

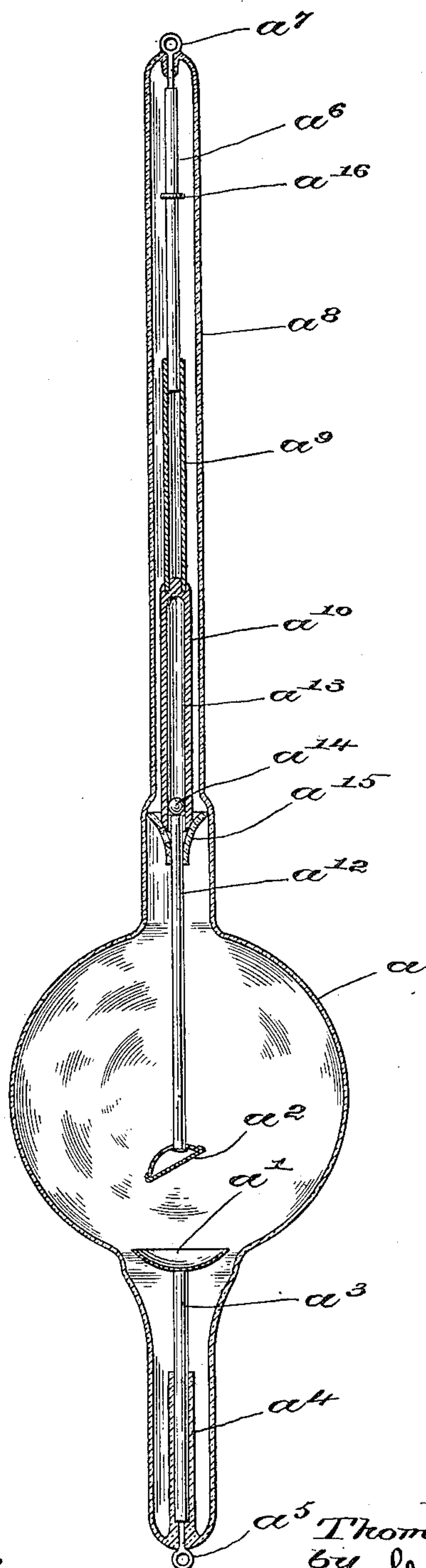
No. 659,891.

Patented Oct. 16, 1900.

T. B. KINRAIDE.  
ADJUSTING DEVICE FOR VACUUM TUBES.

(Application filed Dec. 26, 1899.)

(No Model.)



Witnesses.

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# UNITED STATES PATENT OFFICE.

THOMAS B. KINRAIDE, OF BOSTON, MASSACHUSETTS.

## ADJUSTING DEVICE FOR VACUUM-TUBES.

SPECIFICATION forming part of Letters Patent No. 659,891, dated October 16, 1900.

Application filed December 26, 1899. Serial No. 741,501. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS B. KINRAIDE, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Adjusting Devices for Vacuum-Tubes, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawing representing like parts.

10 This invention relates to means for adjusting or regulating the focal distance of the electrodes in vacuum-tubes such as are commonly used in X-ray work. It is quite essential that some means for accurately and delicately adjusting the electrodes in this class of instruments should be provided in order to control the voltage and otherwise regulate the proper working of the apparatus, and yet because of the vacuum requirements of the tube 15 external adjusting means, such as might ordinarily be employed in the apparatus in general use, cannot be used, and accordingly I have provided an internal adjustment, by means of which the electrodes may be adjusted toward and from each other to the minutest degree required.

In its simplest form, as herein shown, my invention consists of a gravity-hammer or adjusting means operated by gravity.

30 The details of construction of my invention and its mode of operation and further advantages thereof will be pointed out more fully in the course of the following description, reference being had to the accompanying drawing, in which I have illustrated a preferred embodiment of my invention, and the latter will be more particularly defined in the appended claims.

40 In the drawing the figure represents in vertical longitudinal section a typical vacuum-tube provided with my improved adjusting means.

