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CONTROLLING MEANS FOR VAPOR APPARATUS.

APPLICATION FILED APR. 10, 1907.

1,120,949.

Patented Dec. 15, 1914.

2 SHEETS—SHEET 1.

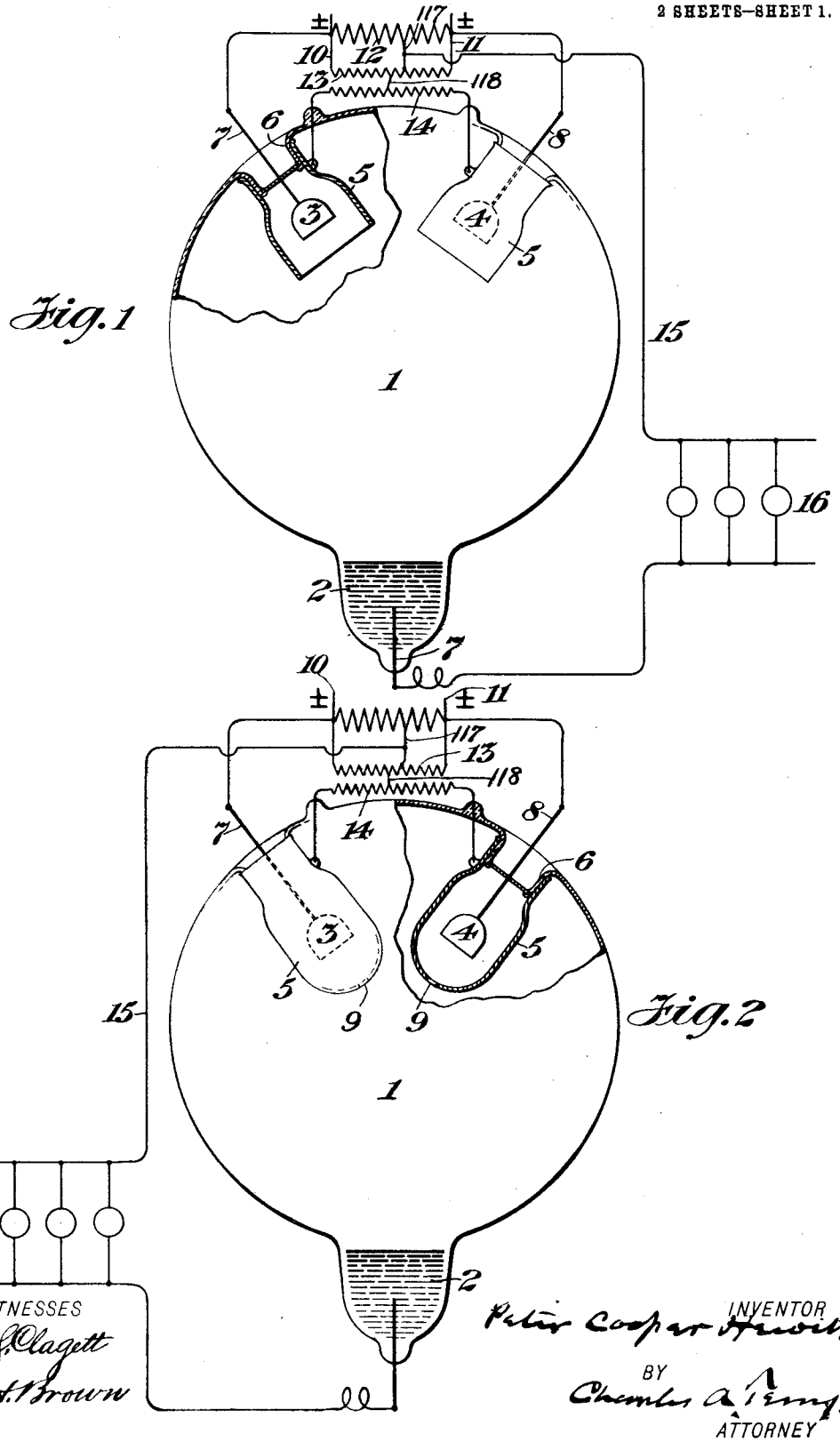

Fig. 1

Fig. 2

WITNESSES

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Fig. 3

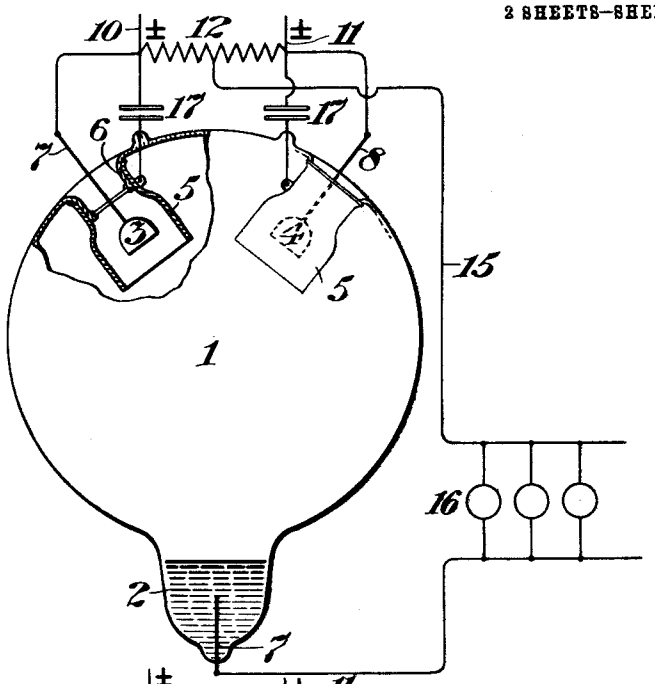
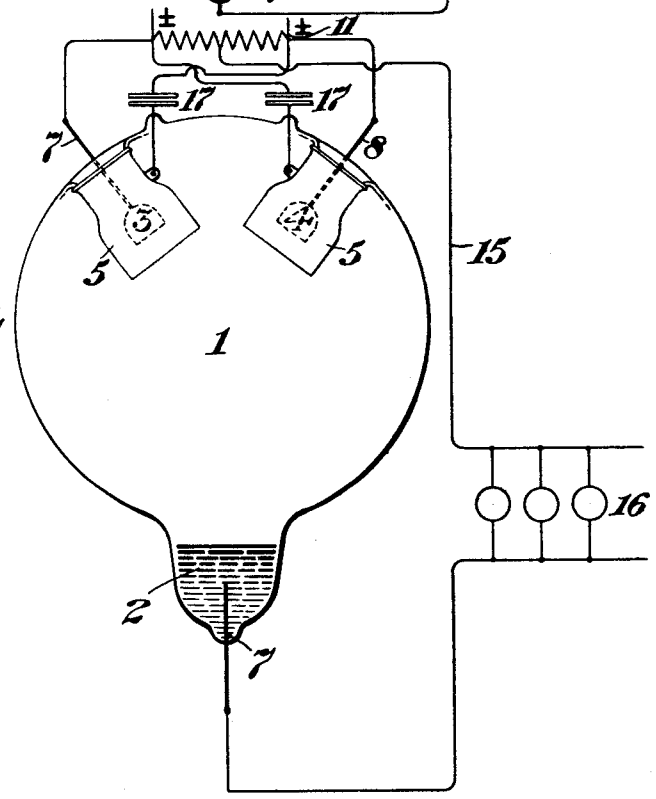


Fig. 4



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PETER COOPER HEWITT, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO COOPER HEWITT ELECTRIC CO., OF HOBOKEN, NEW JERSEY, A CORPORATION OF NEW JERSEY.

CONTROLLING MEANS FOR VAPOR APPARATUS.

1,120,949. Specification of Letters Patent. Patented Dec. 15, 1914.

Original application filed January 20, 1905, Serial No. 241,947. Divided and this application filed April 10, 1907. Serial No. 367,330.

To all whom it may concern:

Be it known that I, PETER COOPER HEWITT, a citizen of the United States, and resident of New York, county of New York, State of New York, have invented certain new and useful Improvements in Controlling Means for Vapor Apparatus, of which the following is a specification.

