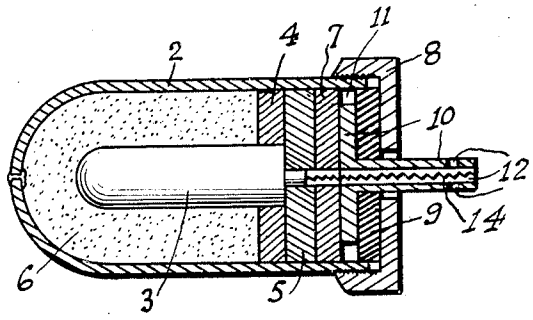
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ELECTRIC VALVE

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Inventor

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ELECTRIC VALVE

Application filed July 23, 1927. Serial No. 207,960.

This invention relates to improvements in electric valves, whereby certain elements are used as electrodes, utilizing the chemical action of A. C. currents in a novel and efficient manner.

The primary object is to provide means to rectify A. C. current thermo-chemically by using an electrode of an acid nature.

Another object is to provide means to polarize or neutralize natural chemical action, and utilize thermo-chemical action caused by heat.

Still another object is to use electrodes that are oxidizable and non-oxidizable to the chemical action of D. C. and A. C. current and an acid. Or in other words using A. C. current and an acid as chemical agents or elements to cause electron emission from a cathode of an electric valve to take place.

Still another and more specific object is to use elements for the electrodes of an electric valve, whereby the laws of thermo-electricity or the Seebeck effect may be utilized, certain elements being used for electrodes whereby natural chemical actions are neutralized.

My invention consists substantially in the compounding, combination, location and proportion of elements, which will be more fully hereinafter set forth in this specification and accompanying drawing, and as set forth in the appended claims.

The drawing, shows in part a cross sectional view of one preferred embodiment of my invention.

This application is in part a continuation of my co-pending application Serial No. 131,215 filed Aug. 24, 1926.

Also this invention was one of the inventions disclosed in my application for Letters Patent of the United States, Serial No. 665,847, filed Oct. 1, 1923.

Referring to the drawing the envelope-anode-electrode 2, contains an anode-cathode-electrode 6, a cathode electrode 3, insulating washers or disks 4, 5, 7 and 9 which are preferably inert to an acid. The washers or disks 7 and 9 are preferably of some resilient material such as rubber, asbestos, etc. The washers or disks 4 and 5 may be composed of bakelite, glass and similar materials. These washers or disks are disposed within the envelope-anode 2, and said washers or disks and electrodes are held in a resilient manner by the screw cap 8. The electrode terminal 10 is hollow so that it may contain the wire or spring 14 which connects electrically cathode 3 and electrode terminal 10, also so that air can circulate and cool the cathode connection.

One preferred modification is to use chemical electrodes arranged as follows: an electron emitting cathode 3, an anode electrode 6 and an electron emitting cathode. This is one means whereby acid chemical action can be neutralized.

One preferred thermo-electric or chemical arrangement of electrodes is as follows: an electron emitting cathode 3, an anode-cathode heating electrode 6, and an anode electrode 2. In this modification both electrodes 3 and 6 emit electrons, when heated by the current to be rectified or from an external source.

The envelope in certain embodiments, which is also an anode thermo-electrically, is preferably composed of such elements as Al, Fe, steel, Ni, Bi, Pb, or their alloys.

The anode-cathode electrode 6 is preferably composed of such elements as granulated C, Cu, Ag, Ni, Au, Pb, steel, PbO, and W, or alloys of same combined with an acid compound and dehydrated so as to form a dry like electrode of an acid nature.

The cathode 3 is preferably composed of elements such as Pb, Al, Ni, Si, Bi, MoS_2, SiC, FeS_2, PbS, and alloys of same.

It will be noted that with above mentioned elements as electrodes, many combinations are possible. My invention resides mainly in the use of an anode electrode of an acid nature, examples are granulated carbon, gold, silver or copper combined with an acid com-

pound such as sulphuric, nitric, hydrochloric, carbonic, etc. However as this invention is also a chemical process to produce many chemical compounds, the use of elements that form explosive compounds should be used with only the greatest of caution, and then only with those that are far advanced in chemistry, and know to a certain extent what to expect. For instance I would advise against the using of nitric acid, hydrochloric, as these by chemical action produce many explosive compounds. I have used these acids with surprising results as an electric valve, but knowing their properties and chemical process involved, I believe it is dangerous to use them, for electric valves, in the manner set forth in this invention.

