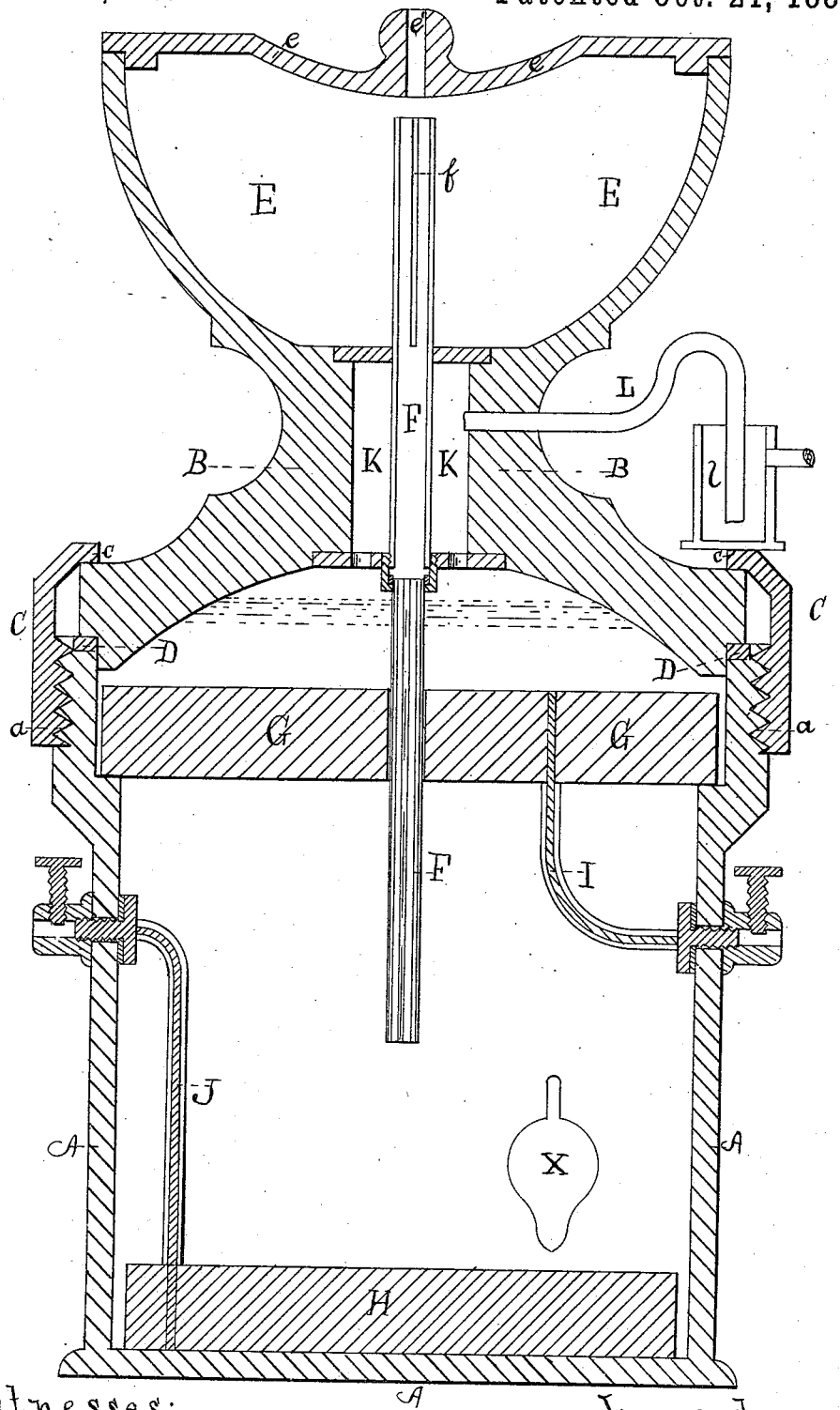
(No Model.)

J. ZOBEL.

BATTERY CELL.

No. 306,796. Patented Oct. 21, 1884.



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UNITED STATES PATENT OFFICE.

JULIUS ZOBEL, OF NEW YORK, N. Y.

BATTERY-CELL.

SPECIFICATION forming part of Letters Patent No. 306,796, dated October 21, 1884.

Application filed January 5, 1884. (No model.)

To all whom it may concern:

Be it known that I, JULIUS ZOBEL, a citizen of Prussia, and a resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Cells for Batteries, of which the following is a specification.

My invention relates to an improved method of constructing the cells in "galvanic batteries," whereby the solution in the cell will be constantly supplied with the requisite proportion of sulphate of copper in solution and be retained at the proper height always to cover the copper electrode, but not to reach the zinc electrode, and the interior of the cell kept clean and free from deposits of copper, thus avoiding expense and time incident to repeated charging and cleaning of the cells, and also effecting a saving in the zinc and sulphate of copper used.

In the drawing, which shows my improved cell mostly in section, A is the jar of the cell, made of any suitable material and in any desired shape. Around its upper edge are formed screw-threads, (seen at *a*,) either in the material of which the jar is made or in a cap or ring firmly attached to the jar.

B is a cap or cover adapted to fit the upper rim of the jar.

C is a ring threaded on its inside to match into the threads *a* on the jar, and provided with an inwardly-projecting flange or lip, *c*, which laps over the edges of the cover B, thus firmly binding the cover and jar together when the ring C is screwed down.

D is a little rubber gasket or other suitable air-tight packing for the joint between the jar and the cover.

E is a receptacle placed on the top of the cover B, preferably covered with a removable lid, *e*, through which is a hole, *e'*.

