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W. B. CHURCHER.

X-RAY APPARATUS.

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NO MODEL.

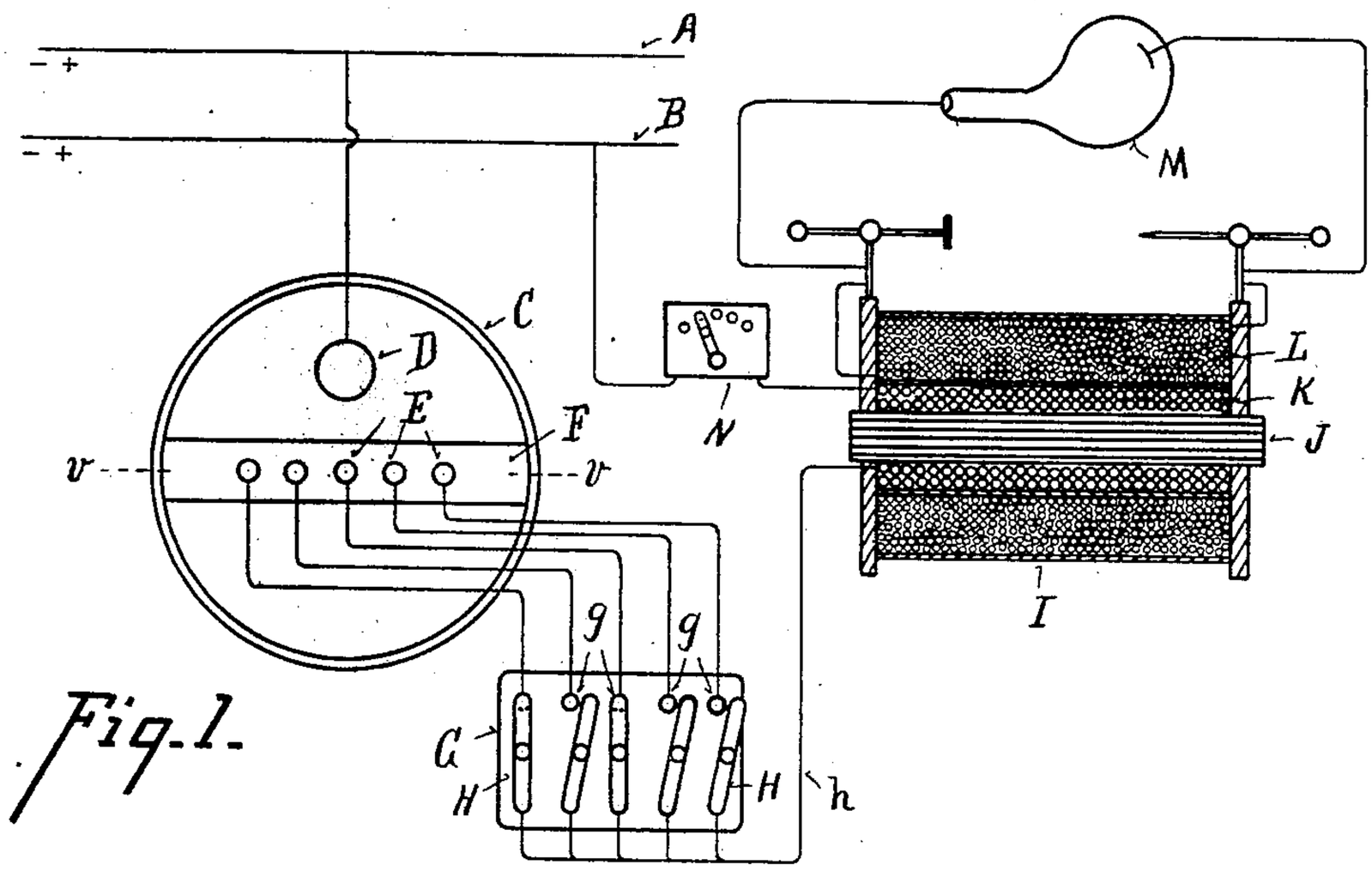

Fig. 1.

