No. 753,819. PATENTED MAR. 1, 1904.

G. J. ATKINS.

ELECTRODE.

APPLICATION FILED APR. 8, 1903.

NO MODEL.

Fig. 2.

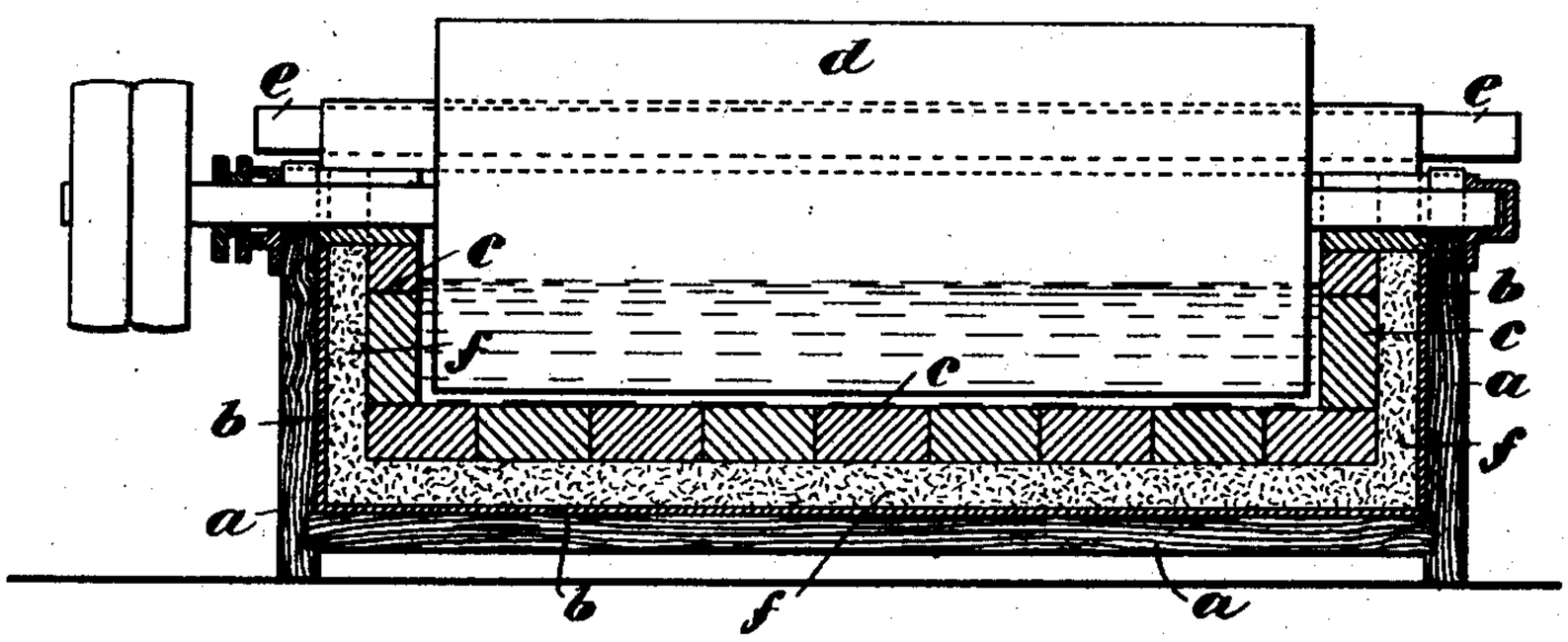


Fig. 1.

