(No Model.)

C. W. A. HERTEL.

GALVANIC BATTERY.

No. 519,330. Patented May 8, 1894.

Fig. 1.

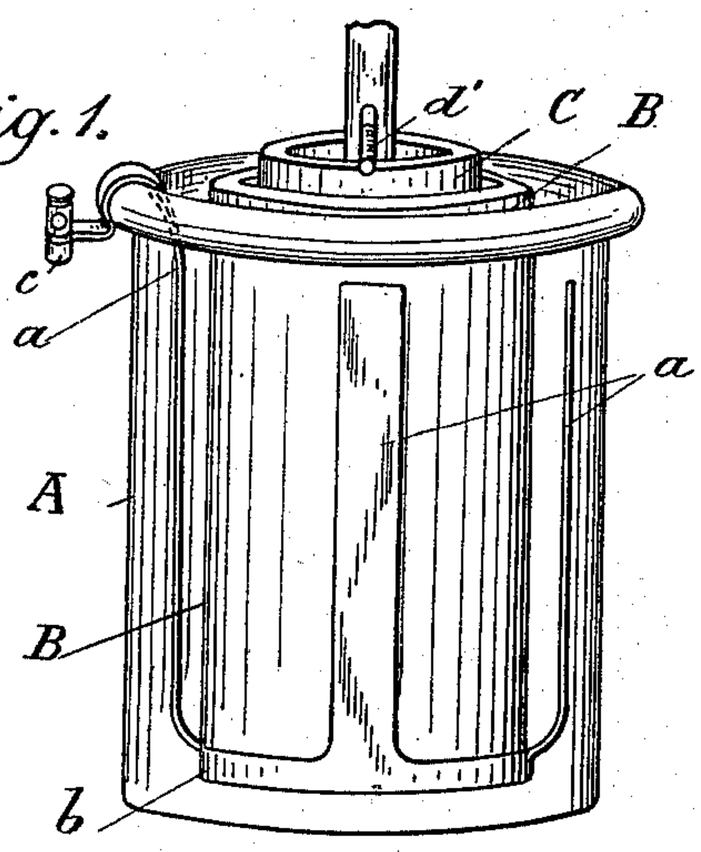


Fig. 2.

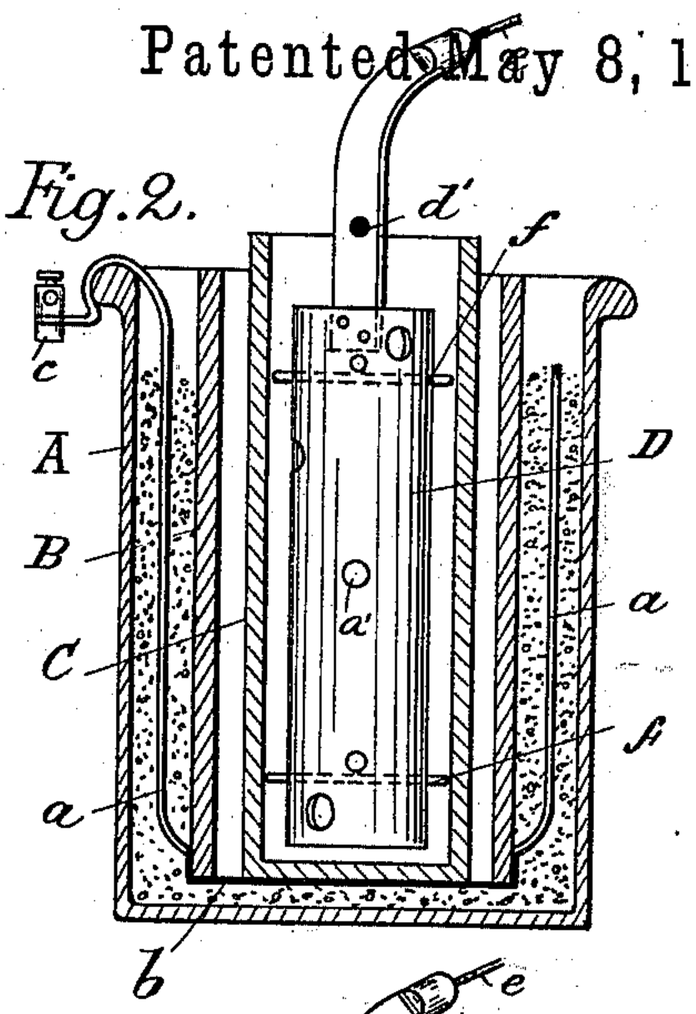


Fig. 3.

