

P. C. HEWITT.  
CONTROLLING MEANS FOR VAPOR APPARATUS.  
APPLICATION FILED DEC. 7, 1914.

1,156,228.

Patented Oct. 12, 1915.

2 SHEETS—SHEET 1.

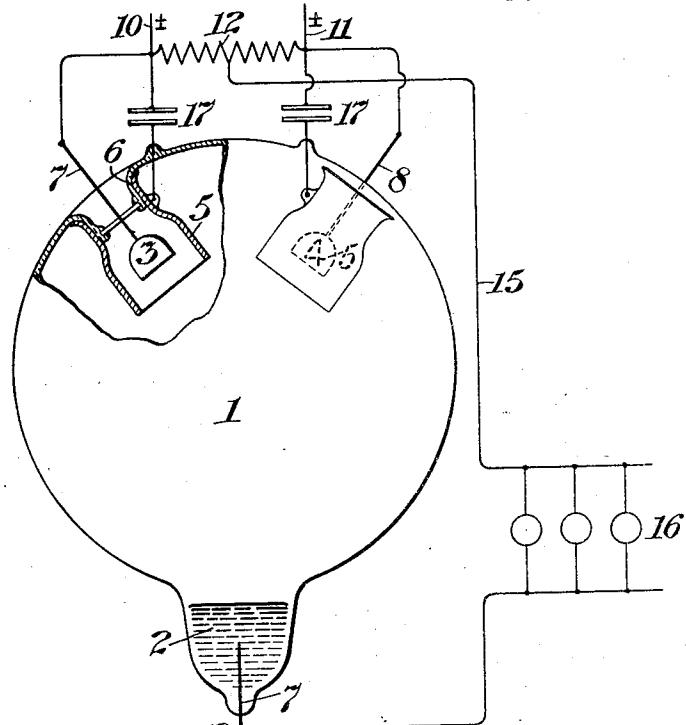


Fig. 1.

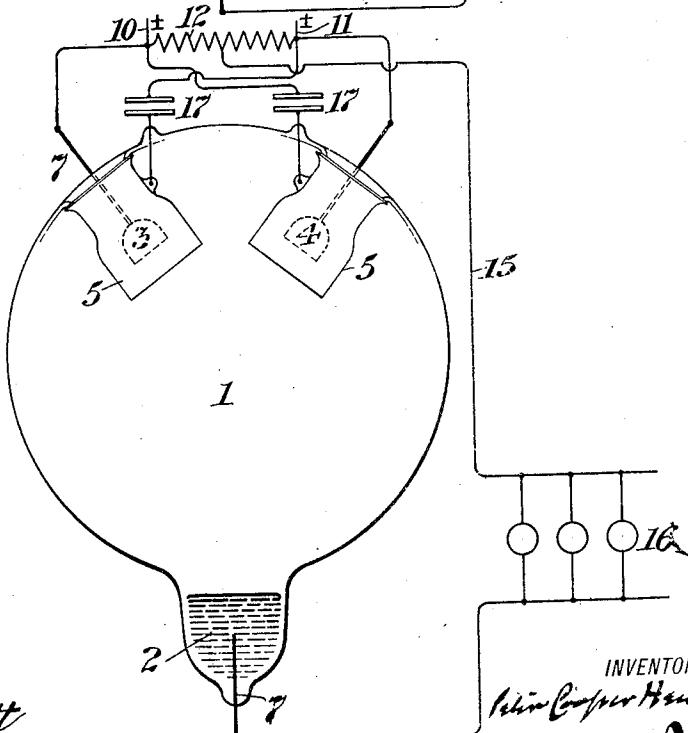


Fig. 2.