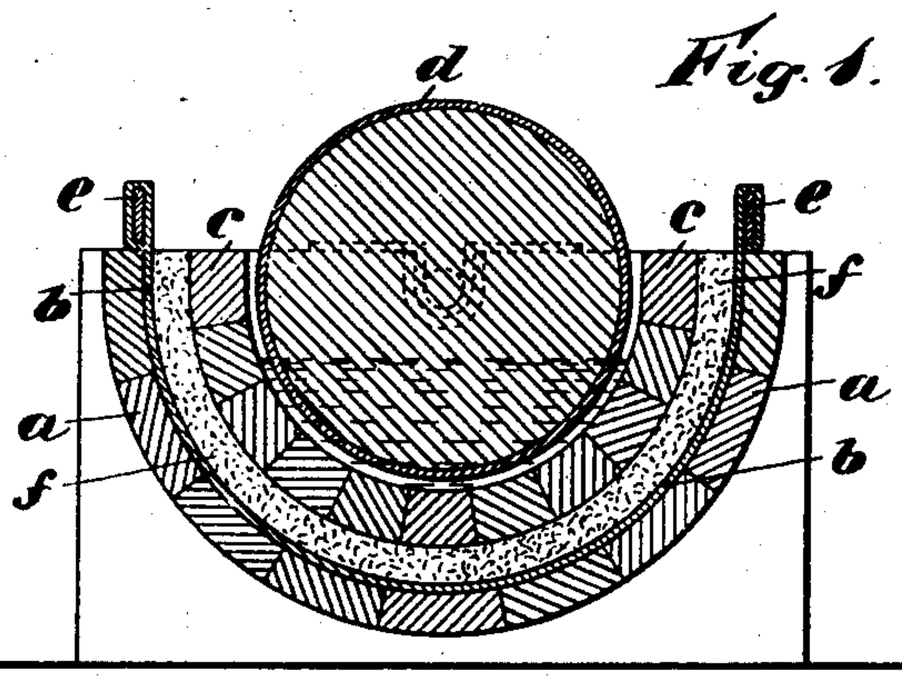


Fig. 3.

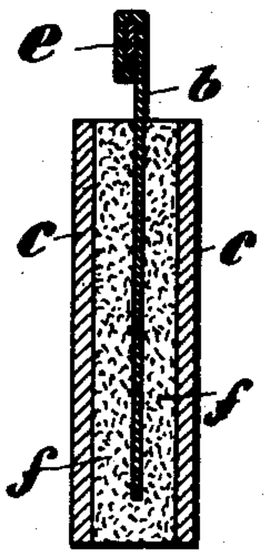
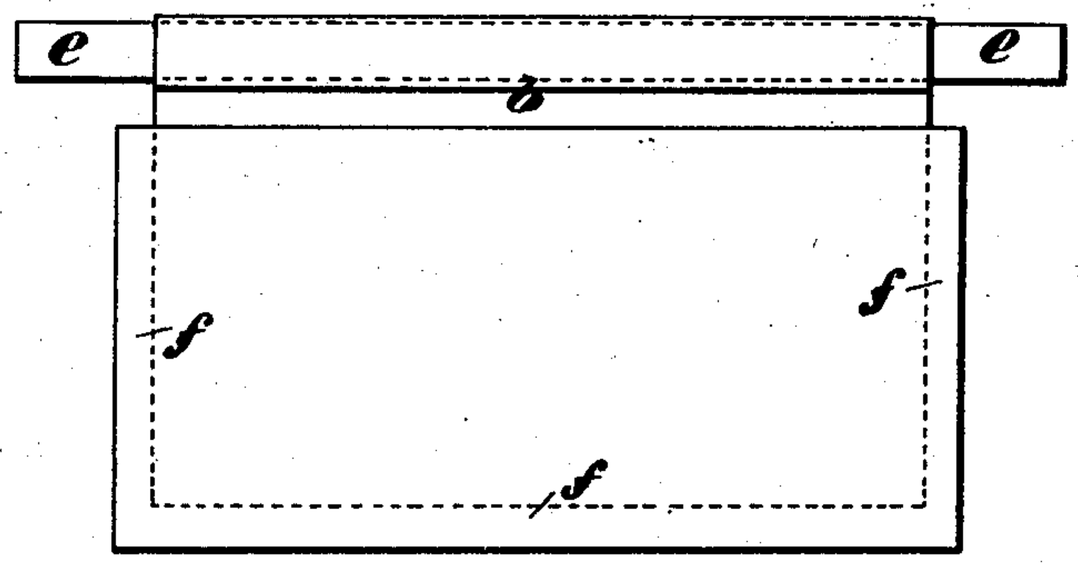


Fig. 4.