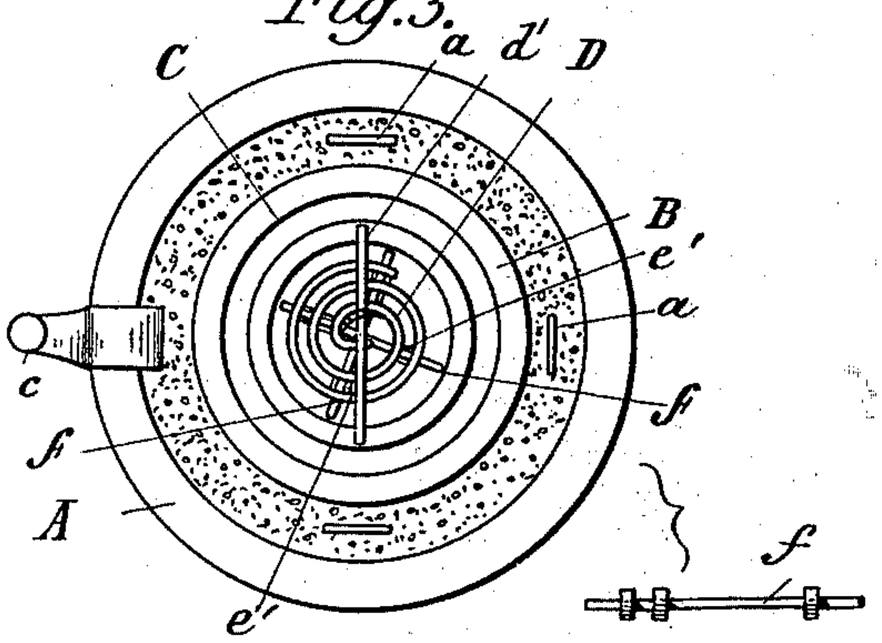


Fig. 4.

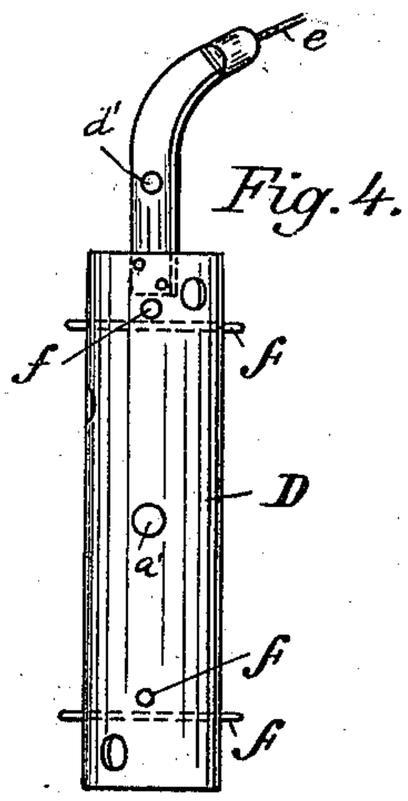


Fig. 5.

