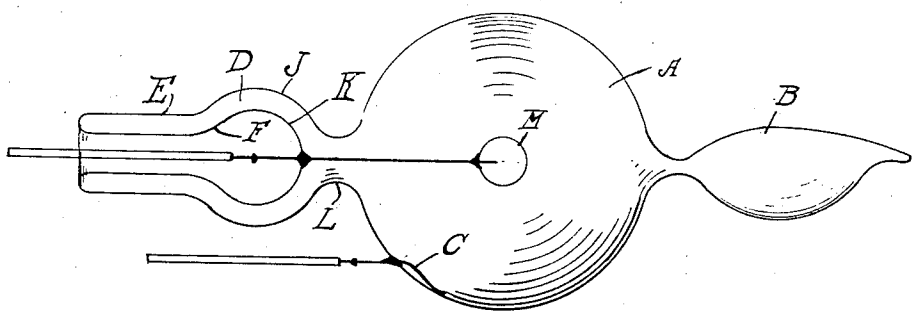
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A. H. COMPTON

PHOTO ELECTRIC CELL

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By his Attorney
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# UNITED STATES PATENT OFFICE.

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## PHOTO-ELECTRIC CELL.

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*To all whom it may concern:*

Be it known that I, ARTHUR H. COMPTON, a citizen of the United States, and a resident of St. Louis, in the State of Missouri, have invented a new and useful Improvement in Photo-Electric Cells, of which the following is a specification.

My invention relates to photoelectric cells and has more particular relation to the production of an alkali-metal cell in which the light-sensitive alkali metal, for example, potassium, is evenly distributed over, and in intimate contact with, a limited portion of an evacuated-cell envelope.

In order to secure this even distribution and intimate contact, it is desirable to employ a deposition method, for example, the condensation of a light-sensitive material in gaseous or vapor form. In alkali-metal cells it is essential, however, that a portion of the dielectric envelope between the electrodes shall be preserved free from metal deposit. The limitation of the deposit to a portion of the cell envelope and the preservation of some portion of the cell envelope between the electrodes free from deposited metal is the primary object of this invention.

One way in which this object may be obtained is by providing a structure, as shown in the accompanying drawing, having an auxiliary tube, preferably located around the leading-in conductor to one of the electrodes and communicating with the cell envelope proper. This tube is provided with an irregular or sinuous channel at some portion thereof, the sinuosities of the channel providing a partial barrier to intercept the volatilized light-responsive material and thereby preventing it from being deposited on some portion thereof. The result is that some portion of the cell envelope along which current might flow between the electrodes, is preserved free from deposited light-responsive material, while the remainder of the envelope is coated with such material adhering to the cell envelope.

In order to illustrate my invention I have shown one embodiment thereof in the accompanying drawing, in which a longitudinal section of the cell, partly diagrammatic, is shown.

An evacuated electrode-containing chamber A is preferably provided with a laterally-extending distilling tube or reservoir B adapted to contain light-responsive material, at least in sufficient quantity to adequately coat the desired portion of the wall or envelope of the chamber.

An electrode C is located on the inner face of the wall or envelope of chamber A and at any convenient point thereof. The electrode C may be, and preferably is, connected to a lead wire sealed in the wall of the chamber A in the usual manner. A double-wall side tube D is arranged to communicate with the chamber A and is preferably formed integrally therewith. Conveniently, the double-wall side tube D is located on the side of the chamber A opposite to the tube B, to preserve the symmetry of the arrangement. The tube D comprises an outer shell E and a reentrant fold F forming a crater-like tube the shell E and the fold F being spaced from each other and each provided with corresponding bulbous or swollen portions J and K, respectively. The space between the outer shell E and the reentrant fold F forms an annular pocket which communicates with the chamber A through the restricted neck L. The bulbous portions J and K provide sinuosities in the pocket, which constitute a barrier and thereby cause a condensation of the volatilized light-responsive material when it comes into contact with said sinuosities.

A second electrode M is located within the chamber A to receive its energy through a suitable lead wire which may, and preferably does, extend through the fold F of the side tube D, being sealed therein in the usual manner.

