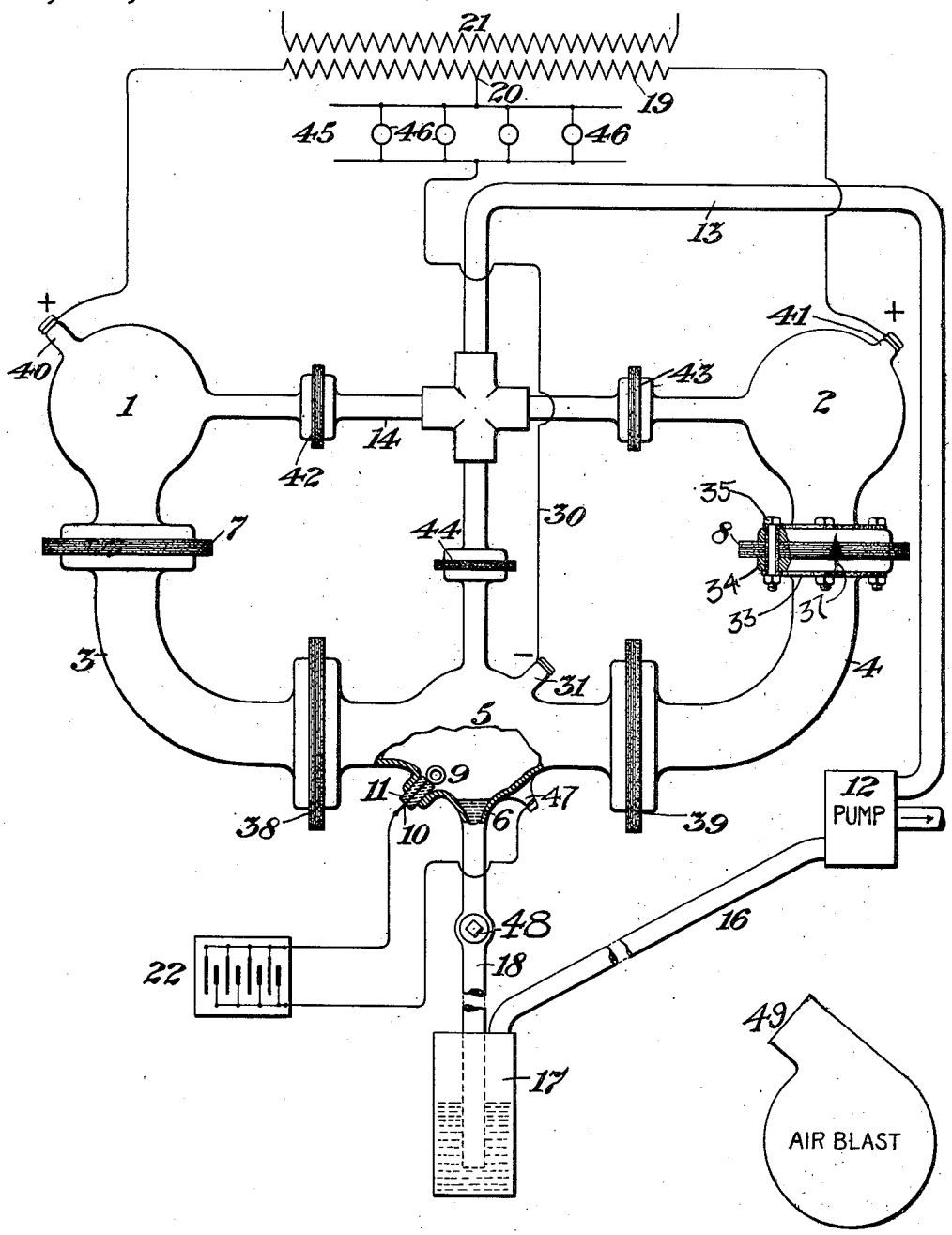
P. C. HEWITT.

VAPOR CONVERTER.

APPLICATION FILED MAR. 20, 1908. RENEWED FEB. 10, 1911.

1,007,694. Patented Nov. 7, 1911.



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VAPOR-CONVERTER.

1,007,694. Specification of Letters Patent. Patented Nov. 7, 1911.

Application filed March 20, 1908, Serial No. 422,218. Renewed February 10, 1911. Serial No. 607,874.

To all whom it may concern:

Be it known that I, PETER COOPER HEWITT, a citizen of the United States, and resident of Ringwood Manor, county of Passaic, State of New Jersey, have invented certain new and useful Improvements in Vapor-Converters, of which the following is a specification.

