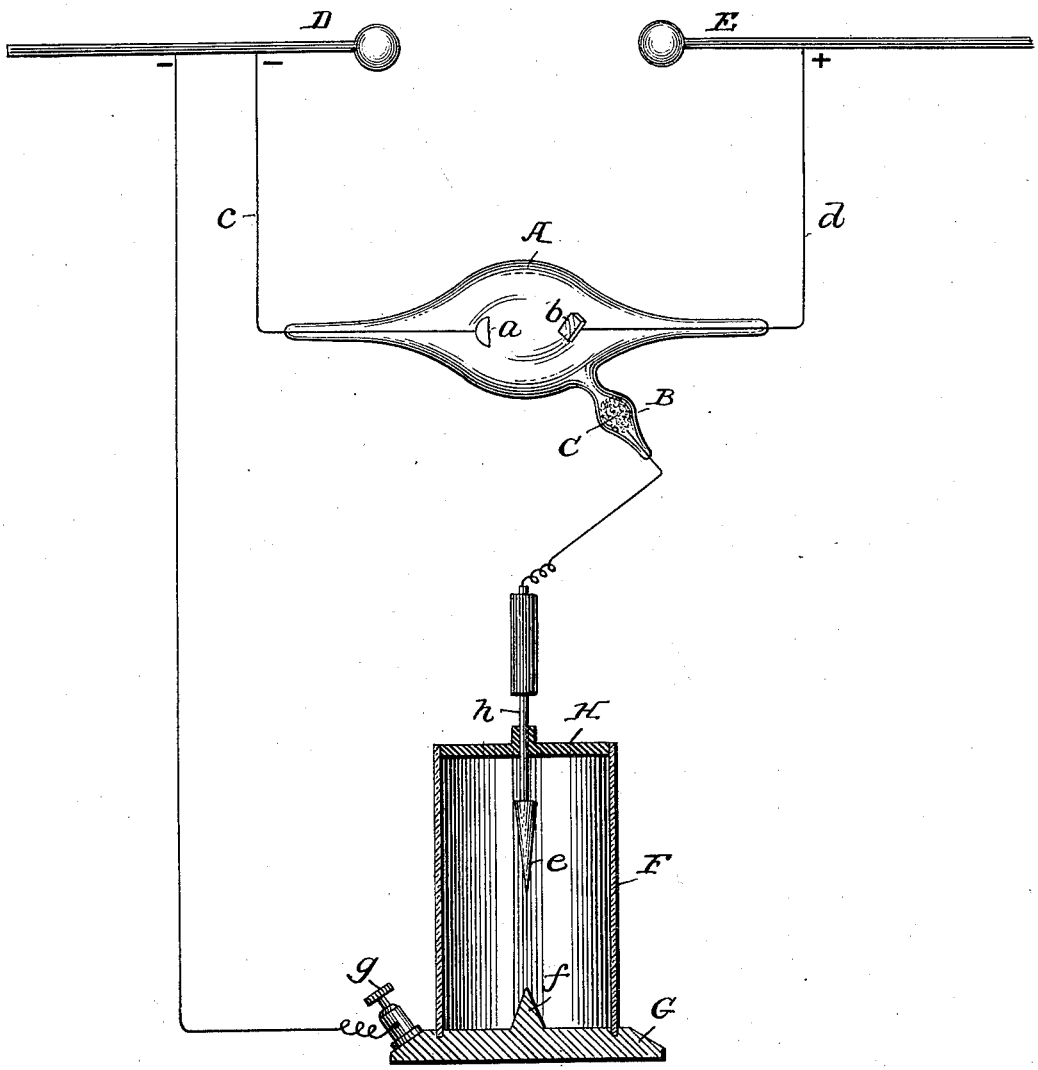
No. 676,166. Patented June 11, 1901.

H. F. WAITE.

REGULATING ROENTGEN RAY TUBES.

(Application filed Mar. 23, 1901.)

(No Model.)



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HARRY FULLER WAITE, OF NEW YORK, N. Y.

REGULATING ROENTGEN-RAY TUBES.

SPECIFICATION forming part of Letters Patent No. 676,166, dated June 11, 1901.

Application filed March 23, 1901. Serial No. 52,545. (No model.)

To all whom it may concern:

Be it known that I, HARRY FULLER WAITE, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Regulating Roentgen-Ray Tubes, of which the following is a specification.