Witnesses.

Stephen Edward Gunyon -

Walter D. Skerten.

Inventor.

George John Atkins

No. 753,819. Patented March 1, 1904.

UNITED STATES PATENT OFFICE.

GEORGE JONES ATKINS, OF TOTTENHAM, ENGLAND.

ELECTRODE.

SPECIFICATION forming part of Letters Patent No. 753,819, dated March 1, 1904.

Application filed April 8, 1903. Serial No. 151,668. (No model.)

To all whom it may concern:

Be it known that I, GEORGE JONES ATKINS, a subject of the King of Great Britain, residing at Tottenham, in the county of Middlesex, England, have invented certain new and useful Improvements in or Connected with the Electrodes of Electrolytic Apparatus and the Like; 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.

This invention relates to improvements in that class of electrolytic apparatus and the like in which one or more of the electrodes is or are composed of carbon or other analogous conductive material in order to form an insoluble electrode; and the object of the invention is to provide improved means for introducing the electric current to such electrodes or for taking the current from them.

The reason why non-oxidizable oil is preferred in the preparation of the substratum is that non-oxidizable oil—mineral lubricating-oil, for example—contains no oxygen, but hydrogen and carbon. Consequently it has no chemical action upon the metallic conducting-plate; but oxidizable oils contain hydrogen, carbon, and oxygen, and the latter is liable to attack the metallic conductor and to set up resistance to the electric current.

It is well known that carbon, for example, is a comparatively bad conductor of electricity, and it is somewhat difficult to introduce a current of considerable density into or to take it from an electrode made of that material and of such a size as it is necessary to employ in an apparatus of this kind constructed on a practical commercial scale. Heretofore the current has generally been introduced or taken away by casting or depositing onto the carbon electrode a metallic conductor (preferably of lead or copper) of sufficient cross-section to carry the current at the required density; but these means are not satisfactory, as the current is not thereby evenly distributed to all parts of the acting surface of the electrode.

The object of my present invention is to insure a more even or uniform introduction or delivery of the current to the entire mass of the carbon electrode than has been practicable with the means heretofore employed, and for this purpose I make the conductor intended to deliver the current to or from the electrode of a sheet of metal—such as lead or copper, for example—one or both surfaces of which is or are connected with the carbon or other analogous material of the electrode in a manner to be hereinafter described. I connect the main conductors to or from the electrode, as the case may be, with the aforesaid sheet-metal conductor and so proportion the various parts that the full quantity of current is delivered to or removed from the electrode without undue heating of any of the said parts. Now inasmuch as it is difficult, if not impossible, to make an ordinary carbon electrode or one made of other analogous material impervious to the electrolyte the latter would obtain access to the sheet-metal conductor if steps were not taken to prevent it, and the latter would be rapidly decomposed and destroyed. In order to prevent this, I interpose between the carbon or other analogous electrode proper and the sheet-metal conductor a substratum or basis composed of finely-divided carbon that has been combined with oil, preferably non-oxidizable oil—such as ordinary mineral lubricating-oil, for example. I have found that this substratum thus made becomes not only waterproof, but is a comparatively good conductor of electricity. By this means the sheet-metal conductor is shielded from contact with the electrolyte and is therefore preserved from electrolytic dissolution, while a sufficiently good electric connection is established between the surface of the said sheet-metal conductor and that of the electrode proper.

In the accompanying drawings, Figure 1 is a transverse section of an electrolytic apparatus of a now well-known kind having a rotating cathode and constructed in accordance with my invention. Fig. 2 is a longitudinal section of same. Fig. 3 is a vertical section of an electrode suitable for an ordinary cell with stationary cathode, and Fig. 4 is an elevation of same.

