an alloy containing alkaline metals and a gaseous medium consisting of an inert gas inclosed in said vessel.

3. In an electric gas relay the combination with an evacuated vessel of an anode, a grid, a cathode consisting of alkaline metals and a gaseous medium consisting of a mixture of inert gases inclosed in said vessel.

In testimony whereof I affix my signature.

FRITZ SCHRÖTER.