PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in or relating to Photo-electric Cells.

We, ARCTURUS RADIO TUBE COMPANY, a corporation of the State of Delaware, United States of America, of 260, Sherman Avenue, Newark, New Jersey, United States of America,. Assignees of SAMUEL RUBEN, a citizen of the United States of America, residing at 801, Riverside Drive, City and State of New York, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to a photo-electric cell. The object of the invention is the provision of cells of this type of high sensitivity.

Such a photo-electric cell may be provided in which the electron emission from the cathode is controlled by photo-electric response to resistance changes of the photo-sensitive control element, the surface of which is composed of fused cuprous oxide. The oxide is produced by heating a copper base in an oxidizing atmosphere and quenching it in hydrochloric acid to produce the desired crystalline structure and also to reduce the surface layer of cupric oxide, after which quenching any undesirable by-products of the reaction between the hydrochloric acid and the cuprous oxide are removed by mechanical or chemical means, such as immersion in a diluted nitric acid solution to assure a thoroughly cleansed surface.

We have found that other compounds are likewise photo-sensitive. We refer particularly to the compounds of the oxygen series in the sixth periodic group. Accordingly our invention comprises a photo-electric cell of the thermionic valve type whereof one of the electrodes acts as the control element and comprises a metal body, having formed on its surface a photo-sensitive compound of the oxygen series of the sixth periodic group. These photo-sensitive materials are such as molybdenum sulphide, silver sulphide and silver selenides. We have also found that mixtures of oxides and sulphides, or oxides and selenides, or tellurides, can be made photo-electrically responsive. In all these materials it is important that the proper crystalline structure be obtained. This may be done by heating and causing a reaction between the metal and a vapour of one of the elements named to produce a surface of a photo-sensitive compound. Where a high resistance is desired, instead of quenching, a very slow cooling can be employed which permits the formation of large crystals. For some applications the long crystal has advantages over the short one. To produce silver sulphide, a silver body of a proper form is heated in a sulphur atmosphere and then heat treated to obtain the most efficient crystalline structure. Molybdenum is likewise treated. To produce selenides, a selenium vapor is used with the proper base material : it is likewise with respect to tellurides. Where mixtures of the compounds are desired they can be applied in the form of a coating of finely ground crystals with a suitable binder which is volatilized so as to leave a residue that will not cause too great a pressure effect in the evacuated tube. Particularly we have noted that the photo-sensitivity of conductive crystalline compounds produced by a reaction with an element of the oxygen series compounds decreases with decreased electro-negative characteristics or with the higher atomic numbers.

A photo-electric cell according to our invention has three electrodes, a cathode, anode and grid, the last of which comprises a metal body having integrally formed on its surface a photo-sensitive compound of the oxygen series in the sixth periodic group. In this device, the grid is operated through the intermittent exposure of the surface of the photo-sensitive compound to light rays, thereby varying its electrical resistance and correspondingly, its potential employed to vary the distribution of the electron stream over the plate surface and therefore the current flow in the cathode-anode circuit. The control electrode or grid may be composed of copper or any other suitably conductive metal base, having a suitably exposed surface of an integrally formed homogeneous, non-porous, photo-sensitive compound of the oxygen series in the sixth periodic group.

[*Price* 1*s*.]

Reference is made to the accompanying drawing, the only figure of which illustrates an embodiment of this invention. A control element A, is surfaced with cuprous oxide, silver sulphide or silver selenide, the other elements in the tube being, 1, a filamentary cathode coated with an alkaline earth oxide and supported by leads 1a and 1b, and anode 2, mounted on lead 2a. The photo-sensitive control element in the tube extends upon two sides of and parallel with the anode.

With the tube in operation, the cathode-anode current discharge is varied in response to changes in the external light rays impinging upon the photo-sensitive grid coating.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :

1. A photo-electric cell of the thermionic valve type, whereof one of the electrodes acts as the control element and comprises a metal body, having formed on its surface a photo-sensitive compound of the oxygen series of the sixth periodic group.

2. A photo-electric cell of the thermionic valve type whereof one of the electrodes acts as a control element and comprises a metal body having an exposed surface of a photo-sensitive copper compound.

3. A photo-electric cell of the thermionic valve type whereof one of the electrodes acts as the control element and comprises a copper body having integrally formed on its surface a photo-sensitive compound of said body.

4. A photo-electric cell, comprising a cathode, an anode and a control electrode, composed of a copper body having a surface of an integrally formed homogeneous, non-porous crystalline compound of said copper body.

5. The improved photo-electric cell substantially as hereinbefore described and illustrated, for the purpose specified.

Dated the 17th day of October, 1929.

For ARCTURUS RADIO TUBE COMPANY,
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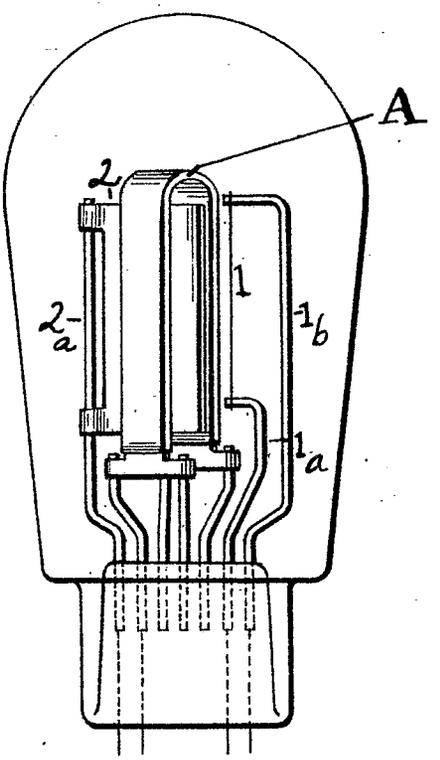
[This Drawing is a full-size reproduction of the Original.]



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