

(No Model.)

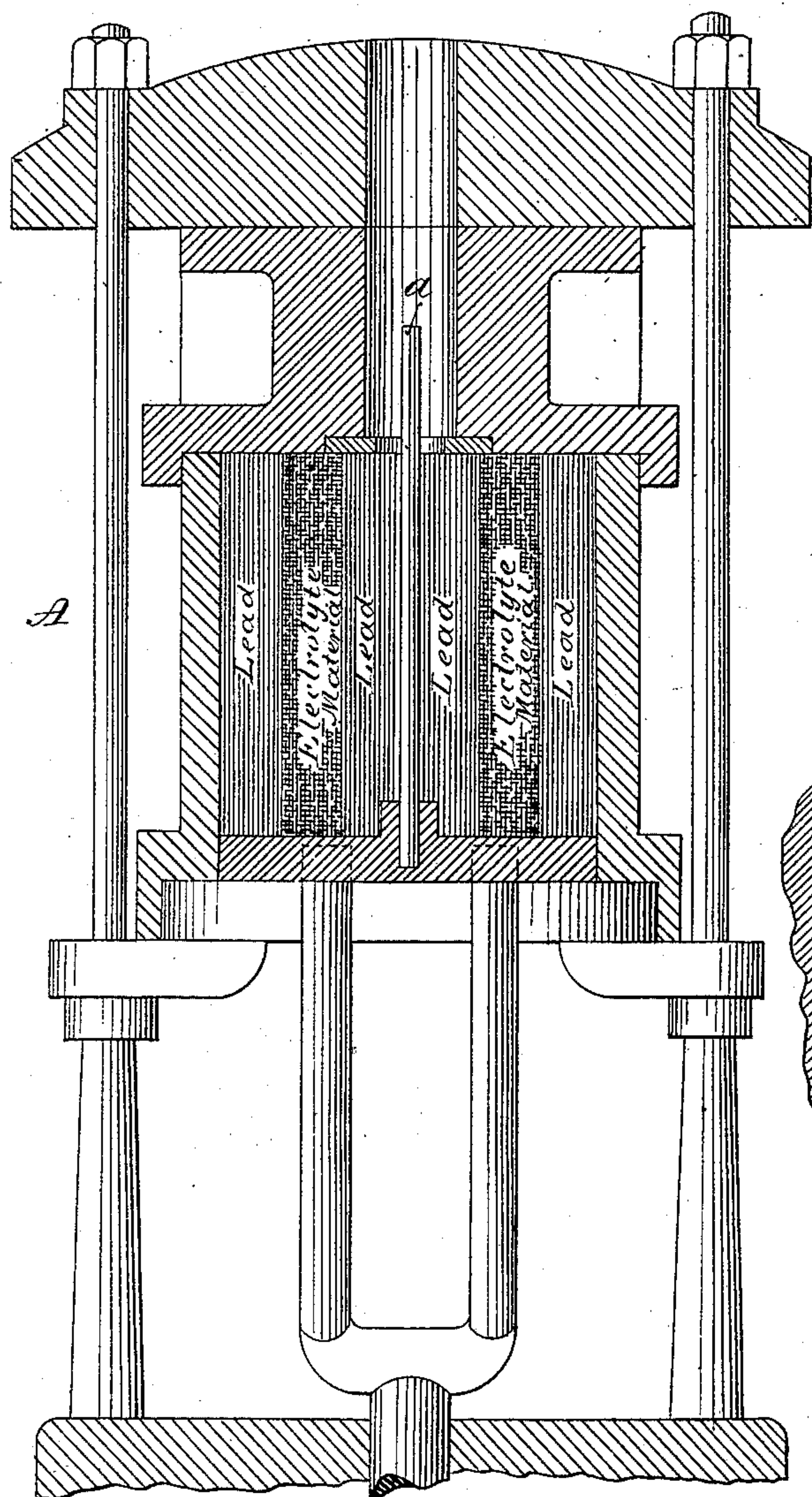
W. A. SHAW.

PRODUCTION OF PIPE LINE AND OTHER BATTERIES.