Vapor converters or rectifiers capable of rectifying currents of considerable magnitude are well-known and commercially used. Such converters usually consist of glass bulbs having lead wires passing through them and carrying the current to electrodes within the bulbs.

To provide converters of larger capacity than those now in commercial use, it is desirable to construct the converter bulbs in such forms as to dispense with the requirement for blowing large glass bulbs, and also to dispense with the necessity of passing conducting leads through the glass walls of such bulbs. It is further desirable to construct the device of such material that the heat generated within the device during its operation may be rapidly and efficiently dissipated or abstracted.

I have devised a converter wherein the cooling of the apparatus may be effected without the employment of large bulbs of glass or similar material and wherein contact leads from outside to inside of the apparatus are unnecessary, different portions of the shell of the apparatus acting as portions of the electrodes.

One convenient form of my invention is shown in the accompanying drawing, which is an elevation of my improved converter.

In this embodiment of the apparatus hollow positive electrodes, 1 and 2, of metal, are illustrated as being connected by bent tubes, 3 and 4, with a metallic receptacle, 5, containing mercury, 6, or other liquid conductor. The mercury may be said to constitute the negative electrode of the converter, while the receptacle, 5, may serve as an easy means of connecting the said electrode with the source of electric currents by means of a suitable lead, 30, extending from a binding post, 31, formed on the receptacle. I prefer to make the bent tubes, 3 and 4, of metal, although they may be of quartz or porcelain.

The electrodes, 1 and 2, are hollow bulbs of iron, copper, aluminum, or other suitable material, having good heat conductivity, and they are connected to the tops of the bent tubes, 3 and 4, respectively, by flange joints, with interposed insulating material, 7, 8. Convenient insulating means are illustrated in detail at the right of the drawing, where insulating rings, 32 and 33, and an insulating tube, 34, serve to protect each of the clamping bolts, 35, 35, from contact with the metal of the flanges, 36 and 37. The same sort of connection may exist between the lower ends of the bent tubes, 3 and 4, and the metallic receptacle, 5, but this latter joint is not always essential, or there may be a number of these joints as the case may require. This receptacle, 5, is also bulbous in shape at its central portion and is provided with tubular extensions by means of which connection is made through insulating flange or other joints, 38 and 39, with the lower ends of the bent tubes, 3 and 4, as already described.

It will be observed that the different parts of the shell or walls of the converter vessel or container form part of the circuit of the converter, the parts, 1 and 2, constituting the positive electrodes and the part 5 being in intimate connection with the negative mercury electrode. When a rectifier is constructed in the manner described herein, there is no necessity for the lead wires being conducted into or through any part of the apparatus, unless the supplemental positive electrode hereinafter to be described should be used, in which case its lead wire can pass through the body of the metallic receptacle, 5, and be insulated therefrom. The leads may simply be connected to the exterior of the bulbs, 1, 2 and 5, say by means of the binding posts, 31, 40 and 41, without passing through or into the apparatus.

The capacity of the rectifier may be varied by varying the size of the several electrodes and the diameter of the connecting tubes. For example, with the positive electrodes, 1 and 2, made in the form of hollow bulbs, each having a diameter of six inches, and with the bulbous portion of the metallic receptacle, 5, having a diameter of eight inches, and with connecting tubes each twelve inches long and three inches internal diameter, a rectifier may be produced having a capacity for handling currents of large quantity, while by substituting for the parts named others having larger diametric measurements, the capacity of the rectifier may be still further increased. These effects may be aided by artificial cooling.

The supplemental positive electrode, 9, may be supported in proximity to the negative electrode, 6, for starting purposes the mode of starting by tilting the apparatus so as to bring these electrodes into contact and then separate them, being now a matter of general knowledge. It also may be started by raising and lowering the negative electrode by the receptacle. The lead wire, 10, connected with the electrode, 9, may pass through the metallic receptacle, 5, and be insulated therefrom, say by a suitable insulated bushing, 11.

A vacuum pump, 12, may be applied to the device or several bulbs by means of the tubing, 13, 14, provided with insulating joints, 42, 43 and 44. By these means the objectionable vapors generated during the operation of the rectifier may be drawn out by the pump. Inasmuch as the mercury vapor thus drawn out may be needed after condensation in order to replenish the losses at the negative electrode the pump may be discharged through a pipe, 16, into an open receptacle, 17, from which the vapors injurious to the operation of the apparatus may escape, while the condensed mercury vapor may return in the form of mercury through a tube, 18, up into the receptacle, thereby replenishing the losses of the negative electrode, 6. By making the tube, 18, of appropriate length, say 29 inches plus, the upper surface of the mercury may be maintained at the proper height within the receptacle, 5, by atmospheric pressure, and this may be adjusted by movement of the vessel, 17. The several electrodes may be connected in the usual way to an alternating current source, the anodes or positive electrodes being joined, for instance, to the terminals of a transformer secondary, 19, and the negative electrode being joined through a load circuit, 45, containing translating devices, 46, 46, to an intermediate neutral point, 20, on the said secondary. The primary of the transformer is shown at 21.