F is a tube, made of material not acted upon by the solution, extending from about the line of the top of the copper electrode upwardly through the bottom of the receptacle E, preferably nearly to its upper edge. That portion of the tube which is within the cup E is slotted from the top downward nearly or quite to the bottom of the cup with a number of slots or other openings, *f*, for the free passage of the solution without allowing the sulphate-of-copper crystals to enter the tube, as hereinafter set forth. The top of the tube is also preferably covered to exclude the crystals.

G is the zinc electrode, and H is the copper electrode.

I is the connecting-wire for the zinc electrode, and J is the like wire for the copper electrode. That portion of these wires which is in the solution should preferably be insulated therefrom.

K is a little chamber in the cover B, which is open to the jar A, but closed to the cup E. Through the wall of this chamber passes a little tube, L, which is bent downwardly at its outer end and placed in the mercury in a mercury-cup, *l*, thus forming a mercury-valve.

X is a little hydrometer, which I prefer to place permanently in the cell, so that when the specific gravity of the solution becomes too great it may be readily ascertained.

The operation of my improved battery-cell is as follows: The copper and zinc electrodes being placed in position in the jar, and connection with the wires I and J having been made as usual, I first fill the jar with a solution of sulphate of zinc or of magnesia or any suitable salt used for this purpose, and I then, preferably, although it is not absolutely essential, add a sufficient quantity of sulphate-of-copper crystals (blue vitriol) to start the cell in operation. The solution of course covers the zinc plate. I then place the rubber gasket D or other packing in its place, put on the cover B, and screw the ring C firmly down, thus sealing the joint between the cover and the jar air-tight. The zinc G has a hole in its central part, through which the tube passes. The solution immediately commences to act on the sulphate-of-copper crystals, if used, and on the metals when the circuit is closed, and a gas is generated which rises through the solution to the upper part of the jar, and the process being continued the chamber K and the upper part of the jar become filled with the gas, thus creating a pressure upon the surface of the solution. This pressure increases until the solution is forced upward through the tube F into the receptacle E and escapes through the slots *f* into the receptacle, in which has previously been placed a quantity of dry sulphate-of-copper crystals, which crystals the

solution immediately commences to dissolve. The mercury-valve L *l* is so adjusted as to resist a pressure greater than that required to lift the solution through the tube into the lower part of the receptacle E; but as the solution rises higher the pressure increases until the mercury-valve is opened and allows the gas to pass through it. When this takes place, the pressure on the upper part of the jar and in the chamber K is suddenly relieved and the solution which has been forced into the receptacle E, and which has now by its dissolving the sulphate-of-copper crystals contained in the receptacle become a saturated solution of sulphate of copper, flows back again through the slots *f* and the tube F into the jar. This operation is repeated as often as the gas is generated in sufficient quantities. The valve is so adjusted that there will always remain in the jar sufficient of the sulphate-of-zinc solution to cover the zinc. In this manner the apparatus automatically supplies or replenishes the solution contained in it with the sulphate of copper as it is exhausted. Thus contact between the blue liquor and the zinc is prevented, and the solution always remains in a proper condition for use. It will be seen that contact between the blue solution and the zinc cannot take place, because the solution will dissolve the sulphate-of-copper crystals in the receptacle E only so long as the solution is not a saturated solution. Thus during the commencement of the operation of the battery the solution, which is then weak, will dissolve sufficient of the crystals contained in the receptacle to make that portion of the solution which is in the receptacle a saturated solution, and thus will continue until the blue solution has risen in the jar to about the height of the bottom of the tube F, then the solution which is forced upward into the receptacle will be itself a partially-saturated solution, being weakened only by the reduction consequent on its use since the last replenishment. It will also be observed that since the crystals in the receptacle E have volume, when they are dissolved and carried down into the jar the contents of the jar is intermittently increased. The surplus white or sulphate-of-zinc solution passes out through the tube L and the mercury-valve *l*.

I do not limit myself to the details of construction shown, since they may be very extensively altered and still my invention be embodied.

Having described my invention, I claim—

1. The described process of automatically replenishing the sulphate of copper in the solution contained in a battery-cell, consisting in retaining the gases generated by the battery in such manner that they exert pressure upon the surface of the solution, which pressure causes a portion of the solution to pass into a separate chamber into contact with sulphate of copper, then relieving the pressure upon the solution, whereby the portion thereof which was forced into the separate chamber is allowed to flow back again into the solution contained in the jar, substantially as and for the purposes set forth.

2. The combination of a closed jar provided with the usual zinc and copper electrodes, solution, and fittings, a tube connecting the interior of the jar below the surface of the solution with a separate chamber in which is contained sulphate-of-copper crystals, and a valve connecting the air-chamber at the top of the jar with the open air, substantially as and for the purposes set forth.

3. The combination of the jar A, the cover B, the threaded ring C, the cup E, the tube F, the chamber K, the tube L, and the mercury-cup *l*, substantially as and for the purposes set forth.

4. The combination of an air-tight jar provided with the usual zinc and copper electrodes, solution, and fittings, the receptacle E, the tube F, the tube L, and mercury-cup *l*, substantially as and for the purposes set forth.

5. The combination, in a battery-cell, of an air-tight jar provided with the usual copper and zinc electrodes, solution, and fittings, a receptacle, E, and tube F, extending from the jar into the receptacle E, pierced with openings in it throughout substantially the entire portion thereof which is contained in the receptacle E, the tube L, and the mercury-cup *l*, substantially as and for the purposes set forth.

Signed at New York, in the county of New York and State of New York, this 31st day of December, A. D. 1883.

JULIUS ZOBEL.

Witnesses:
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