

(No Model.)

C. A. FAURE.  
SECONDARY BATTERY.

No. 409,178.

Patented Aug. 20, 1889.

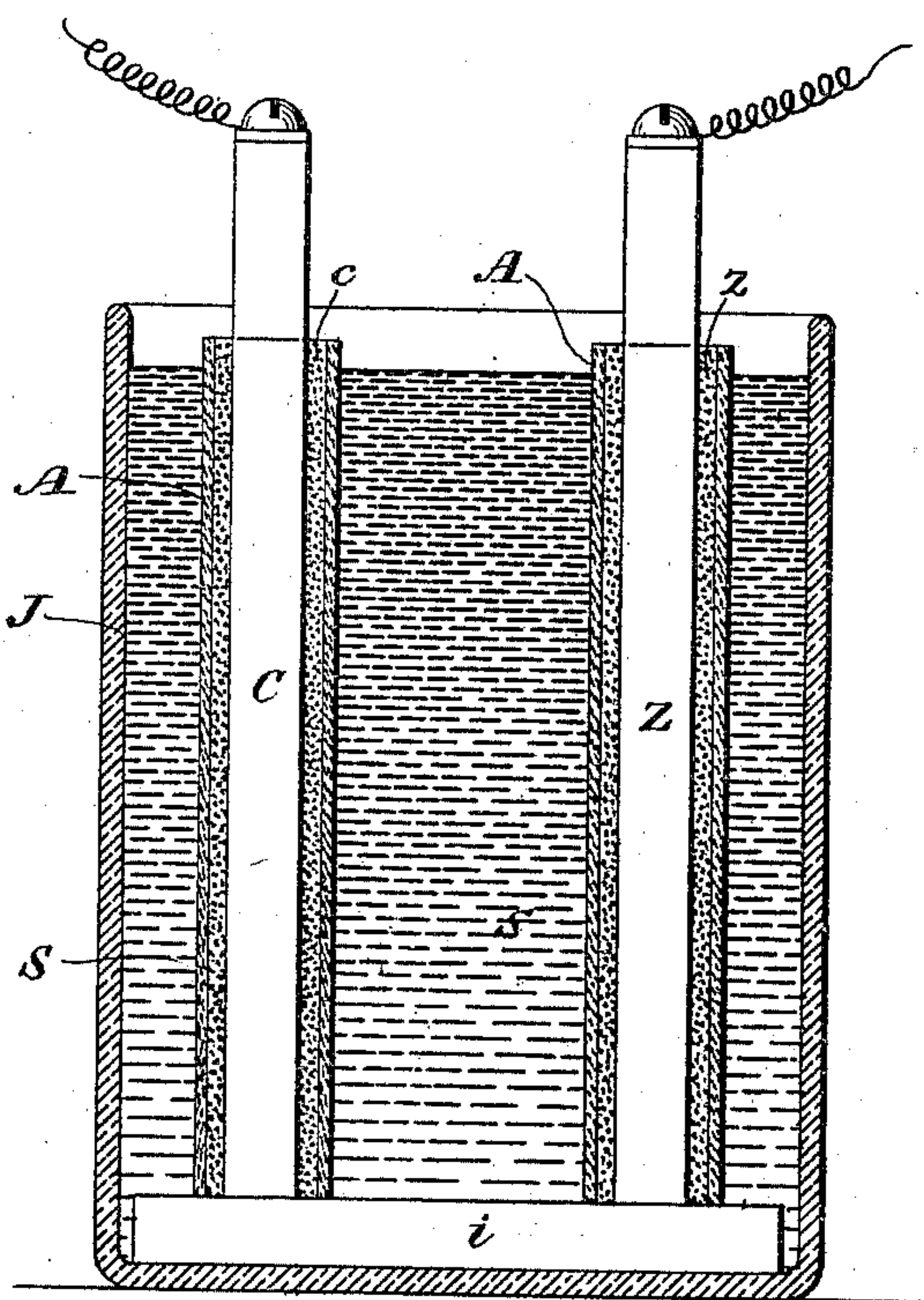


Fig. 1.