In preparing the cell for use, the alkali metal, specifically potassium, contained in the chamber B, is volatilized, the volatile material passing into chamber A and being condensed on the walls thereof in a substantially even layer having intimate contact with the wall of chamber A. The flow of the volatilized material into the annular irregular pocket formed in the side tube D is substantially prevented by the condensation of the material at the mouth of the pocket. The gaseous material is directed in substantially straight lines from the mouth of the chamber B and the small amount thereof entering the restricted neck portion L comes into contact with and is condensed upon the end of the enlarged portion of the reentrant fold F and thus is prevented from entering the reversely

curved annular passage between the outer shell E and the reentrant fold F.

It will be noted, that the electrode M is effectively insulated from the electrode C by a comparatively wide zone extending substantially from the equator of the enlargement K to the restricted portion L of the envelope. It should be further noted that there are two distinct shadow zones or portions protected from the vaporized material emanating from the chamber B, namely that portion of the outer wall of the shell E in the shadow of the restriction L and that portion of the reentrant fold forming the rear side of the enlargement K and in the shadow thereof.

Evidently, if a single bulbous region is insufficient to adequately intercept the volatilized material and prevent it from passing into the tube D, a plurality of such bulbous regions may be used.

Although I have found potassium and sodium to be particularly adapted for use in practicing my invention, rubidium and cæsium may also prove to be suitable light-responsive materials which may be screened in the same manner as potassium. Also, it may be found desirable to limit the deposited area in cells employing light-sensitive materials other than those mentioned. Hence, when I specify a light-sensitive material, I mean to include such materials, other than potassium, as may be found suitable.

What is claimed is:

1. A photo-electric cell comprising an envelope consisting of a main chamber and an auxiliary chamber connected by a restricted neck, said auxiliary chamber having a curved passage forming a plurality of shadow zones, an electrode extending through the wall of the auxiliary chamber and the neck into the main chamber and another electrode extending through the wall of the main chamber, light-sensitive material deposited on the wall of the main chamber, connected with the second electrode and insulated from the first electrode by said shadow zones.

2. A photo-electric cell comprising an envelope consisting of a main chamber and an auxiliary chamber of non-uniform cross section and connected to the main chamber by a restricted neck, an electrode extending through the wall of the auxiliary chamber and the neck into the main chamber, the interior of the wall of the main chamber substantially uniformly coated with a light-sensitive material insulated from the electrode and electrically connected to a leading-in wire extending through the wall of the main chamber.

3. A photo-electric cell comprising an evacuated envelope consisting of a main chamber interiorly coated with alkali metal and an auxiliary annular chamber with a sinuous channel and connected to the main chamber by a restricted portion, an anode extending through the wall of the auxiliary chamber and the restricted portion into the main chamber and a cathode conductor extending through the wall of the main chamber and connected to the deposit of alkali metal on the interior of said wall, but insulated from the leading-in conductor of the anode by said sinuous channel.

4. A photo-electric cell comprising an envelope consisting of a main chamber and an auxiliary annular chamber having a reversely curved channel and connected to the main chamber by a restricted portion, an electrode in the main chamber and connected to a leading-in conductor extending through the restricted portion and the wall of the auxiliary chamber, another electrode extending through the wall of the main chamber and means for introducing alkali metal into the main chamber as a substantially uniform film on the wall thereof, without depositing it on the wall of the auxiliary chamber to a sufficient extent to form a short-circuiting path between the electrodes.

5. An envelope for an electric device comprising a main chamber and an annular auxiliary chamber having a reversely curved channel and connected to the main chamber by a restricted portion and means for introducing an alkali metal into the main chamber, said alkali metal being maintained out of contact with a substantial portion of said auxiliary chamber by said reversely curved channel and said restricted portion.

6. An envelope for a photo-electric cell comprising a main chamber, an annular auxiliary chamber having a curved channel and connected to the main chamber by a restricted portion and a tube containing an alkali metal connected to the main chamber whereby a deposit of the alkali metal may be formed on the inner wall of the main chamber, by heating the tube, without completely covering the inner wall of the auxiliary chamber.

7. A photo-electric cell comprising an envelope having a main chamber, a film electrode on the inner surface thereof, an auxiliary chamber associated therewith having a reentrant stem portion, a second electrode carried by said stem portion and extending into the main chamber, the outer wall of said auxiliary chamber and said reentrant stem defining a reversely curved annular passage having a plurality of zones free from said film electrode material whereby said electrodes are insulated from each other.

In testimony whereof, I have hereunto subscribed my name this 24th day of February, 1921.

ARTHUR H. COMPTON.