UNITED STATES PATENT OFFICE.

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PROCESS OF FORMING PLATES FOR STORAGE BATTERIES.

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To all whom it may concern:

Be it known that I, WILLIAM MORRISON, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Processes of Forming Plates for Storage Batteries, of which the following is a specification.

In the manufacture of a certain type of storage batteries, it is desirable to superficially disintegrate the lead plates, so as to provide the same with crusts or outer layers adapted to serve as the active material. Prior to my invention, this has been accomplished in various ways, as for example, by immersing the plate in a solution of mixed sulfuric acid and nitric acid, and then passing a current from the plate or plates through the solution to another plate or plates, the latter being usually termed dummy plates. During the process of electro chemical disintegration, the plate or plates to be formed are attached to the positive pole of the generator, while the other or dummy plates are attached to the negative pole. Now there are several objections to a process of this character, among which are these, that: first, it is slow and more or less expensive, owing to the fact that the nitric acid during the process constantly splits up and forms nitrous acid; and second, that during the process noxious and objectionable fumes are given off. In other words, the chemical action is slow and of such character that a great deal of nitric acid is necessary to insure the desired results; and, in addition, disagreeable gases are generated and given off, which render it difficult to properly attend to the forming of the plates.

Now the object of my invention, generally stated, is, therefore, the provision of a process which will obviate the foregoing difficulties and objections. In other words, it is the object of my invention, first, to provide a rapid and effective process for forming storage battery plates, and second, to provide a cheap and efficient process for this purpose in which no objectionable gases or fumes will be given off.

To the foregoing and other useful ends, my improved process consists in subjecting the lead plate to electro-chemical action in a suitable solution containing sulfuric acid and nitric acid, and during the time that the electric current is passing from the plate through the solution, and while the nitric acid is gradually splitting up and turning into nitrous acid, I then cause the nitrous acid to be reconverted into nitric acid as fast as it forms. For example, and preferably, my improved process may be practiced by taking a 19 Baumé solution of sulfuric acid, mixing this solution with a suitable quantity of nitric acid, or with a soluble nitrate, and by then adding a suitable quantity of a soluble salt of manganese, such as a permanganate of potash. The exact proportion is immaterial, but it will be understood that the amount of nitric acid employed, and also the quantity of permanganate of potash, or other like substance, will depend upon the size of the plate and the work to be done, and also upon the speed with which it may be desired to form the plate. The solution thus formed can then be placed in a suitable receptacle, and the lead plate to be treated can then be immersed in this solution and arranged in suitable relation to the dummy plate or plates, acting as the other electrode, with a proper source of electric current. After this, the electric current can be turned on, and while the current is passing from the positive pole, or lead plate to be disintegrated, and hence through the other plate or dummies or negative pole, the nitric acid attacks the surface of the lead plate, causing it to disintegrate in the usual and well known manner. Also, at this time, part of the nitric acid will continually split up and turn to nitrous acid, but this action is effectually checked and counteracted by the presence of the permanganate or other like substance in the solution. During the process, and under the influence of the electric current, the manganese compound is carried to the positive pole—that is to say, it tends to move in opposition to the current, and to accumulate on the surface of the lead plate, which latter is of course the positive pole in the electrolytic-like process. At this time, the manganese oxid then adheres to the surface of the lead plate until it becomes oxidized by the electric current to a high state of oxidation, and of a fine red color, which is then soluble in the solution. Consequently, as soon as the manganese has, in this way, taken up sufficient oxygen, and has dissolved and returned into the solution, it at once operates to convert all nitrous acid

into nitric acid, and during this process it again becomes colorless. After doing this, the manganese returns to the lead plate where it again becomes highly oxidized, and in this way the manganese is alternately received upon the lead plate and then delivered therefrom into the solution. In other words, manganese, when thus used, is of such character that, although employed in a solution of sulfuric acid, it is capable of carrying oxygen from the positive lead plate to the nitrous acid in the solution, and thus converting the nitrous acid into nitric acid. Furthermore, the manganese has a like beneficial action with respect to the tendency of the sulfuric acid to become reduced or converted into sulfurous acid. In other words, manganese, under these conditions, acts as a means for converting nitrous acid into nitric acid, and sulfurous acid into sulfuric acid.

It will be readily understood that either a soluble salt of manganese, or other similar acting substance, can be employed without departing from the spirit of my invention.

In practicing my invention, I find that permanganate of potash gives very good results, as it is easy to obtain and convenient to handle, and I also find that an excess of potassium or sodium can be employed with good effect.

After a lead plate has thus been subjected to electro-chemical action for the proper length of time, its surface has become disintegrated—that is to say, it has been provided with a coating or layer of disintegrated lead which becomes lead-peroxid and which is adapted to serve as the active material when the plate is employed in a battery. Although the disintegrating agent in the solution becomes split up or reduced, it is constantly reconverted into nitric acid, and hence it is possible to thus disintegrate the surface portions of the lead plates with much less nitric acid than has heretofore been possible. Furthermore, the process is quicker, as a steady action of the acid is maintained. It will be understood, however, that either nitric acid or a suitable nitrate may be employed, as may be desired, and that various other substances may be employed in place of the soluble salt of manganese. In addition, with my improved process, there are no noxious or objectionable fumes, and consequently the process can be carried out without annoyance or difficulty of this kind.

What I claim as my invention is:

1. The process of superficially disintegrating lead plates for storage batteries before the same are placed in the battery, so as to provide each plate with a crust or outer layer adapted to serve as the active material, which consists in subjecting the plate to electro-chemical action in a solution formed by a mixture of sulfuric acid, nitric acid and permanganate of potash.

2. The process of superficially disintegrating lead plates for storage batteries before the same are placed in the battery, so as to provide each plate with a crust or outer layer adapted to serve as the active material, which consists in subjecting the plate to electro-chemical action in a solution formed by combining sulfuric acid, nitric acid and the oxygen-bearing salt of manganese that will travel toward the positive pole.

Signed by me at Chicago, Cook county, Illinois, this 23rd day of December, 1902.

WILLIAM MORRISON.

Witnesses:
WM. A. HARDERS,
HARRY P. BAUMGARTNER.