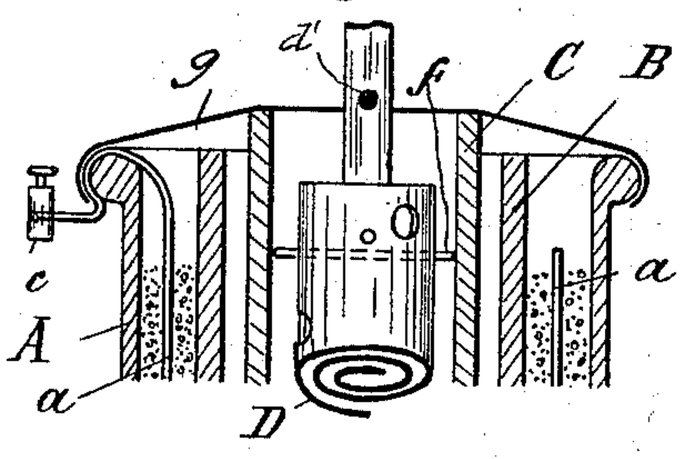
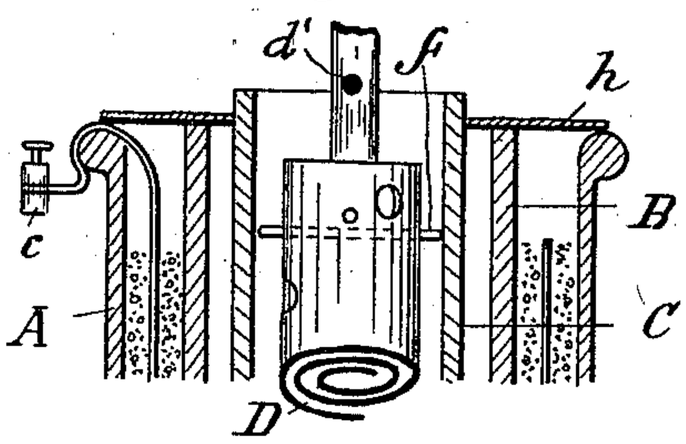


Fig. 6.



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CARL WILHELM ADOLF HERTEL, OF BERLIN, GERMANY.

GALVANIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 519,330, dated May 8, 1894.

Application filed July 14, 1893. Serial No. 480,461. (No model.)

To all whom it may concern:

Be it known that I, CARL WILHELM ADOLF HERTEL, manufacturer, a subject of the King of Prussia, German Emperor, residing at the city of Berlin, in the Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Galvanic Batteries, of which the following is a specification.

The galvanic elements known up to the present time have a great number of defects of which the principal are imperfect working when a powerful effect is to be produced, the short life of the cell before replenishing and the requirement of a long time for regenerating the battery. Besides these objections, the powerful elements as Bunsen elements or those filled with chromic acid or similar highly volatile acids render it impossible to put up a galvanic battery inside inhabited places.

The improvements in galvanic elements that constitute the subject matter of this invention render it possible to construct a powerful element in which the regenerating is done in a proportionally short time and perfectly odorless and of which the cost of keeping in constant operation is very small.

The object of the invention is effected first by a proper combination of zinc, copper and carbon, and second by the use of an improved active fluid agent.

In the drawings—Figure 1, shows a view of the element without the material that generates the induction. Fig. 2, is a vertical sectional view of a cell ready for use. Fig. 3, represents a top view of Fig. 2. Fig. 4, shows the connection of the conducting wire with the zinc-electrode. Figs. 5 and 6 show the closing of the element by means of a rubber cover and a slate tablet.

In the vessel A, as will be seen by Figs. 1 and 2 is located an open carbon cylinder B, the lower end of which is closed by a copper cap *b* which terminates in strips *a* one of which is prolongated outside the vessel in order that the binding post *c* for the circuit wire can be fixed to it. The strips or bands *a* are at a certain distance from the cylinder A and from the cylinder B. The carbon cylinder so mounted is put into the vessel A after the bottom of the same has been filled with gas retort carbon cut in small pieces in such a manner that the upper extremity of the carbon cylinder B is level with the edge of the vessel. The space between the outside wall of the carbon cylinder B and the inside wall of the glass vessel A is also filled with small pieces of gas retort carbon and oxide of copper to which is added some protoxide of copper, in such a manner that the bands *a* are embedded therein. A second carbon cylinder C, closed at the bottom is put into the cylinder B, the diameter of which is smaller than the diameter of the interior of the carbon cylinder B so that there remains an annular space between the two cylinders. The closed bottom is adapted to catch the electrolytic precipitates of the zinc and prevent them from settling upon the electrode B. The zinc electrode is arranged in the carbon cylinder C and is suspended therein by a glass rod *d'* passing through an opening in the stem of the electrode and resting upon the upper edge of the cylinder C. Thus there is a space left between the bottom of the carbon cylinder and the bottom surface of the zinc electrode.