At 22 is shown a source of current, the terminals of the source being connected to the lead, 10, and to a binding post, 47, on the wall of the receptacle, 5, which contains the negative electrode, 6. The tube, 18, may, if desired, be supplied with a check-valve or other valve for preventing the outflow of mercury from the receptacle, 5, such check-valve being illustrated at 48. To cool the apparatus I may make use of any suitable cooling means, such as an air-blast, 49.

Respecting the structure herein described it will be noted that the sections of the converter or rectifier are insulated from each other and are preferably composed of material having a high heat conductivity, and that the means are supplied for abstracting from the device the heat generated during its operation. Moreover, the positive electrodes are of such material and present such an amount of surface as to cause minimum resistance to the transition of current from the electrode to the vapor, while the negative electrode is of such a character as to permit a change of state or condition necessary at such electrode with but small loss of electric energy and is capable of repairing itself and compensating for such loss, and being continually restored to its original condition by its nature and surroundings. Means for maintaining the negative electrode alive are shown in the present application. Still further the vapor columns themselves are of such a shape as tend to prevent the danger of short circuiting between any two positive electrodes. The tubular structure connected with the pump may be crooked, as shown, and of small bore so as to increase the resistance to the passage of current between the electrodes by this path.

I claim as my invention:—

1. In a vapor rectifier, a container comprising a conducting receptacle, hollow arms extending from said receptacle and conducting caps constituting the terminals of the said arms, the said caps forming the main positive electrodes of the apparatus and the negative electrode being contained in the said receptacle.

2. In a vapor rectifier, a plurality of hollow metallic shells located at the teminals of a plurality of branching tubes, which tubes are connected to a conducting receptacle containing the negative electrode.

3. In a vapor rectifier, hollow positive electrodes of metal, a hollow receptacle containing a common negative electrode and metallic tubular connections with interposed insulation separating the several electrodes from each other.

4. In vapor rectifier, a plurality of metallic shells constituting positive electrodes for the rectifier, a metallic receptacle and a negative electrode therein, and tubular insulated connections between the said receptacle and the said shells.

5. In a vapor rectifier, a plurality of hollow metallic shells located at the summits of a plurality of crooked branching tubes, an intermediate metallic shell connected to the said tubes with interposed insulation, and a common negative electrode in the said intermediate shell.

6. In a vapor rectifier, a central shell and a negative electrode therein, tubular branches connected to the said shell and terminating in hollow metallic shells constituting positive electrodes, the several electrodes being insulated from each other, in combination with means for pumping out the gases of vapors existing or generated within the tubular structure.

7. In a vapor rectifier, a plurality of hollow metallic shells forming the terminals of a plurality of branching tubes and constituting positive electrodes, an intermediate common negative electrode located within a hollow receptacle and formed of vaporizable material, in combination with means for pumping out from the tubular structure gases or vapors generated in the operation of the rectifier and means for condensing the mercury vapor and restoring the condensed vapor to the negative electrode.

8. In a vapor rectifier, a tubular structure comprising crooked branching arms of conducting material and a shell of conducting material to which said arms are joined with interposed insulation, and a negative electrode in said shell the said branching arms having hollow terminals constituting positive electrodes, and means for cooling the structure.

9. The combination with a mercury vapor rectifier including separate exhausted anode chambers connected with a common intermediate cathode chamber by constricted portions, of an exhaust pump together with separate connections to the several chambers from the said pump.

10. The combination with a mercury vapor rectifier including separate exhauted anode chambers connected with a common intermediate cathode chamber by constricted portions, of an exhaust pump together with separate connections to the several chambers from the said pump, an insulating joint being introduced in each of said connections.

11. The combination with a mercury vapor rectifier including separate exhausted anode chambers connected with a common intermediate cathode chamber by constricted portions, of an exhaust pump together with separate connections to the several anode chambers from said pump.

12. A vapor rectifier comprising an exhausted container, suitable anodes and a cathode therefor in combination with anode chambers having metallic walls and forcing an indirect current path between the cathode and anode, and between the anodes.

Signed at New York, in the county of New York, and State of New York, this 19th day of March, A. D. 1908.

PETER COOPER HEWITT.

Witnesses:

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