In a vapor electric device comprising a suitable containing vessel and two or more electrodes with an intervening vapor, independent resistances manifest themselves at the electrodes and in the vapor. In previous applications I have disclosed means for modifying the resistance to starting which resides at the negative electrode by a starting band, by which means the electrical potential required to start the lamp could be reduced or increased.

The object of the present invention is to render more difficult the starting of a current into an electrode which for the time being may be negative; that is to say, to strengthen the normal initial resistance to starting at a negative electrode.

I have found that under certain conditions the vapor in the neighborhood of the negative electrode of a vapor device, and particularly at a small distance from the surface thereof, is, before the current actually passes, charged inductively in a sense opposite to the charge of the negative electrode itself, and not in the same sense. That is to say, the vapor at a short distance from the surface of the negative electrode is charged positively as if by induction.

Appearances seem to indicate that the vapor in close proximity to the surface of the negative electrode so arranges itself that it acts as a dielectric while farther away it is capable of assuming a charge as if it were a conductor. For the purpose of the present invention this apparent dielectric action may be considered the cause of the high initial reluctance or resistance to the passage of the current. As already stated the present invention concerns itself with amplifying this effect so as to still further increase this reluctance or resistance to starting.

For example, I have placed near the negative electrode an exploring disk or ring, and when the said disk or ring was charged negatively by means of a static machine the device occasionally started of itself, the terminals being connected with a continuous current circuit carrying a current of 110 volts. When, however, the ring was charged positively even to a greater potential, the device did not start. On introducing a spark-gap, when charged positively, so that the ring was allowed to charge and discharge itself, the device started into operation. By reason of these facts the ring may be made to still further increase the potential of the inductive effects from the negative electrode. The difficulty of starting may be increased by causing the inductive effect of the ring to preponderate over the inductive effect of the current at the negative electrode, modifying it to a great extent, and may be used for assisting these reactions for useful purposes. Certain superimposed charges appear to lessen the tendency of a negative electrode to disintegrate and thus assist in preventing the lowering of the reluctance or resistance to starting from this cause. It appears from the discovery thus made that the vapor close to a negative electrode interposes between the said electrode and an electrode which is positive to it in an apparatus a dielectric condition which can be further increased by inducing a greater charge than that which the electrode itself would induce. I propose to make use of this principle of operation by surrounding an electrode or electrodes of a vapor apparatus or other vapor device with a shield capable of receiving a charge that will augment or assist the charge which would naturally be present at a negative electrode. The device for producing this charge may be any suitable device, but is herein illustrated as a transformer of small current capacity but of higher potential than that at the negative, and is connected to shields thereby assisting the charge. The action is not essentially that of current flowing but more nearly that of capacity charged to the required potential. The shield when properly connected electrically has the effect of increasing the starting resistance at an electrode being negative for the time being to another positive and thus tending to assist in preventing current passing between these electrodes. In

this high potential circuit a condenser may be introduced in order to actually limit the flow of more than a specific amount of current and further the neutral points of the windings of the transformers may be all connected together so as to insure the same zero point or a positive difference of potential at the terminals.

I have found in certain experiments under certain degrees of impurity of the gases and under certain conditions and particularly where other gases were present than those of mercury vapor, that the effects herein stated may be reversed or changed. In other words, under the peculiar conditions of materials and manufacture used, there are instances where the actual reversal of the operation described will tend to take place so that under particular conditions to get at the result desired it becomes necessary to connect the apparatus here shown in the one sense, in the other sense to obtain results. These conditions may be considered as abnormal; and are to be avoided by further cleansing and exhaustion for the removal of the cause, except in instances where such abnormal conditions are desirable. Incidentally the shields may constitute chambers inclosing the various electrodes and thus serve to screen the said electrodes from the effects of certain discharge when one or the other of them is temporarily a negative electrode and another a positive electrode. The shield surrounding a given positive electrode may be made to substantially inclose the electrode or not as is found most practical in use or may be made wholly or in part of conducting material.

I have illustrated my invention in the accompanying drawings, in which—

Figures 1 and 2 represent mercury vapor converters each provided with two positive electrodes with shields, it being desired that current shall not pass from one of these electrodes to the other and showing also diagrams of a system of electrical circuits which may be employed with the apparatus; and Figs. 3 and 4 represent modifications in which condensers are employed.