Similar letters of reference relate to like parts in all the figures of the drawings.

a is the usual trough-like vessel or cell,

commonly made of wood; but it may be made of other material, if preferred.

b is the aforesaid sheet-metal conductor, preferably made of lead, though other metal, such as copper, for example, may be employed.

c is the carbon or other analogous anode, which may be made of bricks of molded carbon or of bricks cut out of gas-retort carbon or any other suitable form of carbon, or other analogous material may be employed.

d is the revolving cathode, which may be made of lead, though other metal—such as platinum, for example—may be employed if preferred.

e represents the main conductors, preferably of copper, leading the current from the dynamo or other source of electricity to the sheet-metal conductor *b*, and these main conductors are preferably connected with the said conductor *b* by the upper edges of the latter at one or both sides of the cell, being wrapped round them, as shown in Fig. 1, or otherwise so intimately connected to them as to insure perfect electrical connection.

f is the aforesaid layer of substratum, composed of finely-divided carbon combined with non-oxidizable oil and rammed into the space between the sheet-metal conductor *b* and the electrode proper, *c*, care being taken that only just so much non-oxidizable oil is used as will cement the particles of carbon together and fill the interstices between them sufficiently to prevent the passage of liquid through such interstices.

In cases where the sheet-metal conductor is covered on both sides and at the edges with the above-described substratum it is completely protected thereby, as shown in Figs. 3 and 4, which indicate the application of the invention to a flat electrode, as used in an ordinary electrolytic cell with flat plates. In these figures *b* represents the sheet-metal conductor; *c*, the carbon or other analogous material forming the electrode proper; *e*, the main conductor, and *f* the substratum, all as described with reference to Figs. 1 and 2; but in cases where the sheet-metal conductor is only covered on one side, for example, with the substratum other means must be employed to prevent the electrolyte reaching the side or part not covered with the substratum. For this purpose such side or parts may be varnished or otherwise protected with any suitable material not acted upon by the electrolyte.

It will be understood that the above-described substratum *f* not only acts a waterproof shield to prevent the access of the electrolyte to the sheet-metal conductor *b* and as a conducting medium between such sheet-metal conductor *b* and the electrode proper, *c*, but also as a more or less elastic and flexible medium between these parts, which permits of the unequal expansions and contractions of those parts without destroying its own integrity and without allowing the electrolyte to reach the sheet-metal conductor, even when the electrode *c* has become cracked or broken, so as to let the electrolyte pass through it to the surface of such substratum.

The carbon or other analogous electrode *c*, which is to be applied to the surface of the substratum *f* remote from the sheet-metal conductor *b*, may be formed of a single plate or slab of carbon or other analogous material or of blocks or any suitably-shaped pieces bedded to the substratum and held in close electrical contact therewith by any suitable means.

In some cases the surface of the sheet-metal conductor may be amalgamated with mercury or a suitable mercurial alloy—such as silver amalgam, for example.

For the purpose of forming the carbon substratum *f* I have found heavy petroleum lubricating-oil a suitable saturating liquid; but I do not confine myself to that material, as any other liquid or semiliquid material may be employed that will produce, on the one hand, a waterproof substratum and, on the other, will not interfere too much with the power of the carbon composing it to conduct the current from the sheet-metal conductor *b* to the carbon electrode *c*, or vice versa.

The above-described improvements are specially applicable to trough-like electrolytic cells with rotating cathode-poles, as above described; but they are also applicable to many other electrolytic cells and batteries where carbon or other analogous poles are employed.

I claim—

1. An electrode for electrolytic or the like apparatus which consists of a sheet-metal conductor *b*, a carbon or other analogous electrode proper *c*, and a conducting, but waterproof, substratum *f* interposed between the said conductor *b* and the electrode proper *c* for the purpose of isolating the said conductor *b* from the electrolyte while establishing and maintaining electric connection between the said conductor *b* and the electrode *c*, substantially as described.

2. In a pole or electrode for electrolytic or the like apparatus, the combination with a sheet-metal conductor *b* and electrode proper *c*, of a waterproof conducting substratum *f* interposed between said parts, said substratum being composed of finely-divided carbon combined with a non-oxidizable oil impermeable to the electrolyte substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

GEORGE JONES ATKINS.

Witnesses:
STEPHEN EDWARD GUNYON,
WALTER J. SKERTEN.