

H. GREEN.
X-RAY TUBE.
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1,042,109.

Patented Oct. 22, 1912.

Fig. 1.

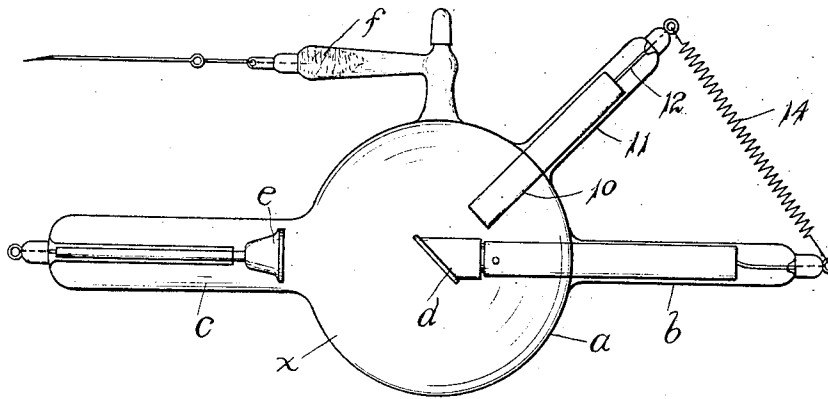
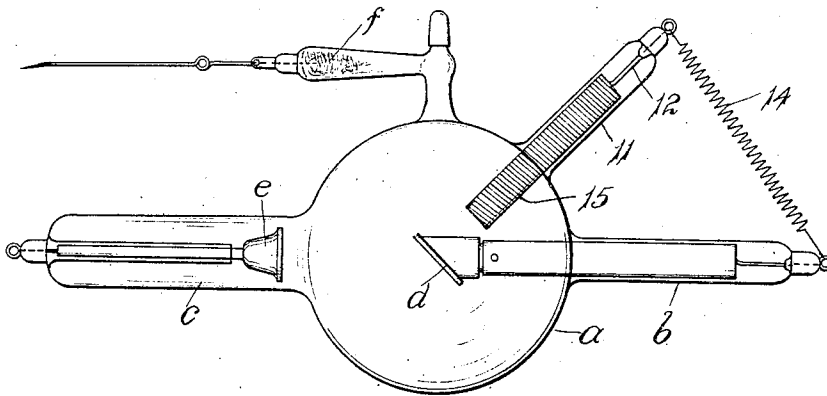


Fig. 2.



WITNESSES

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X-RAY TUBE.

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To all whom it may concern:

Be it known that I, HENRY GREEN, a citizen of the United States, residing at Hartford, county of Hartford, and State of Connecticut, have invented certain new and useful Improvements in X-Ray Tubes, of which the following is a specification.

The object of this invention is to produce a device of the character described having features of novelty and advantage.

Figure 1 of the drawings shows a tube embodying my invention. Fig. 2 shows a modification.

Referring to the drawings, *a* denotes an X-ray tube of usual form having the central bulbous portion *a* and the oppositely arranged tubular extensions *b—c* to receive the usual anode *d* and cathode *e*.

f denotes a conventional form of regulator by means of which the vacuum of the tube may be reduced when desired.

As thus far described the tube is of usual and well known construction.

My invention resides in providing an additional electrode 10 of tubular form the inner end of which is located in operative relation with the anode and preferably at a short distance therefrom and at the rear thereof, this electrode extending into an extension 11 for a substantial distance. A wire of conducting material 12 attached to the outer end of this electrode is sealed through the end of the extension 11 to provide an exterior terminal which is illustrated as connected with the anode terminal by the conducting wire 14, though in some cases it may be desirable to omit this connection.

In the form in which I have practised this invention a considerable portion of the length of the electrode 10 is confined within the tubular extension 11. As a result of this construction a tube, having a vacuum which is relatively low in comparison with tubes as now made, gives a penetration of the higher vacuum tubes of the old type and the clear definition of the lower vacuum tubes, enabling the operator to make rapid pictures of soft tissues and bone structures on the same plate, at considerable depth, with clear definition and at a short exposure.

Furthermore, it results from the use of a tube made in accordance with my invention that the vacuum does not fluctuate to nearly as great an extent as is usual with tubes of the old type which means that it is not necessary to regulate the tube by reducing the vacuum as often or to as great an extent. It is the theory that the cathode stream is composed of minute particles of gas which are thrown against or bombard the anode. With a relatively low vacuum the additional gas in the tubes over that required for the cathode stream is interposed between the cathode and anode, and when using heavy currents this gas interferes with the passing of the cathode stream, blunting the focus to some extent and reducing the penetration.

In the operation of a tube made in accordance with my invention, particularly during the pumping stage, a phenomena appears which indicates that the excess of gas in the tube over that required for the passage of the cathode stream is drawn up into this tubular electrode and there held, removing it from the path of the cathode stream. I am aware that this third electrode instead of having a solid wall, as indicated in Fig. 1, might be formed by a closely coiled wire as illustrated at 15 in Fig. 2 and possibly in other ways. But the essential feature is that it shall be of tubular form whether its cross section be round, square or anything between, and of sufficient length that its inner end shall be in operative relation with the anode and its outer end projected into an extension from the glass bulb.

I claim as my invention:

1. The combination with an X-ray tube including the usual cathode and anode electrodes, of a third electrode of tubular form located within the tube with one end in relative operative proximity to said anode.
2. The combination with an X-ray tube including the usual cathode and anode electrodes, of a third electrode of tubular form supported within the tube with one end arranged in operative relation with the anode, the other end projected into a tubular extension of the tube.

3. The combination with an X-ray tube including the usual cathode and anode electrodes, of a tubular extension from the wall of said X-ray tube, and a third electrode
5 of tubular form having one end located within said tubular extension and its other end in operative relation with said anode,

said third electrode being electrically connected with the terminal exterior of the tube.

HENRY GREEN.

Witnesses:

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