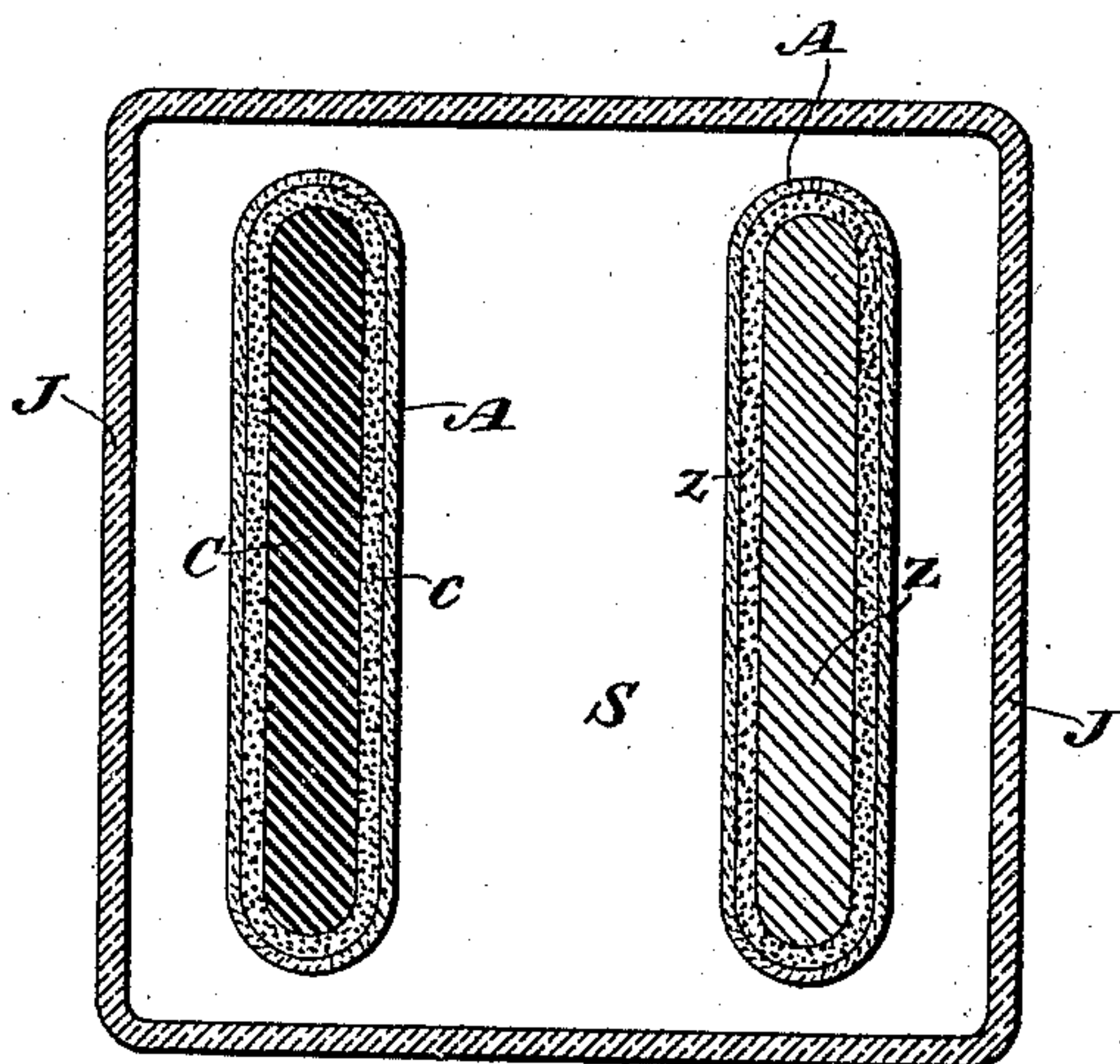


Fig. 2.

Witnesses  
Geo. W. Brock  
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Inventor  
Camille A. Faure,  
By his Attorney W. B. Hanson



# UNITED STATES PATENT OFFICE.

CAMILLE A. FAURE, OF NEW YORK, N. Y., ASSIGNOR TO THE ELECTRICAL  
ACCUMULATOR COMPANY, OF NEW YORK.

## SECONDARY BATTERY.

SPECIFICATION forming part of Letters Patent No. 409,178, dated August 20, 1889.

Application filed April 18, 1888. Serial No. 271,042. (No model.)

*To all whom it may concern:*

Be it known that I, CAMILLE A. FAURE, a citizen of the Republic of France, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Batteries, of which the following is a specification.

