

F. A. DAVIS.
 MONOPOLAR VACUUM TUBE.
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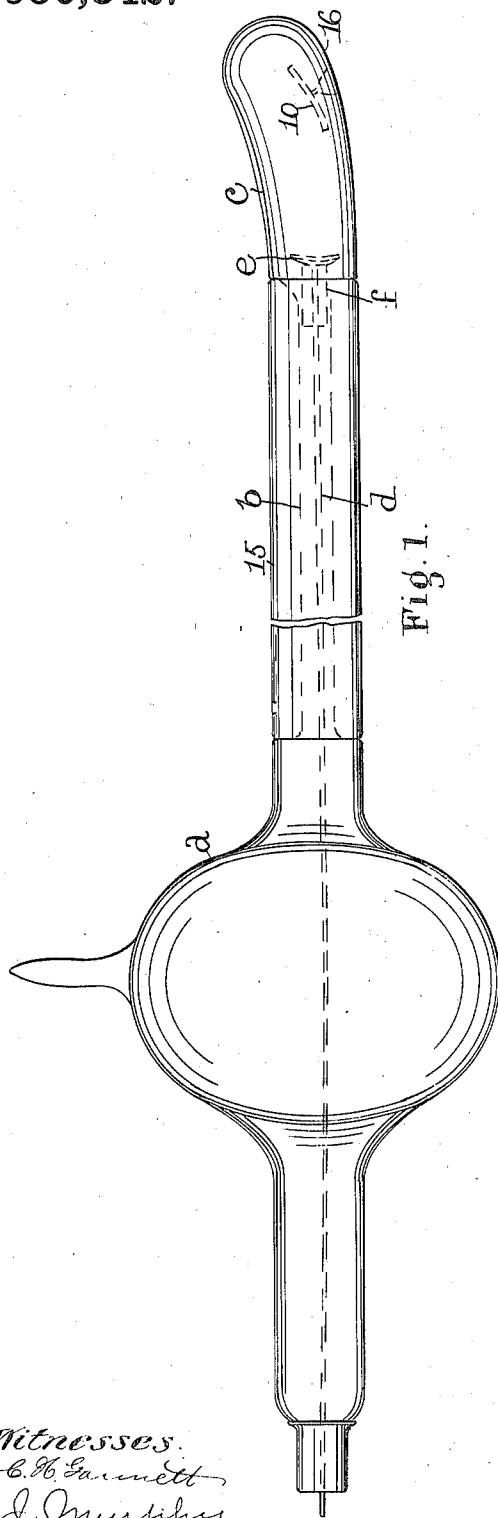


Fig. 1.