My invention relates to vacuum or Crookes tubes, such as are used for the generation of Roentgen rays; and its object is to provide improved means for regulating or adjusting the vacuum in such tubes. I make use of the ordinary vacuum-tube having an auxiliary or regulating discharge-path in shunt to the main discharge-path and in the same vacuum-inclosure with it. In practice I may use that form of vacuum-bulb having a small auxiliary tube communicating with the vacuum-bulb proper. A third terminal passes through the auxiliary tube in which is contained a volatile salt, such as hydrate of potash or other suitable gas-producing agent, through which the shunt passes. The increase of vacuum which takes place in working Roentgen-ray tubes may then be counteracted by the volatilization of this salt when a discharge takes place through it. The shunt-circuit ordinarily includes an adjustable spark-gap designed to offer at will more resistance to the current than the vacuum-tube when the latter is working with normal vacuum. When the vacuum in the tube rises above normal, which is its tendency in course of working, the resistance also rises and current crosses the spark-gap in the shunt in preference to passing through the tube, or the current may be sent through the shunt whenever desired. It is this shunted current which is employed to volatilize the salt either directly or indirectly, and thus reduce the vacuum to the normal.

My improvement in this method of regulation consists in inclosing the usual adjustable spark-gap in the shunt-circuit in a suitable receptacle which may be air-tight and made of any suitable material, as glass or hard rubber.

My object in inclosing a regulating spark-gap is to insure certainty of working, for it is well known the resistance of a spark-gap varies with variations in the currents of air circulating around and through it. With an inclosed spark, therefore, more exact adjustment is possible than with the usual uninclosed form. Furthermore, the noise of the discharge is not so disturbing to patients being operated upon, while with a receptacle of hard rubber, for instance, around the regulating spark-gap the brilliant glow of the discharge is hidden and will not annoy the patient.

The drawing is a diagrammatic representation of my improvement.

In the drawing, A represents a Roentgen-ray tube or bulb having an auxiliary tube B, containing a suitable volatile salt C. The tube A has the usual electrodes *a b*, connected to the poles D E of a suitable generator by wires *c d*. As shown, *a* represents the cathode, and *b* the anode, so that the current is in direction from E to D. A shunt-circuit is connected from the auxiliary tube B through my adjustable spark-gap to the negative pole D.

G represents a suitable base of conducting material having an electrode *f* projecting therefrom or suitably connected thereto and the binding-post *g* for the connection of one of the shunt-wires. A suitable receptacle F is adapted to be placed upon the base G over electrode *f*. This receptacle F may be integral with the base G or made removable therefrom, and it may have a cover either integral therewith or made in a separate piece. The receptacle F and cover H may be made of any suitable material, as glass or hard rubber. Through the cover H is passed an adjustable electrode *h*, carrying a suitable point or end *e*.

In the operation of my regulator or vacuum adjuster connection may be made between the auxiliary tube B and electrode *h*, and connection may also be made between the binding-post *g* and a pole, as D, of the generator. It will thus be evident that if the resistance at the spark-gap in the receptacle F be so adjusted as to be greater than that of the resistance between the electrodes *a b* in the vacuum-bulb A for normal working no current will pass through the shunt. It is also evident that by adjusting the spark-gap in the shunt current may be made to pass therethrough and the salt C volatilized at will to regulate the vacuum in bulb A.

Other arrangements of circuits may be devised and the specific construction of details may be varied without departing from the spirit of my invention.

Without limiting myself to the precise construction and arrangement of parts shown and described, I claim—

1. A vacuum-adjuster for Roentgen-ray tubes, consisting of a shunt-circuit including, in the path of the current, a volatile salt within the vacuum-inclosure, and a spark-gap within a closed receptacle, substantially as described.

2. A vacuum-adjuster for Roentgen-ray tubes, consisting of a shunt-circuit including, in the path of the current, a volatile salt within the vacuum-inclosure, and an adjustable spark-gap within a closed receptacle, substantially as described.

3. A vacuum-adjuster for Roentgen-ray tubes, consisting of a shunt-circuit including, in the path of the current, a volatile salt within the vacuum-inclosure and a spark-gap inclosed in an air-tight receptacle, substantially as described.

4. A vacuum-adjuster for Roentgen-ray tubes, consisting of a shunt-circuit including, in the path of the current, a volatile salt within the vacuum-inclosure, and an adjustable spark-gap inclosed in an air-tight receptacle, substantially as set forth.

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

HARRY FULLER WAITE.

Witnesses:

HENRY E. WAITE,

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