

(No Model.)

C. F. BRUSH.

PROCESS OF MAKING ELECTRODES FOR SECONDARY BATTERIES.

No. 266,762.

Patented Oct. 31, 1882.

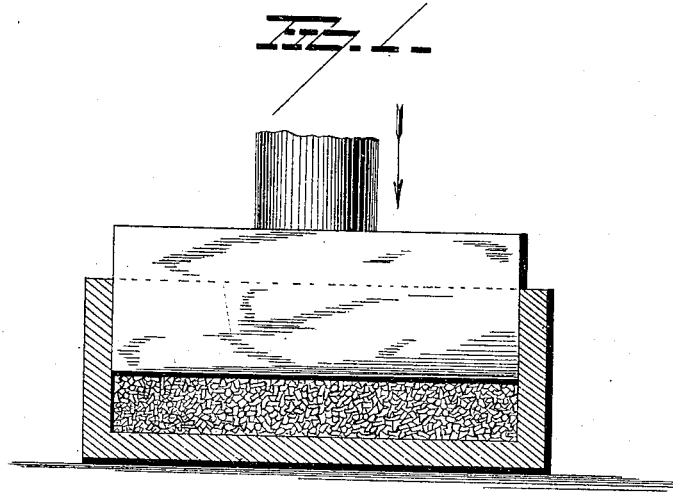
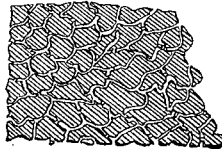


Fig. 2.



Fig. 3.



WITNESSES

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# UNITED STATES PATENT OFFICE.

CHARLES F. BRUSH, OF CLEVELAND, OHIO.

PROCESS OF MAKING ELECTRODES FOR SECONDARY BATTERIES.

SPECIFICATION forming part of Letters Patent No. 266,762, dated October 31, 1882.

Application filed July 20, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES F. BRUSH, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful  
5 Process of Making Electrodes for Secondary Batteries; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use  
10 the same.

My invention relates to secondary-battery elements; and said invention consists in the following-described process for manufacturing a substance or material from which said secondary-battery elements can be constructed.

In carrying out my process take lead that is granulated, pulverized, precipitated, or in any manner more or less finely divided. Let the surface of the particles of the lead thus divided be oxidized, either spontaneously by exposure to the air or by any suitable artificial oxidizing process or application. After the lead particles have had their surfaces oxidized let them be collected and subjected to heavy  
20 pressure—hydraulic or otherwise—until they are welded together and united into a compact and firmly-coherent mass or body.

I do not limit myself to any definite degree of fineness to which the lead must be divided  
30 prior to oxidation, as specified; nor do I limit myself to any exact degree of temperature that the oxidized particles of lead must have when collected and subjected to their welding-pressure. This temperature, however, for obvious  
35 reasons, must not reach the melting-point of lead. It is true that if non-oxidized lead particles be subjected to very heavy pressure they will be perfectly welded into a single, solid body, which, upon the closest inspection, will  
40 have every appearance of having been cast or rolled, all evidence of the former granules or particles having completely disappeared. This result and condition is but partially true in the case of the product made by my process herein  
45 referred to, because in said process each particle of lead has a thin coating, surface, or film of oxide of lead, and when such particles are collected and subjected to great pressure the enveloping film or coating of lead oxide inclosing each particle is ruptured during the

change of form that said particles undergo during the aforesaid pressure, so that a portion only of the pure lead of any one particle can come into contact and be welded, as described, with the exposed pure lead of a neighboring particle that has likewise had its coating of lead oxide ruptured, yet the particles will be welded together to such an extent that they will strongly cohere and form a firm body, throughout which everywhere ramifies and extends  
55 thin sheets, veins, or membranes of oxide of lead. These minute veins of lead oxide within and throughout the mass greatly facilitate the electrical action in "forming" or oxidizing the plates for operative use as elements in a  
60 secondary battery.

In constructing battery elements from the substance resulting from my process the lead particles in some cases can be originally pressed in molds that will give to the finished product  
70 the shape desired for said elements; or said substance can be pressed into the form of blocks, sheets, bars, strips, or otherwise, and afterward cut, fashioned, and constructed as may be desired into any particular form of battery element.

My process can be employed not only in forming elements consisting throughout of the mixed lead and lead oxide, as specified, but also in constructing elements that shall consist of a core or body of lead that is coated or covered upon one or more of its faces with the product of my process. Effective secondary-battery elements of the latter description can be made by covering one or more faces of a  
80 cast or rolled plate or strip of lead or other suitable substance with the superficially-oxidized lead particles, and then uniting by heavy pressure not only the oxidized lead particles into a mass, but also the mass to the lead  
85 plate. To assist and insure the adhesion of the mass to its supporting body or plate, said plate should be pierced with perforations or slots, or should be scored or made file-faced, or otherwise suitably prepared; or, if the plate  
90 is sufficiently thin, it may be corrugated or embossed in such a way as to insure the adhesion to it of the mass.

Figure 1 represents a press having a quantity of superficially-oxidized particles of lead  
100

placed in the press-box preparatory to their being subjected to pressure. Fig. 2 is an exaggerated and ideal representation of a transverse section of the product. Fig. 3 is a similar view of a portion of the plate.

For the sake of convenience in identifying this invention among others that I have made in the class of secondary batteries, I denominate it as "Case M."

What I claim is—

1. A method of manufacturing elements for secondary batteries, consisting in superficially oxidizing particles or separate pieces of lead and then subjecting such oxidized pieces or particles to pressure and uniting them into a compact and firmly-coherent mass, substantially as set forth.

2. The method of manufacturing elements for secondary batteries consisting in subdividing lead into small pieces or particles and superficially oxidizing said particles or pieces,

and then subjecting a mass of such oxidized particles to pressure, and uniting them into a compact and firmly-coherent mass, substantially as set forth.

3. A method or process for making material from which secondary-battery elements can be constructed, said method consisting essentially in subdividing lead into small particles, superficially oxidizing said particles, and finally subjecting a collection of said superficially-oxidized particles to pressure sufficient to concentrate or unite them into a coherent mass or body, substantially as set forth.

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

CHARLES F. BRUSH.

Witnesses:

LEVERETT L. LEGGETT,  
ELBERT H. BAKER.