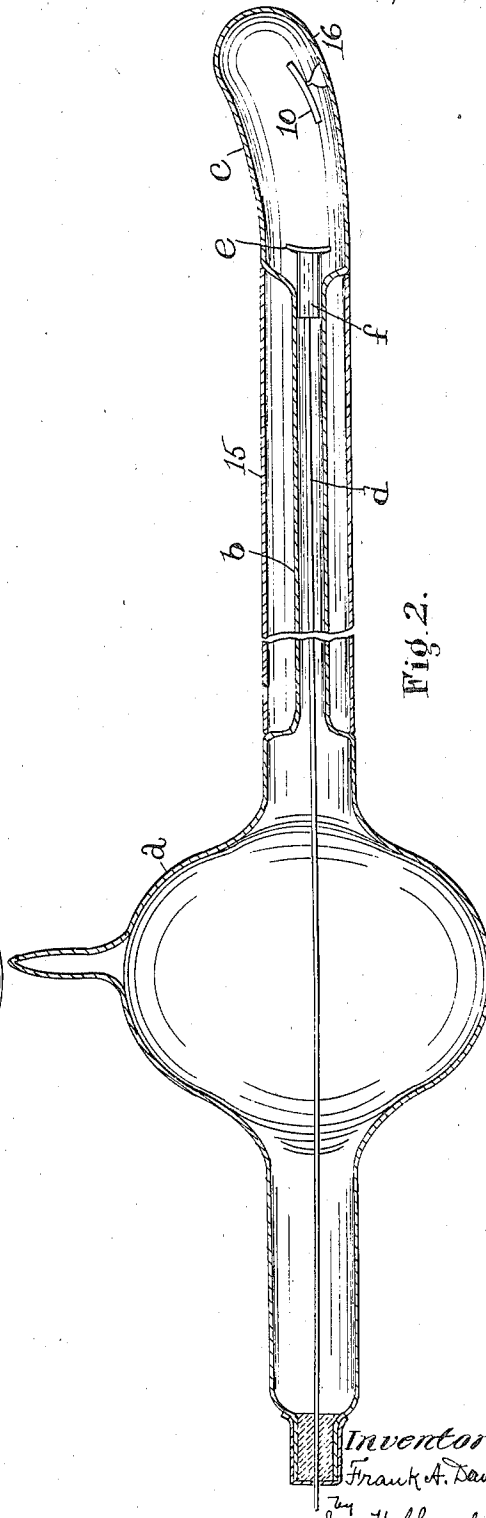


Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANK A. DAVIS, OF BOSTON, MASSACHUSETTS.

MONOPOLAR VACUUM-TUBE.

950,842.

Specification of Letters Patent.

Patented Mar. 1, 1910.

Application filed March 15, 1909. Serial No. 483,449.

To all whom it may concern:

Be it known that I, FRANK A. DAVIS, a citizen of the United States, residing in Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Monopolar Vacuum-Tubes, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to a monopolar vacuum tube especially designed and adapted among other uses to be employed for the treatment of pathological conditions in the mouth, rectum and vagina, such as cancerous conditions, hypertrophied glands, adhesions, exudates, inflammatory disturbances, etc.

The invention has for its object to provide a vacuum tube of the character described with which the benefits of the combined effects of high frequency currents and the X-rays may be obtained in close proximity to the diseased part. To this end I employ a vacuum tube having at one end a head of such size as will permit of its insertion into the orifice of the body to be treated, and at its opposite end an enlarged vacuum chamber, which is connected with the head by a neck portion of smaller diameter than the head, so that the latter forms a chamber of larger diameter or area in cross-section than said intermediate neck portion, which chamber for the purpose of this invention may be designated the X-ray chamber.

The vacuum tube contains within it a conductor, such as a fine wire which terminates at or near the junction of the neck portion with the X-ray chamber, and preferably terminates in a small concave metal disk or button, which is arranged transversely of the X-ray chamber at what may be termed the rear end thereof. The metallic conductor extends to the outside of the tube, preferably through the neck portion and the enlarged vacuum chamber. The X-ray chamber or head may and preferably will contain within it a metal plate or target preferably curved and arranged at an angle to a line through the center of the terminal disk or button, for a purpose as will be described. The X-ray chamber may have its walls curved for a purpose as will be described. These and other features of this invention

will be pointed out in the claims at the end of this specification.

Figure 1 is an elevation of an instrument embodying this invention, and Fig. 2, a longitudinal section of the instrument shown in Fig. 1.

Referring to the drawings, the vacuum tube herein shown comprises a main vacuum chamber in the form of a bulb *a*, a neck portion *b* extended therefrom of substantially small diameter, and a head *c* of larger diameter than said neck, yet sufficiently small to enter the mouth or other cavity containing the part or parts to be treated.

The neck portion *b* has located in it an electric conductor *d*, preferably a fine wire, which terminates in a metallic button or disk *e* at or near the junction of the neck with the head *c*, said button or disk being arranged transversely of the head *c* and having a substantially flat shank *f* of a width substantially equal to the diameter of the neck portion *b* to be supported thereby, while affording communication between said neck and head. The conductor *d* as herein shown is extended to the outside of the vacuum tube through the main chamber *a*, and is connected with a suitable source of supply of a current of high frequency.

The head *c* may and preferably will contain within it a metal plate or target 10, preferably inclined or curved with relation to a line through the center of the disk or button *e*, so as to be struck by the cathode stream from the button or disk and offer resistance to said cathode stream whereby strong X-rays are developed in the tubular head *c* and projected laterally therefrom, and which may be directed and concentrated upon the part to be treated by turning the vacuum tube so that the target 10 is opposite the part to be treated, with which the head *c* makes contact, so that the patient becomes the opposite pole of the instrument in the development of the X-rays.

It may be preferred to employ the target 10, in order to develop the X-rays of maximum strength but it is not desired to limit the invention in this respect, as the glass of the head *c* when curved at its end as herein shown so as to cross the flow of the cathode stream at an angle materially less than a right angle may alone be depended upon to develop weak X-rays, project them laterally and concentrate them on the part to be treated.

ed. The tube having the curved wall 16 without the target 10, may be used in mild cases and also without harm by inexperienced persons.