My invention is an improvement in that class of electric batteries capable of being regenerated after exhaustion by the action of an electrical current.

The invention comprises the employment of two elementary substances widely separated in the electro-motive scale. They are preferably composed of finely-divided particles pressed together in a self-supporting mass or body, or they may be composed of plates of metals of the described nature alone, or having combined, applied, or associated therewith finely-divided and compressed particles of the same metal. I wrap or inclose each element or separate these elements by a diaphragm or septum, using for such purpose prepared asbestos, which consists of sheets one thirty-second inch thick dipped into a solution of a soluble salt, such as the chloride of calcium or the chloride of barium. The sheet is then dried, after which it is dipped into a solution of a soluble silicate, such as the silicate of soda, or a fluo-silicate; or any other solution capable of producing with the first-named substance an insoluble compound, the method of preparing asbestos in this way being the subject of an application for United States Letters Patent filed by me on the 26th day of January, 1888.

The elements prepared as described I place in a cell containing an electrolytic solution, which must be of such a nature that in the process of electrolysis it forms an insoluble compound with the metal or metals composing either or both elements. Thus I take zinc and copper and combine with the zinc finely-divided zinc and with the copper finely-divided copper, or I may use the oxides or phosphates of either metal. The electrolytic solution preferably employed contains the phosphate of potassa; or I may use the silicate of potassa, or the borate of potassa or soda, or any solution of a salt the acids of which form

an insoluble compound with either or both the elements.

The accompanying drawings illustrate my invention, Figure 1 being a vertical section of a cell, and Fig. 2 the same in horizontal section.

C is a plate of copper combined with finely-divided compressed copper *c*. Z is a zinc plate primarily combined with finely-divided zinc *z*. These finely-divided metals in either or both cases may be caused to constitute the entire element by pressing them into the desired form. In any case they are subjected to pressure to consolidate them as much as possible. The copper and zinc plates may also be used without the application or combination therewith of any finely-divided metal, only in this case the capacity would be less and a process similar to the formation of secondary batteries would be necessary.

Elements prepared of solid copper and zinc combined with finely-divided particles of the same materials prepared substantially as shown in the drawings are wrapped in a sheet of asbestos A, prepared as above described, which may be held in position in any suitable manner. These elements I prefer to place in a glass cell resting upon a strip of insulating material *i*. They are immersed in a solution containing a salt of such a nature that it will form an insoluble compound with the material of which the elements are composed. In the described battery, consisting of copper and zinc, I use a solution containing phosphate of potash. On subjecting such a cell to the action of an electric current phosphate of copper is formed upon the surface of the copper elements, the phosphoric acid for this purpose being electrolytically separated from the solution and combined with the copper to form an insoluble compound—*i. e.*, the phosphate of copper. I then substitute a fresh solution of phosphate of potash for the exhausted solution, and upon connecting the battery in a simple circuit for the purpose of discharge phosphoric acid is transferred from the solution to the zinc and from the copper to the solution, so that the solution remains unchanged as regards its constituent elements. Of course this preliminary preparation would



be avoided if we placed phosphate of copper upon the copper element in the first instance; but phosphate of copper is not easily obtained and manipulated, and the process I have described is perhaps as good as any for attaining the desired end. So, too, I might place phosphate of zinc on the zinc element, or I might place oxides of either metal upon supports of copper or of zinc. In case plain plates or sheets of copper or zinc are used there is a necessary disintegration of the surface to a greater or less degree, and the combination, association, or application of finely-divided particles of the same material with the metal or elementary substance composing the electrodes is simply to afford greater capacity for electro-chemical action.

I do not herein claim in an electric battery the combination of two elements or elementary substances of respectively different ma-

terial separated in the electro-motive scale and an electrolytic solution forming an insoluble salt with either or both said elements under the influence of an electric current; nor do I claim the use of finely-divided and compressed particles of metal in such a battery, as that forms the subject-matter of an application filed by me in the United States Patent Office February 2, 1888, Serial No. 262,698; but

What I claim, and desire to secure by Letters Patent, is—

In an electric battery, the combination of a negative element, a positive element, and a diaphragm or septum composed of asbestos, a soluble salt, and a silicate, combined together substantially as described.

CAMILLE A. FAURE.

Witnesses:

DANIEL E. DELAVAN,  
WM. B. VANSIZE.