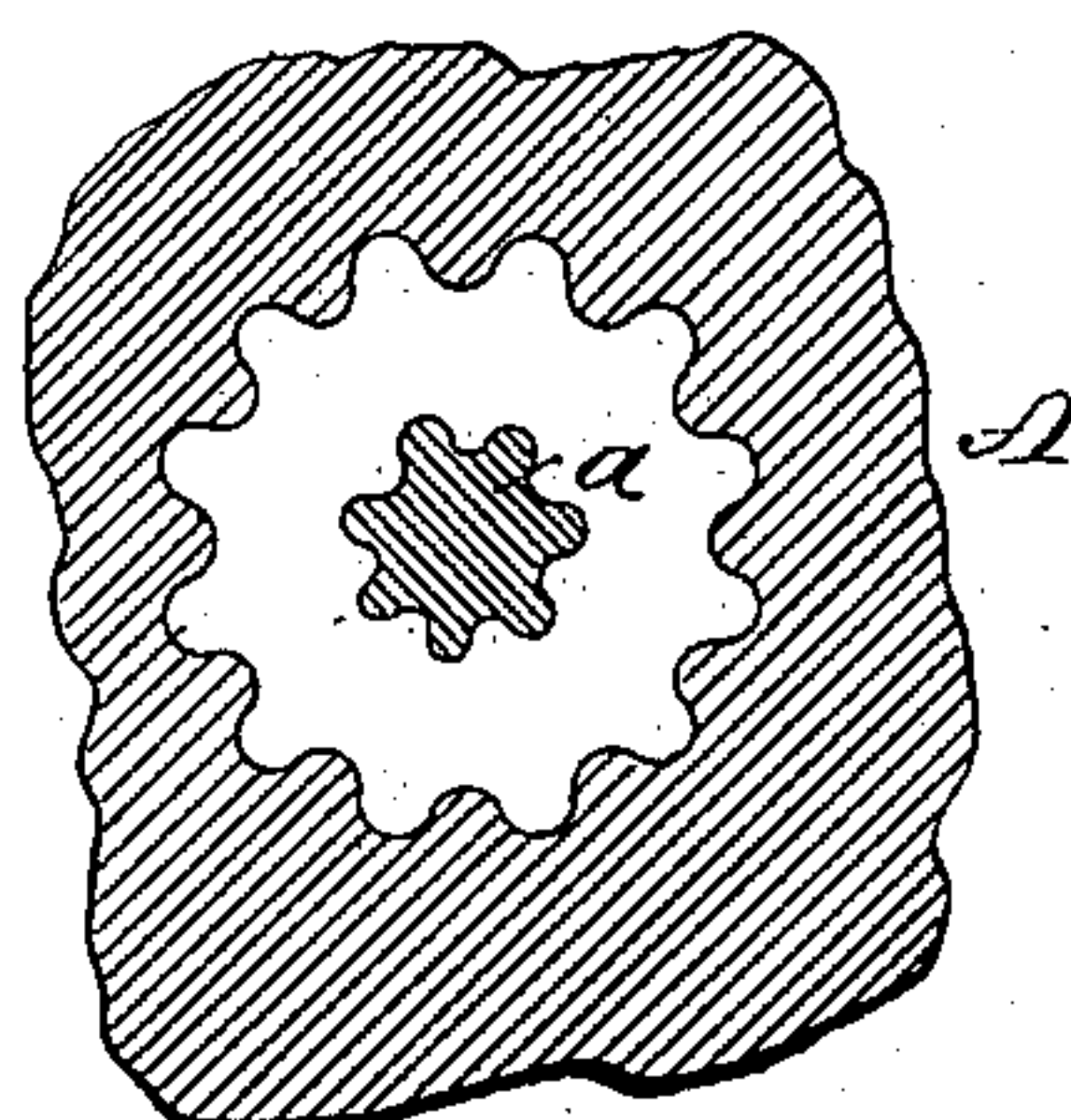
No. 305,023.

Patented Sept. 9, 1884.

