

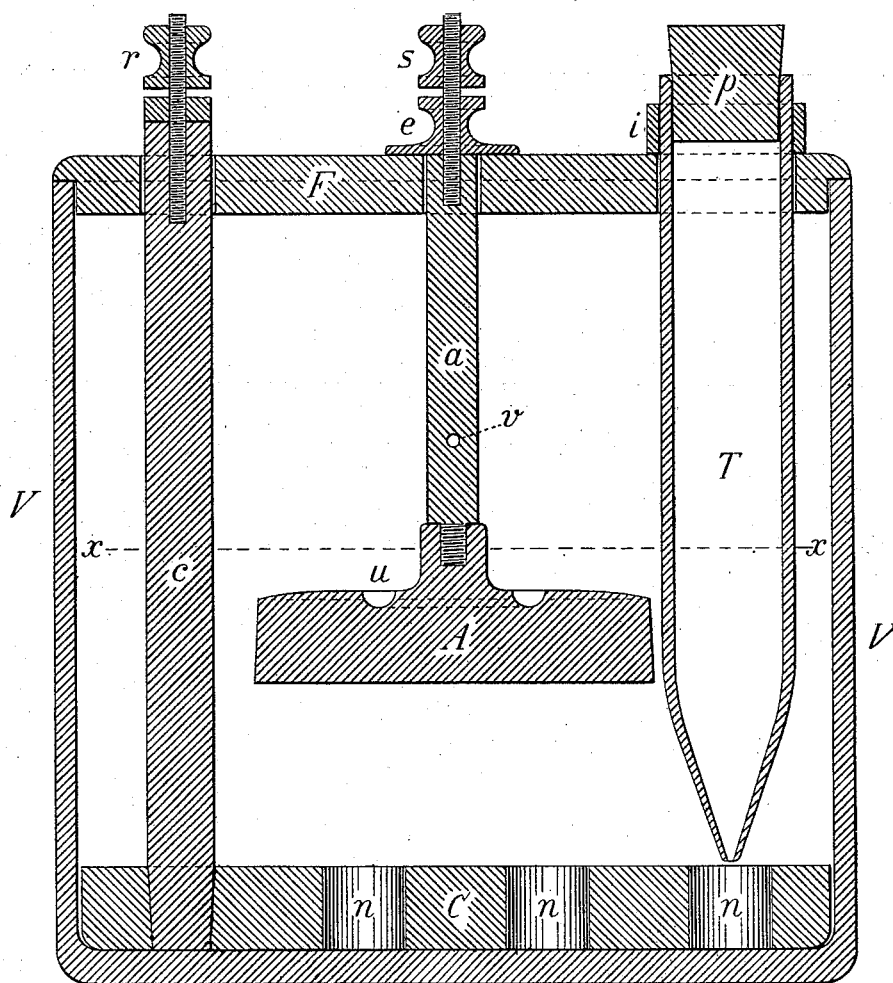
(No Model.)

A. F. W. PARTZ.

VOLTAIC BATTERY.

No. 347,440.

Patented Aug. 17, 1886.



Witnesses:
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UNITED STATES PATENT OFFICE.

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VOLTAIC BATTERY.

SPECIFICATION forming part of Letters Patent No. 347,440, dated August 17, 1886.

Application filed November 4, 1884. Serial No. 147,171. (No model.)

To all whom it may concern:

Be it known that I, AUGUST F. W. PARTZ, a citizen of the United States, residing at Philadelphia, in the State of Pennsylvania, have invented a new Voltaic Battery, of which the following is a full and exact description, reference being had to the accompanying drawing.

When using an ordinary Bunsen or Poggen-
dorff battery, in which carbon cathodes are depolarized by either nitric or chromic acid, one is obliged, in order to obtain its full effect, to supply it with the normal quantity of acid for however short a time it may be wanted, and unless it be emptied after having done its work the liquids, vertically separated by porous partitions, will soon diffuse and material be wasted. For this reason, and to avoid the resistance of porous clay cells, diverse modifications of Grenet's "dip-battery" have become the favorite means of generating strong electric currents for temporary applications, though the periods of their employment are inconveniently limited by a speedy decrease of power, owing partly to the direct attack of sulphuric and chromic acid upon the anodes and partly to the deposition of chrome-alum upon the cathodes.