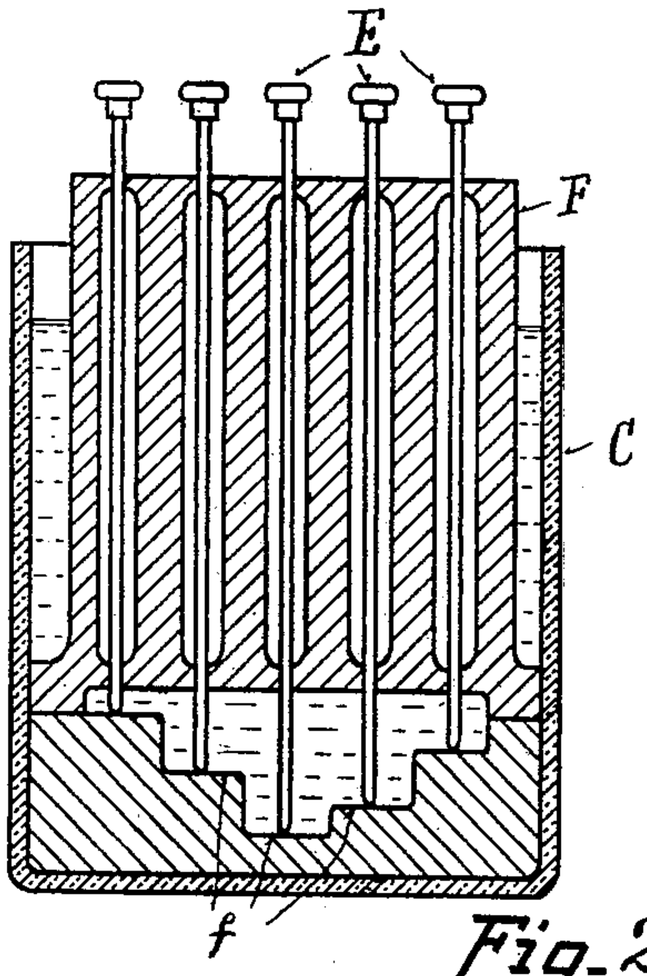

Fig. 2.

Fig. 3.

Fig. 4.

Witnesses
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UNITED STATES PATENT OFFICE.

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X-RAY APPARATUS.

SPECIFICATION forming part of Letters Patent No. 762,881, dated June 21, 1904.

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To all whom it may concern:

Be it known that I, WILLIAM B. CHURCHER, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in X-Ray Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in X-ray apparatus. One of its objects is to provide apparatus by means of which X-rays of the desired character can be produced from a source of alternating current.

Another object is to provide improved means for regulating the volume of current and the rapidity of interruptions requisite to produce the quality of X-rays desired.

It further consists in certain details of form, combination, and arrangement, all of which will be more fully set forth in the description of the accompanying drawings, in which—

Figure 1 is a diagram of my improved apparatus. Fig. 2 is a central section on line *v v* of Fig. 1 through the electrolytic cell. Figs. 3 and 4 are diagrams illustrating the change produced in the character of current.

A B represent the line-wires supplying alternating current. C represents an electrolytic cell having one or more electrodes D, of aluminium, and one or more, preferably a series, of electrodes E, of platinum, carbon, or other suitable material. The electrodes E are preferably set in a porcelain supporting-frame F, so as to expose only a limited area to the electrolyte, which is preferably effected by passing the electrodes E through vertical channels in the upper portion or section of the supporting-frame and allowing their lower ends to rest upon steps of the lower section of the frame, so that the portion of the electrodes between the steps and the lower end of the upper section of the frame is in contact with the electrolyte, and thus the amount of surface of the respective electrodes in contact with the electrolyte differs.

G represents a switch-plate having a series of contacts *g*, which are connected by wires with the respective electrodes E.

