

UNITED STATES PATENT OFFICE.

GEORG HÜBNER, OF GERNSBACH, GERMANY.

ELECTRODE FOR SECONDARY BATTERIES.

SPECIFICATION forming part of Letters Patent No. 565,140, dated August 4, 1896.

Application filed June 24, 1895. Serial No. 553,899. (No model.) Patented in France April 22, 1895, No. 242,186; in Belgium April 22, 1895, No. 115,239; in England April 23, 1895, No. 8,011, and in Sweden April 25, 1895, No. 6,553.

To all whom it may concern:

Be it known that I, GEORG HÜBNER, cellulose manufacturer, of Gernsbach, in the Grand Duchy of Baden, German Empire, have invented Improvements in the Electrodes or Plates of Electric Storage Batteries, (for which I have obtained patents in England, No. 8,011, dated April 23, 1895; in Sweden, No. 6,553, dated April 25, 1895; in France, No. 242,186, dated April 22, 1895, and in Belgium, No. 115,239, dated April 22, 1895,) of which the following is a specification.

This invention relates to the plates of electrodes of electric storage batteries; and its object is the production of plates having good conductivity and great durability in a simple and easy manner.

The plates produced according to these improvements, as hereinafter described, being hard and porcelain-like, and being cast or molded to the required form, can be constructed, if desired, without such supports as lead grids and the like, and their especial advantage is that they can resist the strongest charging or discharging currents practicable without warping or crumbling.

In constructing plates according to this invention I melt together nitrated hydrocarbons, *e. g.*, dinitrobenzol, mononitrobenzol, or bromonitrotoluol, with nitrated cellulose, *e. g.*: mononitrocellulose, cellulose meal, and lead oxids. The cellulose meal may be prepared by grinding cellulose. For cheapening the plates it is advisable to add tar or its derivations. These may be produced by distilling tar at above 280° or 300° centigrade. The mixture, when cooled, forms a dense hard porcelain-like product. Before it cools it can be cast in molds, and be thus formed into plates, which without any support or other accessory are sufficiently rigid to be used as storage-battery plates.

In actual practice I may employ the materials in the following proportions: *a*, one part by weight of crystallized dinitrobenzol; *b*, one part by weight mononitrobenzol or bromonitrotoluol; *c*, one part by weight tar or its derivatives; *d*, one-half part by weight mononitrocellulose, and *e* one-half part by weight

of cellulose meal. These are mixed together and heated in a steam or water bath to about 80° to 85° centigrade until the mixture becomes fluid. The hot fluid mass has the property of combining with certain metallic oxids chemically to form a porcelain-like mass when cold. While still fluid, a metallic oxid or metallic oxids of suitable character is or are mixed with the mass, by preference, from 1.5 to 1.6 parts of lead oxid or lead oxids to one part of the mass, and this mixture is further heated until the added oxids have become fluid or dissolved. The oxids become, by this process, more oxidizable, so that a shorter time is ultimately required for the "formation" of the battery in which the plates made from the mixture are used. The melted mixture is cast in molds of the required shape, wherein it becomes solid in about thirty seconds after it has cooled to about 50° centigrade. The plates so produced may be used without any metal frame, grid, or support, and terminals of suitable conductivity may be clamped or otherwise secured thereon; or, straps or bands of suitable metal may be cast into the plates, with projecting parts to be used as or to be connected with terminals. Alternatively, the melted mass may be cast in a framing of suitable metal having means for connection with the cell-terminals, or any other similar device may be employed for electrically connecting the plates with the terminals.

Plates having about one hundred square centimeters area, constructed as hereinbefore described, may be charged with a current of from thirty to forty amperes without suffering in any way.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The hereinbefore-described method of constructing plates or electrodes for electric storage batteries, which consists in fusing together nitrated hydrocarbons, *e. g.* mononitrobenzol, or dinitrobenzol or bromonitrotoluol, with nitrated cellulose, *e. g.* mononitrocellulose and cellulose meal and lead oxids, and casting the fused mixture to the desired form, substantially as described.

2. The hereinbefore-described method of constructing plates or electrodes for electric storage batteries, which consists in fusing together nitrated hydrocarbons, *e. g.* mononitrobenzol, or dinitrobenzol or bromonitro-
5 toluol with nitrated cellulose, *e. g.* mononitro-cellulose, cellulose meal, tar substances and lead oxids, and casting the fused mixture to the desired form, substantially as described.

G. HÜBNER.

Witnesses:

H. MORANO,

GUSTAV OTTINGER.