WITNESSES

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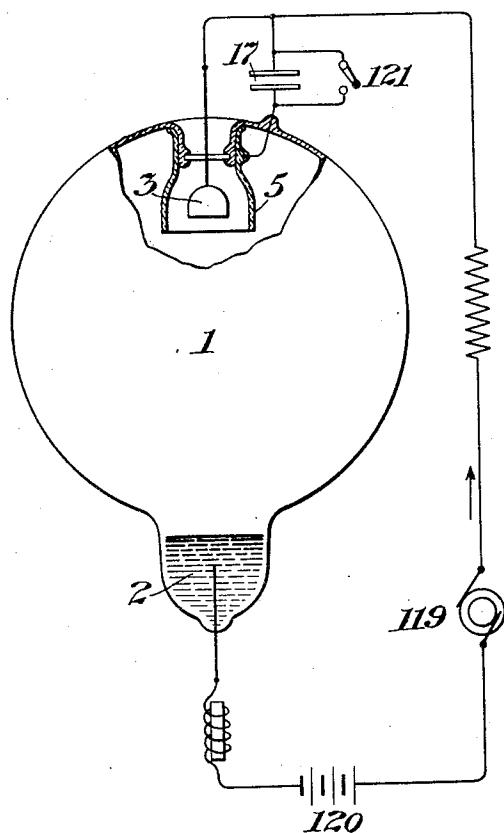
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Fig. 3.



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# UNITED STATES PATENT OFFICE.

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## CONTROLLING MEANS FOR VAPOR APPARATUS.

1,156,228.

Specification of Letters Patent. Patented Oct. 12, 1915.

Original application filed January 20, 1905, Serial No. 241,947. Divided and this application filed December 7, 1914. Serial No. 275,947.

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 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.

10 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.

20

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 actions 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; Figs. 1 and 2 represent mercury vapor converters in which condensers are employed; and Fig. 3 illustrates a modification adapted to direct current.

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 are 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 electrode and its lead-wire. In the preferred con-

struction, the shields are supported upon inwardly projecting or reentrant 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 supports without making contact with the shields.

In the form illustrated in Fig. 1 the shields are made of thin sheet metal, and are sealed to the supports 6, 6. 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.

The mains are connected to the two positive electrodes 3 and 4, while the negative electrode is joined by a conductor, 13, through a work-circuit including translating devices, 16, to an intermediate point of the coil, 12.

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.

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.

The condensers are illustrated at 17, 17 in Figs. 1 and 2, and their action is to limit current flow to the shields. When considering the more unusual condition in which the common action is reversed the connections of the condenser shields should be as shown in Fig. 1. In the more usual conditions they should be as shown in Fig. 2. Such an arrangement is shown in Fig. 3 wherein the like numbered parts are the equivalent of these parts in the other figures. It will be

seen that the D. C. generator 119 normally passes current through the anode 3 to the cathode 2 and thence through the storage battery 120 back to the generator. The 5 shield 5 corresponding to the shield 5 of the other figures is connected to the lead of the electrode 3 through a condenser 17 as in Fig. 1. This shield when thus connected will serve to protect the negative electrode 10 starting reluctance of the anode 3, should, for example, the electromotive force of the generator 119, fall below the voltage of the battery 120, and the latter tend to reverse the current through the rectifier 1. The 15 short circuiting switch 121 serves to make a direct connection between the shield 5 and the lead of the electrode 3 when desired, thus eliminating the effect of the condenser, which would otherwise limit current flow to 20 the shield. The operation of this figure is otherwise as described for the previous figures. Fig. 3 illustrates a condition similar to the condition of Fig. 1 described above.

This case is a division of my application

Serial Number 241,947, filed January 20th, 25 1905.

I claim as my invention:

1. The combination with an evacuated electric apparatus, of a plurality of electrodes, an electrified conductor, means for 30 impressing electric variations on said electrified conductor and a condenser between the source of said variations and said electrified conductor.

2. The combination with an evacuated 35 electric apparatus, of a plurality of electrodes, a metal electrified conductor, means for impressing electric variations on said electrified conductor and a condenser between the source of said variations and said 40 electrified conductor.

Signed at New York in the county of New York and State of New York this 2nd day of December A. D. 1914.

PETER COOPER HEWITT.

Witnesses:

R. A. HEWITT,  
WALTER E. F. BRADLEY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."