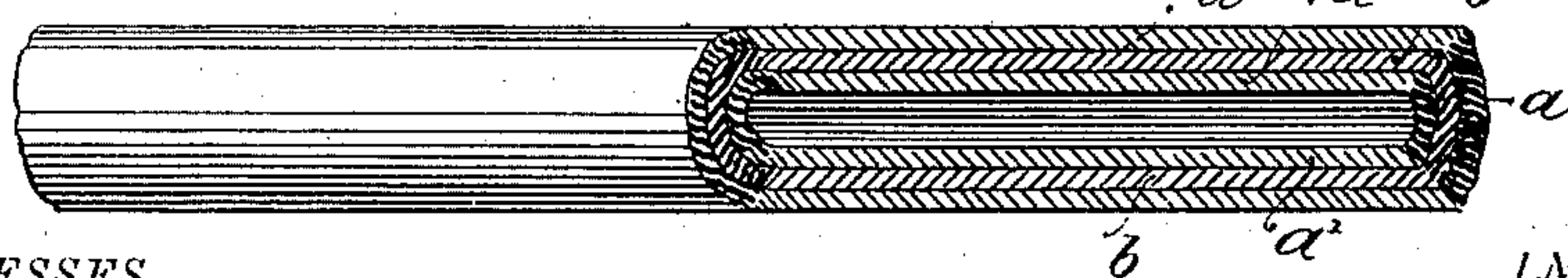
*Fig. 1,*



*Fig. 3,*



*Fig. 2,*



WITNESSES

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By his Attorney

INVENTOR

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# UNITED STATES PATENT OFFICE.

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## PRODUCTION OF PIPE-LINE AND OTHER BATTERIES.

SPECIFICATION forming part of Letters Patent No. 305,023, dated September 9, 1884.

Application filed May 13, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM ANTHONY SHAW, of Brooklyn, Kings county, State of New York, have invented a new and useful  
5 Improvement in Production of Pipe-Line and other Batteries, which is fully set forth in the following specification.

This invention has reference more particularly to the formation at one operation of continuous-line batteries, such as described in my  
10 application for patent filed April 21, 1882, but is also applicable to the formation of other batteries, or the elements thereof, such as the coated plates forming the electrodes of secondary or storage batteries; and it consists, mainly,  
15 in pressing the materials of which the battery or compound element is composed together through a die. It has reference also to the grooving and fluting of the battery-plates in  
20 process of manufacture.

The invention can be successfully carried by means of a pipe-press, in the receiving-cylinder of which the materials are placed in proper order and pressed out through the die,  
25 completing the article at one operation. The die and core of the press employed may be cylindrical or polygonal, according to the shape desired in the finished article, and to produce fluted or corrugated plates or electrodes a grooved or fluted core or die, or both,  
30 is used. Thus in the formation of a cylindrical pipe-line battery—such as described in my aforesaid application—the containing-cylinder of a pipe-press is charged with an interior hollow ingot of lead placed around a steel  
35 core or spindle. This ingot has packed around it the mixtures of nitrates or other salt and earth or porous or absorbent materials, as may be required in any particular instance,  
40 and around this layer of electrolyte composition is placed an exterior hollow ingot of lead. Upon pressing a compound charge, made up and composed as just described, out of the containing-cylinder through the die around the  
45 core, the line-battery is at once produced.

To make the parts of a storage-battery the lead and litharge or lead peroxide are placed in the cylinder of the press together and then pressed out, making and coating them at one  
50 operation.

To produce compound sheets for battery-

plates, a laminated charge of metal—say litharge or lead peroxide, carbon, or lead sulphate—interposed between layers of lead, is placed in the cylinder, pressed out in tubes,  
55 and afterward opened longitudinally and flattened into sheets; or they may be pressed at once into sheets by substituting a flat for a tubular die.

In order that the invention may be more  
60 fully understood, the same will now be described in connection with the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a vertical section, partly in elevation, of a pipe-press of ordinary construction, showing the materials as arranged in the containing vessel or cylinder; Fig. 2, a section of a finished line battery or conductor, and  
65 Fig. 3 a sectional view of a fluted or grooved die and core.

The pipe-press A, which is of ordinary construction, is shown charged with materials for producing a pipe-line battery such as shown  
70 in Fig. 2. Around the core *a* is placed a hollow ingot of lead, and around the latter is packed a layer of electrolyte material—such as earth and salts—and the whole surrounded by an exterior hollow ingot of lead, as shown. These different layers will all issue from the  
75 press in their appropriate positions and form a line-battery composed of two concentric tubes of lead, *a a'*, Fig. 2, with an intermediate layer of electrolyte material, *b*.