The object of my invention is to provide a battery of the Bunsen type which without detriment to its strength of current may be supplied with the acid intended for the depolarization of the cathodes each time in proportion to the work it is designed to do, which does not require to be emptied, nor that the anodes be taken out during intervals of rest, and wherein the formation of chrome-alum may be avoided by the substitution for sulphuric or hydrochloric acid, which latter can but rarely be employed in batteries of the usual make on account of its fumes. I attain that object by a battery of the said type, in which I have applied the gravity principle in a somewhat similar way as it has been applied by Meidinger, Calland, and others in their batteries of the Daniell type, and which may be called an "acid gravity-battery."

My invention consists in a combination, in a voltaic element of the Bunsen type, with a horizontal anode suspended in the containing-vessel and a horizontal cathode of carbon ly-

ing upon its bottom and holding a firmly-inserted upright rod of carbon, which projects from the element and forms its positive pole, of a vertical tube of glass, designed to convey through the dilute acid or alkaline solution with which the vessel is primarily supplied the heavier depolarizing-liquid to the said cathode, so that it may spread over the same in a separate layer, and specific gravity thus be caused to perform the service of a porous diaphragm.

The drawing hereto represents a vertical section of a voltaic element embodying my invention.

V is a vessel of glass or other suitable material; F, a cover of varnished wood or ebonite.

C is a cathode of carbon lying upon the bottom of the vessel and holding a carbon rod, *c*, which is firmly inserted therein, and, extending through the cover F, has a binding-screw, *n*, for the positive-pole wire attached to it. The cathode C may be perforated with a number of holes like *n*, to increase its surface and form recesses for the depolarizing-liquid with which it is to be covered.

A is an anode, either of zinc or of iron, according to the intended chemical character of the apparatus, and into it is screwed a rod, *a*, of the same metal as A. To this rod is fastened a nut with a broad base, *e*, by means of which the anode is suspended from the cover F, and to the nut is joined a binding-screw, *s*, for the negative-pole wire. The rod *a* should be coated with paraffine or some other protecting substance, so that it may be used again when a nearly-consumed anode is replaced by a new one. When the apparatus is not to be employed for some length of time and still contains unconverted acid, the anode ought to be lifted out of the liquid, and to this end the rod *a* is provided with a hole, *v*, in which after the anode has been raised a pin is inserted above the cover F.

For the purpose of maintaining the amalgamation of anodes of zinc they are cast with a groove, *u*, into which is put some mercury.

T is a tube, most suitably of glass, suspended from the cover F by means of a rubber ring, *i*. It terminates below in a narrow outlet, so that when an acid which is to effect the depolarization of the cathode is poured into it the

same may issue therefrom without agitating the liquid already contained in the element. The tube may also be made with a much wider outlet than shown in the drawing, or even throughout of equal width, if it be stood upon the cathode C instead of being suspended.

p is a cork soaked in molten paraffine, intended mainly to prevent the escape of fumes when the tube contains hydrochloric or nitric acid.

Without confining myself to the use of any particular materials as electrolytes, or to any special mode of their application, I will briefly set forth various ways in which the described apparatus may be charged and operated on the general principle that the anode be surrounded by a liquid in which it will dissolve when the conditions are given for galvanic action, and that the cathode be covered with a stratum of a depolarizing-acid which keeps practically separate from the upper liquid by difference of specific gravity.

When the anode is of zinc, I supply the vessel V to the height indicated by the broken line *xx* with dilute sulphuric acid, or a solution of an alkaline sulphate or chloride, and pour nitric acid or drop crude chromic acid into the tube T; or I cover the cathode C with crystals of bichromate of potash, fill the vessel to the indicated height with a solution of an alkaline sulphate or chloride, and pour slightly-diluted sulphuric or hydrochloric acid into the tube, thus causing a layer of either

chromic or chlorochromic acid to be formed upon the cathode. When the anode is of iron, I supply the vessel V with a solution of an alkaline chloride, preferably that of sodium, and pour a saturated solution of ferric chloride containing a small percentage of hydrochloric acid into the tube T.

I am aware that vertical glass tubes have heretofore been used in combination with vertical metallic cathodes, and also in elements with porous cells with vertical cathodes of carbon. It will be seen that the object of my invention could not be attained with such devices, since it necessitates the use of horizontal cathodes as alone suited for the employment of depolarizing-acids on the gravity principle.

I claim as new—

A voltaic battery on the gravity principle, comprising a zinc electrode supported in the upper part of the containing-vessel, and a carbon electrode in the lower part of the containing-vessel, the carbon electrode being provided with a carbon conductor leading through the exciting-fluid, an acid-proof tube extending from a point above the level of the fluid and having a discharge-opening near the level of the carbon electrode, and an acid-depolarizer contained in said tube and around the carbon, substantially as set forth.

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