No. 677,499. Patented July 2, 1901.

E. W. CALDWELL.

METHOD OF INTERRUPTING ELECTRIC CURRENTS.

(Application filed May 20, 1901.)

(No Model.)

Fig.1

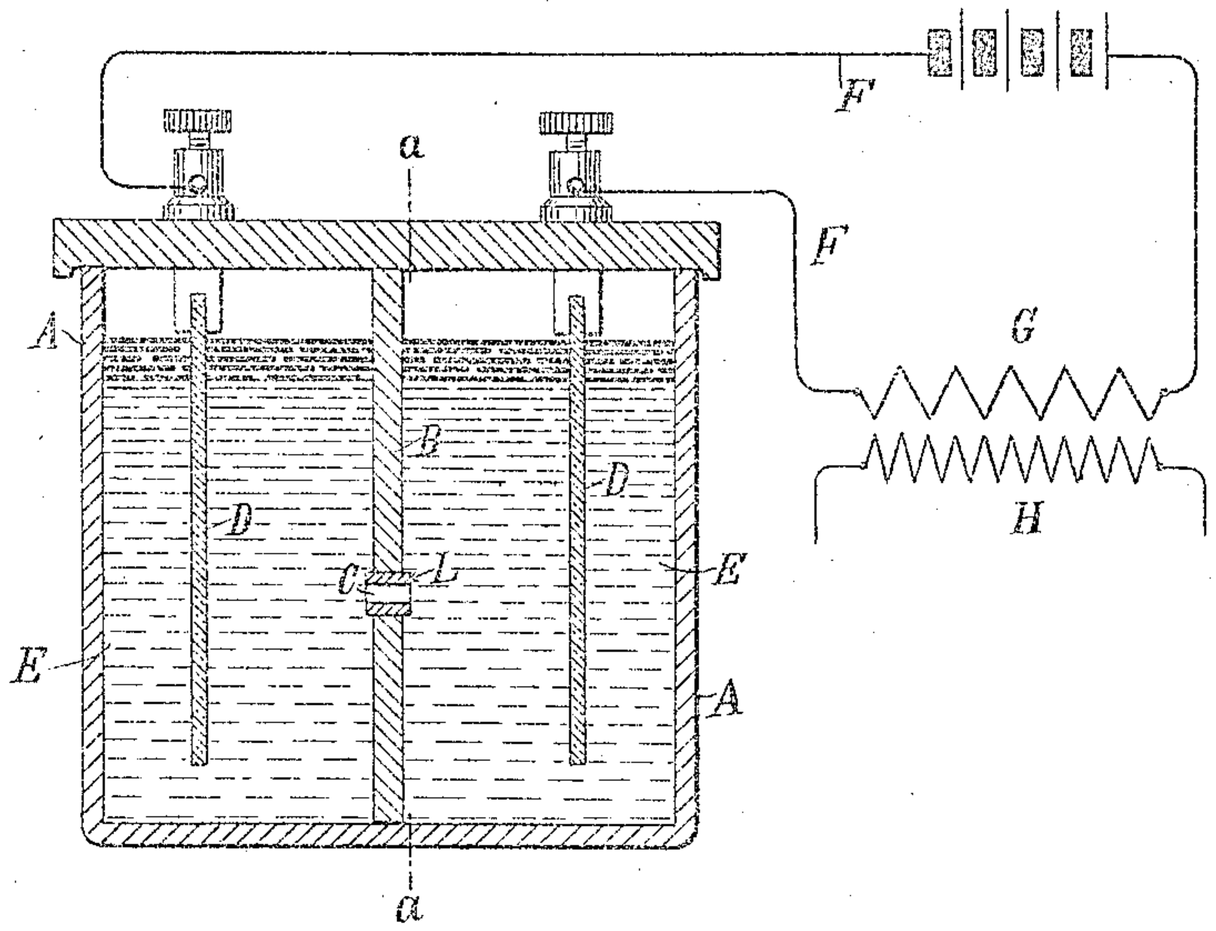


Fig.2

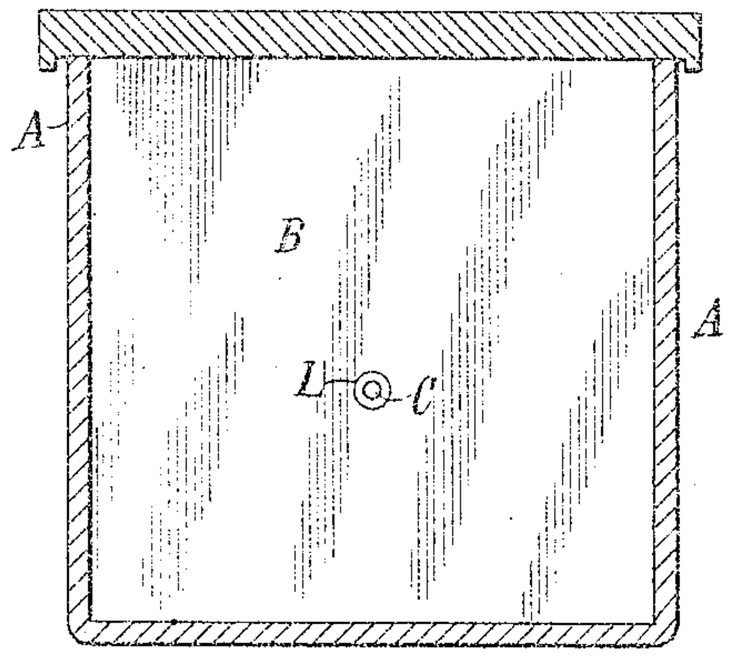
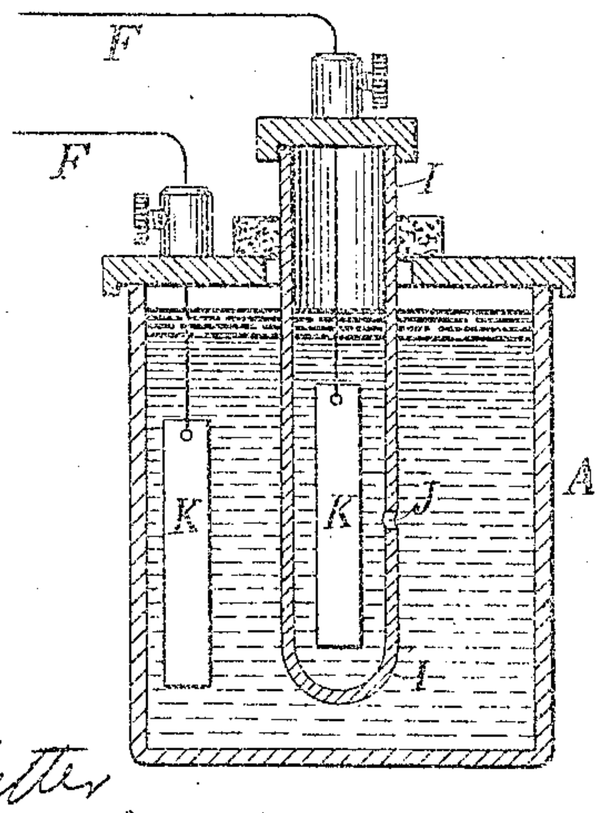


Fig.3



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UNITED STATES PATENT OFFICE.

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METHOD OF INTERRUPTING ELECTRIC CURRENTS.

SPECIFICATION forming part of Letters Patent No. 677,499, dated July 2, 1901.

Original application filed May 4, 1899, Serial No. 715,557. Divided and this application filed May 20, 1901. Serial No. 61,035. (No specimens.)

To all whom it may concern:

Be it known that I, EUGENE W. CALDWELL, a citizen of the United States, and a resident of the city of New York, in the borough of Manhattan, county and State of New York, have invented a certain new and useful Method of Interrupting Electric Currents, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

This application is a division of my copending application for electric-current interrupters, Serial No. 715,557, filed May 4, 1899.

The present invention relates to a new method of interrupting, especially at a high rate of frequency, an electric current.

The invention as herein illustrated and described is applicable to an interrupter for use in connection with an induction-coil, especially such a coil as is used for X-ray work; but it is to be understood that this method of interrupting currents may be used with other apparatus requiring an interrupted current.

In general terms the invention consists in passing an electric current through an electric conductor a portion of which is composed of a fluid. A part of such fluid is so confined that as the current passes it will be evaporated or rendered gaseous, and thereby the circuit will be broken and the current thereby interrupted. Then since no current is passing through the confined part of the fluid the evaporation ceases and the fluid once more conducts the current, and this action is rapidly repeated, so that a regular and rapid interruption of the current results.