When pressure is first applied to the  
80 lower of the press, the lead of the inner cylinder is at first pressed out alone. At this time the lead of the outer cylinder, being compressed, spreads at the top toward the opening in the die, as does also the electrolyte  
85 material. In a short time they collect sufficiently to force the electrolyte or filling material into the die-opening. This and the inner lead now escape together until the outer lead, which continues to collect, (there being at  
90 present no escape for it,) at length forces itself through the die. After this the outer lead, the inner lead, and the interposed electrolyte or filling material are forced out together, the amount of each depending upon their relative  
95 thickness in the cylinder. The line may be made in continuous lengths to any ex-  
100



tent, the only limitations being the facilities for handling and transportation. The line may be wound upon reels as fast as it comes from the press, provided its section is not too great to admit of its being rolled up. In this case the battery is to be made in straight divisions, which are afterward coupled together.

In the place of simple cylinders of lead with an intervening layer of electrolyte material, the interior pipe or electrode may be incased in a layer of red lead made into a paste by mixing it in a solution of one part sulphuric acid to ten of water. This paste or coating is introduced into the containing-cylinder of the press around the central hollow ingot. Next in order comes the electrolyte composition, and then another layer of red-lead paste, and finally the exterior hollow ingot of lead incasing and surrounding the whole. These different layers will issue from the press in their appropriate positions in the finished pipe or battery, which is thus made and completed at one operation with the greatest speed, perfection, and economy.

To produce electrodes or battery-plates grooved or corrugated, so as to increase the superficial area, and to provide holding-recesses for the better retention of the red lead or other coating, the core and die of the press are made fluted or grooved, as shown in Fig. 3.

Where it is desired to produce flat sheets or electrodes, the lead with the coating substance may be put in press, (shown in Fig. 1,) pressed out in tubes of large diameter, and afterward cut open longitudinally and flattened or rolled in spirals; or a laminated charge of metal—say layers of lead—with litharge or lead peroxide, carbon, or lead sulphate (the latter mixed with the litharge or lead peroxide) interposed, may be placed in the retaining-vessel and the whole pressed out into compound sheets through a flat die.

Any desired shape of core and die may be used, according to the result desired. Thus a hexagonal die may be substituted for the circular one and the electrodes pressed out into hexagonal shape, and many similar modifications may be made without changing the character of the invention.

If it is desired to produce small batteries, the tubes pressed out, or the plates, may be cut into sections of any desired length.

The invention is not limited to secondary batteries, nor to batteries having leaden plates.

Any metal adapted to be worked in a press or to be rolled may be employed, and the two

electrodes may be of different metals, or of metal and carbon, so as to form with the interposed electrolyte or a suitable excitant a voltaic couple.

If desired, the masses of metal to be pressed into plates may be separated by material which is not in itself an electrolyte or excitant—as, for example, instead of the mixture of nitrate or other salt and earth or other absorbent material, before referred to, earth or other absorbent material may be used alone.

Having now fully described my said invention and the manner of carrying the same into effect, what I claim is—

1. In the manufacture of electric batteries, the improvement consisting in pressing out simultaneously two or more electrodes with an intervening layer or layers of electrolytic or filling material, substantially as described.

2. The method of forming the compound plates or electrodes of storage or other batteries by pressing out the electrodes or metal plates from a body of metal and pressing the chemical layers or composition upon the metal plates simultaneously with the formation of the latter, substantially as described.

3. The method of forming battery plates or electrodes by pressing them out in the form of tubes and then cutting and opening the latter, substantially as described.

4. The method of applying to battery-plates or supports of battery-electrodes the composition constituting the active layer of a secondary battery by pressing the said composition through a contracted opening—such as the die of a pipe-press—through which the said battery-plate or electrode-support is delivered simultaneously, substantially as described.

5. The method of making electrodes or plates for secondary batteries by combining the metal of which the said plate is to be composed with the metallic oxide or like active material, so as to form a compound mass or body of greater thickness than the proposed electrodes, and then squeezing out and spreading the said body or mass, so as to diminish the thickness and increase the surface-area, and thereby reduce the same to the required size, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WM. ANTHONY SHAW.

Witnesses:

M. M. BUDLONG,

G. W. RAWSON.