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S. LOEWE

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ELECTRIC DISCHARGE TUBE

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Fig. 1

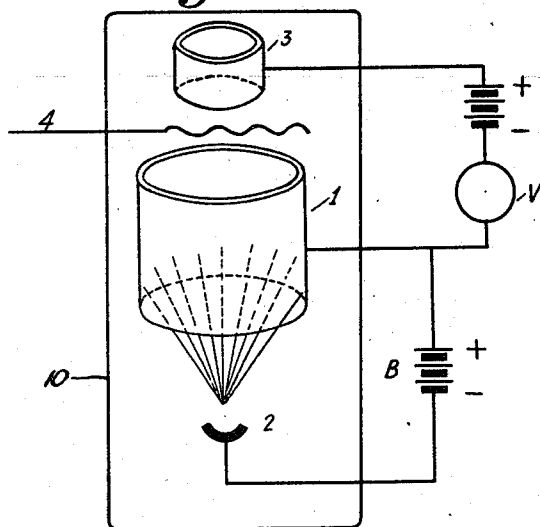


Fig. 2

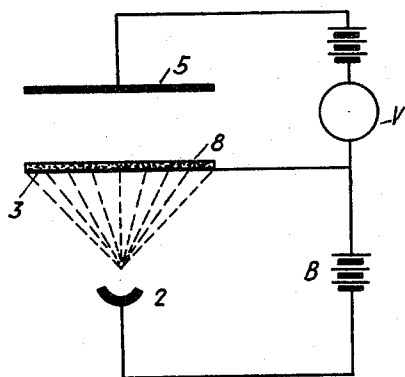
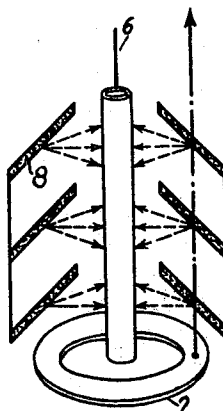


Fig. 3



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ELECTRIC DISCHARGE TUBE

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This invention relates to a cathode and more particularly to a cathode for use in a vacuum tube.

It is an object of this invention to provide a device for emitting electrons in a sufficiently copious quantity for various purposes.

In the accompanying drawing Figure 1 represents such a device wherein electrons leave a secondary cathode at an obtuse angle; Figure 2 shows another form of the device wherein electrons leave the secondary cathode at right angles; and Figure 3 shows still another form of the device wherein multiple electron flow from a secondary cathode is obtained.

When the interior surface of a cylindrical metallic tube 1 (Figure 1) is covered with an oxide film, for example, barium oxide, and if in the axis of this tube, say, below the same, a small quantity of a radio-active substance 2 is arranged, the primary electrons emitted from 2 at a high rate of velocity will strike the inner surface of the said tube, and cause the emission of an abundant number of secondary electrons from 1, which are conveyed to a cylindrical anode 3 which is kept at a higher potential than the cathode 1. Of course, it is necessary that the oxide coated cathode 1 should be at a positive potential with relation to the primary electron source 2. The said slight quantity of radio-active substance may be confined within a metal cup, made, for example, of aluminum. It is connected with the secondary cathode 1 by way of a certain potential (battery B) preferably above 10 volts. Anode 3 proper is connected with cathode 1 by a still higher potential and the consumer V. It is evident that control grids having the shape of a sieve or a network or the like, as indicated at 4, may be used. An envelope for the thermionic device is shown schematically at 10.

In Figure 1 the primary electrons impact upon the oxide surface from which they pull out secondary electrons at an obtuse angle, but this angle, as shown in Figure 2, can also be made of 90 degrees so that the impacting will occur perpendicularly.

In Figure 2, 2 indicates a feeble primary

electron source, 3 is a thin aluminum plate, or foil, e. g., of circular form which at the side furthest away from the primary cathode 2 is coated with an oxide 8. The anode is indicated in Figure 2 by 5. The cathode-rays ejected from the primary cathode 2 penetrate the thin aluminum layer 3 and are shot into the oxide mixture 8, releasing from the latter a large number of secondary electrons of lower speed so that the resultant electron current has an order of magnitude required for practical purposes.

If radio-active substances, which by virtue of atomic decomposition emit primary electrons at a high rate of velocity, are used as cathode-ray sources 2, battery B shown in Figures 1 and 2 may be dispensed with.

In the arrangement shown in Figure 3, the release of secondary cathode-rays is produced in a multiple manner. The anode is here arranged as a neutral cylinder 6, while the secondary cathode consists of a row of plates connected in parallel and coated with a layer of oxide 8. The primary cathode 2 has the shape of an annular disk. Primary electrons are radiated off in all directions, but principally in an upward direction. They impact upon the parts of the secondary cathodes, simultaneously and consecutively, in other words, they partly pass therethrough, and consecutively release secondary electrons from the different fans, and these secondary electrons flow towards the anode 6. This process is illustrated in Figure 3. The individual electrons pass through the three plates shown there, in the direction of the large arrow, and they cause at each plate the release of secondary electrons as indicated by small arrows. This electron emission flows to the anode. It is evident that the electrons thus released can be controlled electrically by grids or by the action of magnetic fields.

Though not shown in the drawings, it is clear that these systems may be enclosed in vacuum tubes, or in tubes containing a rarefied gaseous atmosphere, as is done in certain electron tubes.

Having thus described my invention, I claim:

In combination a cylindrical anode, an annular cold cathode coated with a radio active material emitting primary electrons, and a series of oxide coated plates connected in parallel and mounted in the path of the
5 primary electrons emitted from said annular cathode, and designed to have secondary electrons flow therefrom to said cylindrical anode.

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