5 The neck portion *d* of the instrument may be inclosed by a tube or sleeve 15 of larger diameter, which may be joined at its ends to the head *c* and the bulb or vacuum chamber *a*. The sleeve 15 serves as an insulator for
10 preventing the current dispersing itself at points where it is not desired, for protecting the patient, and also for concentrating the current on the cathode or button *e* and in the head *c*, thereby increasing the efficiency
15 of the instrument.

In operation with the instrument herein shown, the conductor *d* is properly connected with the source of supply of current, and the head *c* is inserted into the cavity with
20 the target 10 or the curved end portion 16 of the said head substantially opposite the part of the body to be treated, with which the head *c* makes contact. As above explained, the current from the terminal disk or button *e* passes longitudinally of the head
25 *c*, impinges upon the target 10 or in the absence of the latter against the curved portion 16 of the head, and develops X-rays which are directed upon the part being treated,
30 with beneficial results, as has been demonstrated in actual practice, a strong X-ray being developed when the target is used.

In addition to the above mentioned uses to which the instrument may be put with highly
35 satisfactory results, it is also capable of being used, when exhausted to the proper vacuum to develop X-rays, which will fluoresce a bright green when in contact with the tissues, and which can be used on a resonator
40 or high frequency electrical apparatus to cause a fluoroscope to become illuminated sufficiently, if the fluoroscope is in good condition, to enable one to see shadows of bones of the hands and other parts of the body.

45 The vacuum chamber *a* is made of sufficient size to take care of the gases given off by the metal wire *d*, due to the heat developed when the tube is in use, and thereby maintain the vacuum at the desired high
50 point, notwithstanding said gases.

In the present instance I have shown one construction of instrument with which highly satisfactory results have been obtained, but I do not desire to limit the invention to the
55 particular construction herein shown.

Claims.

1. In an instrument of the class described, in combination, a vacuum tube comprising a
60 vacuum chamber at one end, a head or chamber at the other end sufficiently small to enter a cavity in the body of the patient, and an intermediate neck portion of smaller diameter than said head and connecting the latter with said vacuum chamber, a con-
65 ductor in said neck portion extended to the

outside of the instrument and terminating near the junction of the said neck and head in a button or disk, a target located near the end of the said head in line with the said button or disk and separated therefrom, and a sleeve inclosing the said neck portion, substantially as described.

2. In an instrument of the class described, in combination, a vacuum tube having at one end a head of a size to permit it to be inserted into a cavity of the body and having a narrower portion communicating with said head, a target located in said head substantially in line with the said narrower portion, and a conductor in the said narrower portion terminating out of contact with said target, substantially as described.

3. In an instrument of the class described, in combination, a vacuum tube having at one end a head of a size to permit it to be inserted into a cavity of the body and having a narrower portion communicating with said head, a conductor in said narrower portion terminating out of contact with the end of said head and a target within said head inclined with relation to said conductor, substantially as described.

4. In an instrument of the class described, in combination, a vacuum tube having at one end a substantially large vacuum chamber, and at its other end a head of a size sufficiently small to permit it to be inserted into a cavity in the body, and an intermediate neck portion of smaller diameter than said head joining the latter with said vacuum chamber, a conductor extended through the said vacuum chamber to the outside thereof and through said neck portion and terminating in proximity to the junction of the head with said neck portion, and a target within said head inclined with relation to said conductor, substantially as described.

5. An instrument of the class described, in combination, a vacuum tube having at one end a substantially large vacuum chamber, and at its other end a head of a size sufficiently small to permit it to be inserted into a cavity in the body, an intermediate neck portion of smaller diameter than said head joining the latter with said vacuum chamber, a conductor extended through the said vacuum chamber to the outside thereof and through said neck portion and terminating in proximity to the junction of the head with said neck portion, a target within said head inclined with relation to said conductor, and a sleeve surrounding said neck portion and separated therefrom by a space, substantially as described.

6. In an instrument of the class described, in combination, a vacuum tube having a head of a size to permit it to be inserted into a cavity of the body, and a neck portion of smaller diameter than said head communicating therewith, a conductor in said

tube extended through said neck portion and terminating in proximity to said head, and a target located in said head near its outer end substantially in line with and inclined
5 to said conductor and separated therefrom, substantially as described.

In testimony whereof, I have signed my

name to this specification in the presence of two subscribing witnesses.

FRANK A. DAVIS.

Witnesses:

WILLIAM R. RICHARDS,
JAMES R. MURPHY.