In the drawings, 1 is a container for a vapor converter; 2 is the negative electrode thereof, the same being in the present instance of mercury; and 3 and 4 are positive electrodes of some solid material, such as iron. In this instance the positive electrodes 3 and 4 each surrounded by a shield or screen, 5, of sheet metal, gauze, or wire forming a chamber around the electrode. The shield or screen thus described is of conducting material, but is insulated from the corresponding positive electrodes and its lead-wire. In the preferred construction, the shields are supported upon inwardly projecting or reëntrant supports, 6, 6, formed of the glass which constitutes the material of the container 1. The lead-wires, 7 and 8, for the positive electrodes 3 and 4 pass through these lugs without making contact with the shields.

In the form illustrated in Fig. 2 the shields are made of thin metal. They are in this instance sealed to the supports 6, 6 and they may be provided at their opposite ends with smaller or larger openings, 9, 9. That is to say, the screens or shields may, if desired, be made to substantially inclose the electrode, or they may be open to the interior of the container. By this it is meant that the openings 9, 9, may either be made so small as to present a practically prohibitive resistance to the passage of current through the openings or may be made larger so as to prevent varying of resistance thereto, according to the size of the openings.

Screens or shields such as herein described serve to increase the normal resistance to starting between the positive electrodes and also to reduce the danger of short-circuiting between the positive electrodes 3 and 4. Thus, the apparatus is adapted to work with greater certainty.

Referring now to the electrical connections, I show in Fig. 1 a system of circuits which may be conveniently utilized in the operation of a converter having my improvements applied thereto.

At 10 and 11 are shown the mains of an alternating current circuit, between which mains is connected a coil, 12, as shown. Between the same mains I may include the primary, 13, of a small transformer, the secondary of which appears at 14. This transformer is of high resistance and high voltage and the terminals of its secondary are connected one to each of the shields or screens, 5, 5. The mains are connected to the two positive electrodes 3 and 4, while the negative electrode is joined by a conductor, 15, through a work-circuit including translating devices, 16, to an intermediate point of the coil, 12. At 117 and 118 I have shown connections extending between the neutral points of adjacent coils to provide for maintaining uniformity of action where necessary.

By the means described, a charge of high potential is applied to the screens or shields, 5, 5, while the working current, or the current which is to be translated into direct current is applied to the positive electrodes 3 and 4 and to the negative electrode 2.

The operation will be readily understood, the function of the shields, 5, 5, having been already explained in the foregoing part of the specification.

So far as the advantages which pertain to the use of the shields as screens are concerned, the shield might be made of insulating material. That is to say, the function of

protecting the electrodes from the effects of discharges when one of the positive electrodes is temporarily negative with respect to any other electrode, the interposition of a shield of insulating material would be effective and further when capable of receiving and locating a charge from any source whatever will enable it to accomplish the purposes described in the present specification if suitably placed. I may connect the main line across to each shield through a condenser.

The same general arrangement for an electrode may be used in connection with direct current circuits as well as with alternating current circuits as described above. That is to say, in cases where it is desired to strengthen the negative electrode starting resistance in devices where this characteristic is utilized to perform useful functions in connection with direct current circuits this result can be accomplished by shielding the negative electrode in the manner already described in this application.

In Figs. 3 and 4 I have illustrated condensers which may be employed with apparatus of this class, as set forth in a preceding paragraph of this application. The condensers are illustrated at 17, 17 in Figs. 3 and 4, and their action is to charge the shields by the flow of current to the condenser, and to interrupt the condensed flow of current thereto. This relates more particularly to Fig. 3. In Fig. 4 the arrangement is such as to provide for an alternative positive or negative charge by virtue of the presence of the condensers.

In another application filed by me on the 20th day of January 1905, Serial Number 241,947, of which this application is a division, claims are made upon certain methods of operations described herein.

I claim as my invention:—

1. In an evacuated electric apparatus, a container, electrodes therefor, and a shield at one electrode, and means for charging the said shield independent of the conductor leading to said electrode.

2. In an evacuated electric apparatus, a container, a plurality of positive electrodes and a negative electrode therein, and a shield at a positive electrode, and means for charging the shield independently of the conductor leading to the corresponding electrode.

