Patented Apr. 19, 1927. 1,625,427

UNITED STATES PATENT OFFICE.

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TARGET FOR X-RAY TUBES.

No Drawing. Original application filed December 21, 1920, Serial No. 432,326. Divided and this application filed November 17, 1922, Serial No. 601,649. Renewed December 6, 1926.

The present application is a division of our application for an improvement in targets for X-ray tubes, Serial No. 432,326, filed Dec. 21, 1920, and assigned to the Westinghouse Lamp Company.

This invention relates to Röntgen or X-ray tubes and, more particularly, to the targets or anticathodes employed in such devices.

It has been recognized for a long time that the intensity of the X-rays generated in devices of this character is dependent upon the atomic weight of the anticathode or target. It is well known that the greater the atomic weight of the target, the greater is the intensity of the X-rays emanating from the target. Kaye has arranged the metals having high atomic weights and which are suitable for X-ray targets on the basis of 100 for platinum as follows, the values for uranium and thorium being calculated:

Uranium	125
Thorium	120
Gold	101
Platinum	100
Iridium	98
Osmium	97
Tungsten	91
Tantalum	90

Of these metals, gold is unsuitable owing to its low melting point. Platinum, iridium and osmium are practically eliminated on account of the scarcity of these metals. Uranium has not been used heretofore because it has been impossible to prepare the same in a condition suitable for anticathodes.

Many attempts have been made to produce the heavier rare metals, such as uranium, in dense, coherent, metallic form suitable for targets and for other purposes, but such efforts have uniformly been unsuccessful. So far as we are aware, no one hitherto has succeeded in producing uranium in dense, coherent, metallic form, although the powder of this metal is well known. Owing to the readiness with which uranium oxidizes in the air and the great ease with which it interacts with gases, such as oxygen, hydrogen, water vapor, and the like, it is especially difficult to obtain metallic uranium in the pure, coherent form.

We have recently discovered that various refractory metals, such as uranium, may be readily obtained by sintering the substantially pure metal powders in a furnace of special construction, under suitable conditions. We have also found that, under suitable conditions, these metals may be produced in this furnace by heating the hydrides or the oxides in a high vacuum and at a high temperature in such manner as to cause complete dissociation and ultimate sintering to solid, coherent metal with or without the metal passing through the molten condition. The furnace is described and claimed in Rentschler Patent 1,480,301, granted Jan. 8, 1924, on furnaces, and assigned to the Westinghouse Lamp Company. The method employed in the production of such coherent metals and the products obtained thereby are described and claimed in our copending application, Serial No. 432,325, filed December 21, 1920, on a method of sintering metals, and assigned to the Westinghouse Lamp Company.

In accordance with the method set forth, we generally prefer to mold or compress a disk or pellet of metal powder, such as uranium, and place the same in a crucible or on a sheet of molybdenum or tungsten which is inserted within a closely wound coil in an evacuated chamber. High-frequency current is passed through the coil which acts as a primary, inducing secondary currents in the crucible or sheet and the pressed disk of metal powder, sintering the same and forming dense, coherent, metallic uranium.

Uranium has the highest atomic weight of any metal known, namely 238.5. The intensity of emission of X-rays from this metal is in the neighborhood of 20% to 25% greater than the intensity of emission of rays from platinum. We believe that we are the first to have obtained satisfactory X-ray targets which have atomic weights above 200.

We are aware of a patent which claims the use of metallic uranium for X-ray targets but it is not apparent from the description of said patent that the inventor had dense, coherent, metallic uranium. Furthermore, so far as we know, no process had been devised prior to the date of that patent which would produce substantially pure, coherent uranium, although, as heretofore stated, it was appreciated that this metal

possesses certain properties which are desirable in X-ray targets.

An X-ray target of uranium is eminently suitable for ray emission since its melting point is comparatively high and its atomic weight is the highest known. It is far superior to the metal tungsten previously in common use.

We do not wish to restrict ourselves to the use of the pure metals alone as X-ray targets, but we may use alloys or mixtures of uranium with thorium or with other metals. If desired, the X-ray tube may be filled with an inert gas, such as argon, helium, and the like.

We claim as our invention:

1. In an X-ray tube, a target of dense, coherent metallic uranium.

2. In an X-ray tube, a target of substantially pure, coherent, metallic uranium.

3. An anticathode comprising coherent, metallic uranium.

4. An anticathode comprising substantially pure, coherent, metallic uranium.

5. A target for X-ray tubes and the like consisting partly of substantially pure, coherent uranium.

6. A target for X-ray tubes and the like consisting wholly of substantially pure, coherent uranium.

7. In an X-ray tube, a target in a dense, coherent form and containing uranium in such proportion that the major portion of X-ray emission is due to the uranium.

8. A target for an X-ray tube containing coherent uranium in such proportion that the major portion of X-ray emission is due to the uranium.

In testimony whereof, we have hereunto subscribed our names this sixteenth day of November, 1922.

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