By the expression "confined" I mean simply that the cross-section of that part of the fluid should be sufficiently small compared with the other parts of the fluid to make possible the results above described.

Referring to the drawings, Figure 1 illustrates one form of apparatus for carrying out my improved process. Fig. 2 is a cross-section on line *a a*. Fig. 3 is a modified form of the apparatus for practicing my invention.

Referring to the views in detail, A represents a vessel of any proper material and size and form of construction.

B represents a diaphragm or separating member integral with the walls of the main vessel or disconnectedly arranged relatively to the same, which diaphragm is pierced by an open passage C.

D D represent circuit terminal plates or electrodes supported by any suitable means in position relatively to the diaphragm, practically as shown in the figures. These plates are of sufficient size to effect full electrical communication with the fluid E, contained in the receptacle A, which fluid is preferably acidulated water. Other terminals and other fluids may be used. These terminals are connected to the wires F F, which for illustration form the primary G of the induction-coil H.

The action of the apparatus is as follows: Current passing through the fluid connecting the terminals so heats the part of the fluid conductor confined in the passage through the diaphragm as to cause such confined fluid to be vaporized or become gaseous or to expand in the form of bubbles, which will interrupt the passage of the current, (or the most of the current, if not all,) whereupon the gas or bubble will tend to move from the confining-passage or to condense, and then the pressure of the fluid in the vessel will act to refill the passage, the current will be remade, another bubble formed, and so on. This operation will go on with high and manageable frequency of current interruption and with sustained regularity, so that (as is found after many and careful experiments) a high frequency and certain efficiency are secured for the purpose of interrupting an electric current or circuit. Such apparatus used to operate an induction-coil, especially for the purpose of X-ray work, is found to effect greater steadiness as to the work of the secondary coil than that of any electric interrupter known to me.

Referring to Fig. 3, in lieu of the diaphragm of Fig. 1 I use a tube T, which is perforated at J or any other place as requirements may demand, which tube contains the terminal K, and another terminal K is contained in the outer vessel, the solution or fluid being the same as before.

In the last-mentioned case the tube constitutes a convenient member to be easily removed, so that tubes having passages of dif-

ferent sizes may be readily utilized to effect various rates of interruption. In the case of Fig. 1 the passage there shown may be modified as to size, as by the removal therefrom of the small tube or passage-closing tube L.

The frequency of interruption can be varied in different ways. The size of the passage in the partition between the terminals may be increased or diminished, the passage may be of a fixed size and the terminals be brought closer together or placed farther apart than is shown, the electrical conductivity of the fluid can be varied, and the gravity action of the fluid can be utilized for the same purpose.

Generally speaking, it is found that after the apparatus has been in use for a short time the fluid in the containing vessel will be brought to a temperature that will remain practically stationary, whereupon the frequency of interruption becomes uniform, although it should be understood that the apparatus works instantly at ordinary temperature upon the closing of the circuit, though with an increasing rate of interruption as the fluid rises in temperature.

I am aware that electric-circuit interrupters involving electrolytic action have heretofore been suggested. In the present case the essential interrupting action is that of heating a confined part of a body of conducting fluid by the passage of the electric current through such part, so that it is formed into steam or gas.

What is claimed as new is—

1. The herein-described method of interrupting an electric current by passing said current through a circuit, a portion of which is composed of a conducting fluid, by confining a part of said fluid and by heating and vaporizing said part.

2. The herein-described method of interrupting an electric current by passing said current through a circuit, a portion of which is composed of a conducting fluid, by confining a part of said fluid and by vaporizing the same by the heat produced by said current.

3. The herein-described method of interrupting an electric current by passing the same through a circuit, a portion of which is composed of a conducting fluid, by confining a part of said fluid and by subjecting the same to pressure and by heating and vaporizing said confined part of the fluid.

4. The herein-described method of interrupting an electric current by passing the same through a circuit, a portion of which is composed of a conducting fluid, by confining a part of said fluid and by subjecting the same to the pressure of the superposed fluid and by vaporizing said confined part of the fluid by the heat produced by a passing current.

5. The herein-described method of interrupting an electric current by passing the same through a circuit, a portion of which is composed of a conducting fluid by confining a part of said fluid and by vaporizing the same by a passing current.

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