3. In an evacuated electric apparatus, a container, a positive electrode, a negative electrode, and a conducting shield therein, in combination with a main current supply circuit connected with the positive electrode, and means for charging the shield.

4. In an evacuated electric apparatus, a container, a plurality of positive electrodes and a negative electrode therein, a shield at a positive electrode, an alternating current supply circuit connected to the positive electrode, and means for connecting the shield to an independent source of current.

5. In an evacuated electric apparatus, a container, a plurality of positive electrodes and a negative electrode therein, shields at the positive electrodes, an alternating current supply circuit connected to the positive electrodes, and means for connecting the shields to an independent source of alternating current.

6. In an evacuated electric apparatus, a container, a plurality of positive electrodes and a negative electrode therein, and a shield at a positive electrode together with means independent of the leading-in conductor of the positive electrode for charging said shield.

7. In an evacuated electric apparatus, a container, a positive electrode and a negative electrode therein, and a shield at the positive electrode, said shield receiving its charge independent of the conductor leading to its positive electrode.

8. In an evacuated electric apparatus, a container, a plurality of positive electrodes and a negative electrode therein, conducting shields at the positive electrodes, an alternating current supply circuit connected to the positive electrodes, a transformer of high voltage connected to the shields, the primary of the said transformer being connected with the main supply circuit.

9. In an evacuated electric apparatus, a container, a plurality of positive electrodes and a negative electrode therein, and conducting shields at the positive electrodes, in combination with a main alternating current supply-circuit connected with the positive electrodes and a subsidiary circuit supplied from a source of higher potential than the main positive electrodes, the said subsidiary circuit being connected with the shields, and a negative electrode connected to an intermediate point of the supply-circuit.

10. In an evacuated electric apparatus, a container, a plurality of positive electrodes and a negative electrode therein, conducting shields at the positive electrodes, an alternating current supply circuit connected to the positive electrodes, a transformer of higher voltage connected to the shields, the primary of the said transformer being connected with the main supply-circuit, and intermediate points on the said transformer being provided with cross-connections.

11. In an evacuated electric apparatus, an exhausted container, electrodes therefor, a conducting shield for at least one of said electrodes and a separate lead wire for charging said shield in combination with a suitable source and suitable connection to said electrodes and to said shield.

12. The combination in an evacuated con-

tainer of two like functionating electrodes, means for reducing the starting resistance to the passage of current at one of the electrodes, such means comprising electric circuit connections for conveying electrical variations between the said reducing means and another electrode.

13. The combination with an evacuated chamber, two electrodes and a conductor within the chamber, the conductor being of a polarity opposite to that of one of the electrodes, an electric circuit connected with the two electrodes and means for charging the conductor electrically.

14. The combination of an evacuated vessel, two electrodes therein, means for reducing the initial resistance to the passage of current at the negative electrode, such means consisting of metallic shields of opposite polarity to the positive electrodes, and electrical connections to the electrodes and the reducing means.

15. The combination of a receptacle, a plurality of solid electrodes, a metal shield between said electrodes and a coöperating fluid electrode.

16. The combination of a receptacle, a fluid electrode, a solid electrode located above the fluid electrode, and a metallic barrier located between the electrodes.

17. The combination of an evacuated chamber, two like functionating electrodes and a conductor within the chamber, an electric circuit connected with the two electrodes, and means for charging the conductor electrically.

18. An electrode for an evacuated electric apparatus in combination with means for controlling the discharge conditions of said electrode, said means consisting of an electrified conductor in operative relation thereto.

19. An electrode for an evacuated electric apparatus in combination with means for controlling the discharge conditions of said electrode, said means consisting of an electrified conductor in proximity thereto.

20. An electrode for an evacuated electric apparatus in combination with means for controlling the discharge conditions of said electrode, said means consisting of an electrified conductor in operative relation thereto, said means comprising means for establishing a Hertzian field in the neighborhood of said electrode surface.

Signed at New York, in the county of New York, and State of New York, this 5th day of April A. D. 1907.

PETER COOPER HEWITT.

Witnesses:

PERCY H. THOMAS,

WM. H. CAPEL.