The zinc electrode D consists of a spirally wound or zig-zag shaped zinc plate which is provided with perforations *a'* for the circulation of the induction liquid and also with perforations for receiving the glass rods intended for insulating the same.

In Fig. 4 is shown the zinc electrode D connected with the conducting wire *e*, and insulated against the inside wall of the cylinder C by means of glass rods *f* which pass through the zinc electrode D and project outside its walls. Washers *e'* are placed around the glass rods *f* between the windings of the zinc electrode which prevents the displacement of the zinc and glass rods in relation to each other which might otherwise arise from the wearing out of the zinc electrodes at the perforations through which the glass rods pass, but by using the rubber rings on the glass rods the latter remain constantly in the required position as no wearing out of and no change in the rubber rings take place.

For closing the cell either a cap of elastic rubber *g* can be used, as seen in Fig. 5, which has an opening through which the conducting wire of the zinc electrode passes or a fixed cover *h*, Fig. 6, can be employed made of slate or of any any other suitable material. In the

latter case it is necessary to leave an opening in the cover *h* for the passage of the cylinder C. When now the carbon cylinder B having a copper bottom has been inserted in the vessel A and small pieces of gas retort carbon with an addition of oxide of copper and protoxide of copper has been introduced in the described way and the inner cylinder C has been put into the cylinder B, the next thing that must be done is to pour into the annular space between the cylinder B and the wall of the vessel A, the exciting liquid consisting of a solution of caustic potash and then to fill the inner cylinder C with that solution after having placed the zinc electrode D in the same.

It is not absolutely necessary that the outside vessel be of glass as it can be made of iron or any other suitable metal and in that case the binding post *c* will be fixed directly to the vessel A. The object of placing small pieces of gas retort carbon upon the bottom of the vessel and of the introduction of said carbon in the space between the vessel A and the cylinder B is to obtain a greater yielding power and to weaken as much as possible the polarization which takes place when the element is used and finally by the conversion of the protoxide of copper into oxide of copper during the working of the element, to compensate for the loss of oxide of copper caused by said working so as to obtain not a momentary but a continuous regeneration of the element, that is, a regeneration taking place as often as desired.

The chemical process during the working of the battery can be explained as follows: After the circuit has been closed a decomposition of water takes place. The positive current goes from the zinc through the liquid to the copper or coal plates. The hydrogenous particles move in the same direction; there they reach the oxide of copper and by the strongly reducing power inherent to the hydrogen the oxide of copper is converted into protoxide of copper or even to metallic copper. The oxygen particles, the carriers of the negative current travel in the opposite direction from the copper bands toward the zinc.

I claim—

1. In a galvanic battery, the combination of the vessel A, the outer carbon cylinder B having the copper bottom and the copper terminals *a* embedded in a depolarizing compound in the vessel A, the second carbon cylinder C closed at the bottom and electrically connected with the copper bottom *b* and the zinc electrode D arranged within the inner cylinder C, substantially as described.

2. In combination, the vessel A, the carbon cylinder B arranged therein, the terminals connected therewith, the removable carbon cylinder C arranged within the cylinder B, and electrically in connection or contact therewith and the zinc electrode arranged within the inner cylinder, said inner cylinder having a closed bottom adapted to catch the electrolytic precipitates of the zinc and prevent them from settling upon the electrode B, substantially as described.

3. In combination, the vessel A, the carbon electrode, the porous carbon cylinder C, the zinc electrode within the same and a glass rod passing through the stem of the electrode and resting upon the top of the cylinder C, substantially as described.

4. In combination, the vessel, the carbon electrode therein, the zinc electrode consisting of the sheet of zinc wound spirally, the glass rods passing through the zinc electrode to hold the same in position and insulate it and the rubber rings on the glass rods, between the zinc windings, substantially as described.

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

CARL WILHELM ADOLF HERTEL.

Witnesses:
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G. WILLNER.