H represents separate switch-levers adapted to independently connect the contacts *g* with the line *h*.

I represents a transformer adapted to produce current of high potential suitable for the generation of X-rays. This transformer preferably consists of a laminated iron core J, a primary coil K, and a secondary coil L, to the terminals of which the X-ray bulb M is connected.

In operation one or more of the electrodes E are connected into the circuit by means of switch-levers H, depending upon the volume of current to be passed through the primary coil K and the number or frequency of interruptions desired. The current is then turned on and regulated at the rheostat N. As an electrolyte a solution of sodium or potassium phosphate, or both together, is preferably employed. The action of the electrolyte and the aluminium electrode is such as to permit the plus wave of the current to pass freely from the electrodes E, acting as anodes to the electrode D, acting as a cathode; but their effect upon the reverse or minus wave of current is such as to practically suppress the same. In Fig. 3 I have indicated approximately the wave of the normal alternating current, and in Fig. 4 the effect produced thereon by passage through the electrolytic cell. As the relative surface of electrodes E or anode is very small compared with the volume of plus current passing, gases are produced at the surface thereof, due to electrolytic action, which serve to insulate the surface of the electrodes E, and thereby produce a very rapid interruption of the current, while during the passage of the minus waves the volume of current passing is diminished to such an extent that little or no interruption of the current takes place at the passage of minus waves. The result is that the primary coil K is traversed almost or quite exclusively by a rapidly-interrupted plus current which

reacts upon the secondary coil to produce therein the character of current adapted to obtain the best results in the X-ray bulb.

By employing a series of electrodes E and selectively connecting the same into the circuit I am able to locate the electrolytic cell in the cellar or other suitable location therefor and to make the connections at the switchboard located near the transformer. The effect of increasing the anode-surface is to permit an increase of current volume without increasing the rapidity of interruption, while a decrease of anode-surface with a given volume of current increases the rapidity of the interruptions, thereby producing means for regulating the current volume and the rapidity of interruptions thereof. I am thus enabled to obtain with a source of alternating current and in localities where only alternating current is available equally as good if not superior results to those which could heretofore be obtained with direct current and with apparatus which is simple and reliable.

Having described my invention, what I claim is—

1. In combination, an X-ray generator, a secondary coil supplying current thereto, a primary coil to induce a current in said secondary, an electrolytic cell having an electrode adapted to freely pass current of one polarity and to resist the passage of current of opposite polarity, an electrode exposing a restricted surface to the electrolyte to interrupt the current, and a source of alternating current connecting said primary coil and electrolytic cell in circuit.

2. An electrical converter for producing from a source of alternating current a rapidity-interrupted current of one polarity, consisting of an electrolytic cell, an electrode adapted to freely pass a current of one polarity and to resist the passage of current of the opposite polarity, and an electrode exposing a restricted surface to the electrolyte to interrupt the passing current.

3. In an electrical converter, an electrolytic cell, an electrode adapted to freely pass current of one polarity and to resist the passage of current of the opposite polarity, a series of electrodes, each exposing a restricted surface to the electrolyte to interrupt the current, and means for selectively connecting one or more of said interrupting-electrodes in circuit.

4. In an electrical converter, an electrolytic cell, an electrode adapted to freely pass current of one polarity and to resist the passage of current of the opposite polarity a series of electrodes exposing restricted surfaces of respectively different areas to the electrolyte to interrupt the current, and means for selectively and collectively connecting said interrupting-electrodes in circuit.

5. In combination an X-ray generator, a secondary coil supplying current thereto, a primary coil to induce a current in said secondary, a source of alternating current connecting said primary coil in circuit, and means interposed in said circuit for suppressing the waves of one polarity of said alternating current, and rapidly interrupting the waves of opposite polarity thereof.

In testimony whereof I have affixed my signature in presence of two witnesses.

WILLIAM B. CHURCHER.

Witnesses:

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