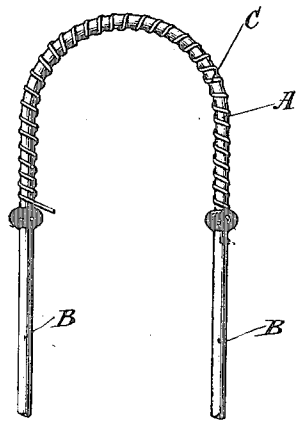
W. G. HUDSON.

ELECTRODE FOR DEVICES FOR VARYING ELECTRICAL RESISTANCE.

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1,190,412. Patented July 11, 1916.



Witnesses:
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UNITED STATES PATENT OFFICE.

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ELECTRODE FOR DEVICES FOR VARYING ELECTRICAL RESISTANCE.

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To all whom it may concern:

Be it known that I, WALTER G. HUDSON, of New York, in the county of New York, and in the State of New York, have invented a certain new and useful Improvement in Electrodes for Devices for Varying Electrical Resistance, and do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention has been to provide an improved electrode for use in devices for varying electrical resistance, of which one class consists of detectors for radio telegraphy of the types known as the "Fleming valve" and the "Audion detector," and of which other types are current amplifiers operating on principles similar to those of the said "Fleming valve" and Audion; in which devices feeble oscillating, pulsating or other currents are modified, rectified or amplified so as to make them perceptible in an ordinary signal indicating device, such, for instance, as a telephone receiver, or to increase their audibility in telephony; and to such ends my invention consists in the electrode for use in devices for varying electrical resistance hereinafter specified.

In the accompanying drawing the figure is an elevation of an electrode embodying my invention.

I have chosen as an illustration of my invention that embodiment thereof which is the best embodiment known to me, but my invention is capable of embodiment in many different forms, and for use for many different purposes, and the illustrated embodiment thereof is to be regarded, therefore, as typical only of many possible embodiments and my invention is not to be confined thereto.

The illustrated embodiment of my invention is an electrode for use in the type of detectors for radio telegraphy or telephony known as gas detectors like the "Fleming valve" and "Audion," and in current amplifiers operating on similar principles. These devices make use of two or more electrodes inclosed in a bulb, like an incandescent light bulb, connections with the electrodes being provided by means of wires sealed in the glass. One or more of these electrodes is commonly a lamp filament heated to bring about a change in the gaseous medium between it and another electrode or electrodes, such that the said medium will modify, rectify, amplify, or otherwise conduct feeble, oscillating, pulsating, or other currents in such a manner as to make the same perceptible to a signaling device, such as, for instance, a telephone receiver. I have used the term "varying resistance" as a generic term to include such actions as modifying, rectifying, amplifying, or otherwise conducting in a variable manner the oscillating, pulsating or other variable currents, or, under their influence, of supplemental currents provided by local means. In the operation of the said devices the heated electrode performs two functions, namely, that of heating the electrode or filament (if it be in the form of a filament) and that of varying the resistance of the medium between the electrodes. I have discovered that by separating these functions, and not seeking to perform them both by the same substance, I can get improved results, for I find substances which are best adapted to perform one function are not the substances which are best to perform the other function.

I will state a theory which I believe to be correct, but which I only offer as possibly throwing light on the invention, and I am not to be bound by the correctness or incorrectness of the said theory. Such theory is as follows: When the filament electrode is heated by means of an ordinary electric current (for instance, from a small storage battery) it ionizes and renders sensitively conducting the attenuated gas between and around all the electrodes within the bulb. When the negative pole of a second battery, otherwise properly connected with the system, is brought into electrical connection with the heated filament electrode, the latter also throws off ions, greatly adding to the sensitiveness of the gaseous medium; so that very feeble oscillating, pulsating or other currents are able to materially affect its resistance to the current from the second battery, and thus cause signals in ordinary signaling devices they would otherwise be unable to operate.

The part of the above theory which is pertinent to my invention is this:—1st. I have found that the throwing off of these ions by the electrode is much more effective with some materials than with others; and 2nd, experiment further shows that with

very suitable materials the ionization is so rapid that a noticeable erosion of the electrode occurs. As this erosion is not uniform the electrode usually made in the form of a filament (when made of a single substance) soon becomes thinner and of higher electrical resistance at one spot. The result is that such eroded spot becomes the hottest part of the filament and performs a largely increased share of its work as an electrode, leading to still greater erosion, and thus in a short time the circuit through the filament is broken and the instrument rendered useless.

By my invention, separating the heating functions from the detecting, rectifying, amplifying, or other electrodal functions of the filament, I select for the heating function a material as, for instance, tungsten, which has qualities especially adapted to that function and looking to efficiency and durability in heating, and I cause the heat thus generated to act upon another material (as for instance tantalum), which possesses in a high degree the physical, chemical or molecular properties required for the said electrodal functions.

In the illustrated embodiment I have provided a tungsten filament A connected with platinum leads B which are sealed in the glass bulb, and this tungsten filament performs the said heating function. The substance which performs the said electrodal functions is, in the present instance, a tantalum wire or ribbon C wound around the tungsten filament. Where suitable salts of the electrodal material are available, electroplating is a convenient method of applying the same to the filament. Any convenient method may be used, and it is obvious that the nature of the materials used will govern their method of application.

In the operation of my electrode, the erosion of the electrode is more uniformly distributed and does not affect the heating function of the filament. The conductivity of the tungsten filament is not materially altered by the erosion of any portion of the tantalum wire, and the electrode will continue to perform its two functions so long as any portion of the tantalum wire is present upon the electrode.

I claim:

1. An electrode of the class described, comprising a tungsten filament and a covering of tantalum.

2. An electrode of the class described, comprising a filament adapted to be heated electrically, and a covering of tantalum.

3. An electrode of the class described, comprising a tungsten filament and a sheath of tantalum inclosing said filament.

In testimony that I claim the foregoing I have hereunto set my hand.

WALTER G. HUDSON.

Witnesses:

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