It will be understood that the tube  $a$  may be a Crookes or Geissler tube or any of the usual kinds of vacuum-tubes used for this general purpose or may be any preferred kind, and, in fact, my invention may be applied to electrical apparatus of any kind wherein electrodes are employed within a vacuum. The opposite electrodes are herein indicated at  $a'$   $a^2$ , being such as are commonly used in connection with X-ray work, the elec-

trode  $a'$  being supported on a conductor  $a^3$ , suitably mounted in a glass or other socket or post  $a^4$ , having an external connection by means of a suitable platinum or other wire  $a^5$ , and the electrode  $a^2$  is similarly provided with a conductor  $a^6$  and wire  $a^7$ , housed in a glass or other stem  $a^8$  of the tube.

I have herein shown my improvement in connection with the electrode  $a^2$ ; but it will be understood that it may be provided in connection with the opposite electrode, or, if desired, both electrodes may be made adjustable.

Slidingly mounted on the rod or conductor  $a^6$  is a cylinder  $a^9$ , fitting said rod with sufficient exactness to prevent relative movement simply by the weight of the parts, but yet permitting the tube to slide frictionally on said rod when required, as will be more fully explained.

At its lower end, as shown, the tube  $a^9$  carries a hollow or recessed part  $a^{10}$ , to the opposite end of which is permanently secured a rod or post  $a^{12}$ , which carries the electrode  $a^2$ . Within a longitudinal recess  $a^{13}$ , provided in the part  $a^{10}$ , I mount a gravity device, preferably in the shape of a ball  $a^{14}$ , capable of moving in said recess so as to strike projections therein, herein shown as formed by the opposite ends of the recess.

When it is desired to change the adjustment of the electrodes in any degree, all that is necessary is to move the vacuum-tube in such a manner as to cause the ball or gravity device  $a^{14}$  to strike or pound upon one or the other end of the recess  $a^{13}$ , thereby driving the cylinder  $a^9$  onto or off from the post  $a^4$  to the extent required.

The rod  $a^{12}$  has a bearing  $a^{15}$  in order to maintain it perfectly steady, and the rod  $a^6$  preferably has a stop  $a^{16}$  to limit the movement in that direction of the tube or cylinder  $a^9$ .

While I have herein shown my invention in one specific and preferred embodiment thereof, I wish it understood that I am not limited thereto, inasmuch as it is capable of being embodied in very many constructions, the main idea thereof being to provide a gravity device for automatically shifting the electrode according to the position in which the vacuum-tube is placed and by this means



changing the striking or focal distance of the two electrodes from each other. For instance, instead of having the part  $a^9$  hollow to slide on the rod  $a^6$  the parts may be reversed, and the part  $a^9$  may slide within the part  $a^6$ , or the part  $a^9$  or its equivalent may have frictional engagement with any other part of the conductor or tube, so as to be retarded as desired, and I may employ any kind of an electric conductor between the adjustable electrode and the external connection  $a^7$  or  $a^5$ , as the case may be, or the gravity device, instead of being a ball sliding within a member, may encircle and slide on said member or may be in any other shape moving in or on any moving part to be adjusted, it being understood that my invention consists in its broad aspect simply in providing a gravity-operated device for overcoming the frictional resistance of the adjustable electrode.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a vacuum-tube having an electrode adjustable therein, means for adjusting said electrode, said means being operable by gravity, substantially as described.

2. In a vacuum-tube, an electric conductor, an electrode, connections between said conductor and said electrode including a device

slidingly mounted in said tube and normally retarded frictionally from movement, and means contained within the vacuum-tube for moving said sliding device and thereby adjusting the electrode, substantially as described.

3. In a vacuum-tube, the combination with an adjustable electrode thereof, of means within the vacuum-tube and controlled by the position of said vacuum-tube for adjusting the position of said electrode, substantially as described.

4. In a vacuum-tube, an electrode slidingly mounted in the tube and having a recessed connection, and a gravity device movable in said recess for shifting the electrode in one direction or the other, substantially as described.

5. In a vacuum-tube, the combination with an electrode movably mounted therein, of a gravity-hammer for shifting said electrode, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS B. KINRAIDE.

Witnesses:

GEO. H. MAXWELL,  
GEO. W. GREGORY.