I might mention a few combinations of above elements, a cathode of nickel, an anode-cathode sulphuric acid electrode and an anode electrode 2 of Cu, or steel. Nickel is thermo-positive to said acid electrode, and said acid electrode is thermo-positive to steel, when heat is used as a chemical agent. When an acid is used as a chemical agent, nickel is electro-positive to said acid electrode, and also said anode or electrode 2 is electro-positive to said acid electrode 6, providing one means to neutralize a common chemical action. The natural chemical affinity of nickel and steel is virtually neutralized or polarized, leaving a relative large thermo-electric affinity of nickel to steel.

Another combination is an alloy of Ni, and Cu, or constantan as a cathode, 3, a carbon acid electrode, of an anode electrode 2 of Fe or steel. The thermo-electric affinity of nickel alloy and steel is about 60 micro-volts per degree of change (C) near atmospheric temperature.

By using elements as the cathode 3 and anode 2 having virtually the same chemical properties with respect to an acid as a chemical agent, natural chemical action does not hardly exist even when in closed circuit, providing a long life device, and utilizing relative high thermo-electric laws of chemistry, to obtain valve action and electron emission.

In one direction or from cathode 3 to anode 2 the current heats thermo-contacts and in the opposite direction the current cools thermo-contacts. The Peltier effect is used here to cool the device, and prevent over heating. Also in one direction the current causes oxidation of a cathode electrode and in the other direction reduction. By the term oxidation in this paragraph I mean the broad term of oxidation, that of removing electrons from an element, and the broad term of reduction that of adding electrons to an element.

The current has a direct chemical effect on the electrodes used, and a secondary effect by producing heat which also causes oxidation to take place, as well as reduction. Herein the laws of thermo-electricity are involved.

The granulated elements comprising a part of the anode-cathode electrode 6, may be of a metal or of a non-metal. This electrode could also be termed a heater-electrode. The acid chemically increases the conductivity of anode-cathode 6, in direction of chemical action, and decreases in direction of less chemical action.

The screw cap arrangement, permits an easy way to adjust the pressure of the electrodes, thus to a certain extent controlling valve action. It also provides means whereby certain elements within said electric valve may be renewed.

These electric valves may be connected in series or series-parallel, by using the necessary resistance in the circuit.

The A. C. current may be stepped down or up in voltage so that the electric valve or valves will work most efficiently.

It is preferable in many modifications that a reverse current also goes through the valve as it will last longer. In the direction of rectification the tendency is to chemically tear down the cathode, and in the other direction the tendency is to build up the cathode.

All the theories or principles I have used here may not prove to be correct in the future, but after years of study and experimenting with electric valves of this nature it is the best explanation I can give of electric valves at present, and I firmly believe the theory herein used is infallible, but in case it is not I do not want to be held or bound by my explanation of theory involved. I have shown means whereby those versed in chemistry, electricity, electric valves, thermo-electric laws, and electro-chemistry may make the many embodiments made possible by my discovery and invention, and it is thought that further disclosure is unnecessary.

Having described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric valve comprising an envelope-anode electrode of steel, containing a cathode electrode of an alloy of nickel and copper, and an anode electrode combined with an acid compound.

2. An electric valve comprising the combination of a thermo-positive cathode electrode, of an alloy of nickel, a thermo-negative anode electrode of steel, joined together by carbon granules and an acid compound.

3. An electric valve comprising the combination of a thermo-positive cathode electrode of an alloy of nickel, an anode electrode of steel of a thermo-negative nature, joined together by a granulated element and an acid compound, and said cathode and anode electrodes used having like chemical electro-positive properties with respect to said acid electrode.

4. An electric valve comprising the com-

bination of a thermo-negative anode of steel, a thermo-positive cathode electrode of an alloy of nickel joined together by granulated carbon and an acid compound of sulphuric acid.

5. An electric valve comprising the combination of a cathode electrode of an alloy of nickel, an anode electrode of steel, and said electrodes joined together by carbon combined with an acid.

In testimony whereof I affix my signature.

FRANK E. SUMMERS.