

(No Model.)

H. F. KIRKPATRICK-PICARD & H. THAME.  
METHOD OF MANUFACTURING ELEMENTS OR PLATES FOR SECONDARY  
BATTERIES.

No. 527,861.

Patented Oct. 23, 1894.

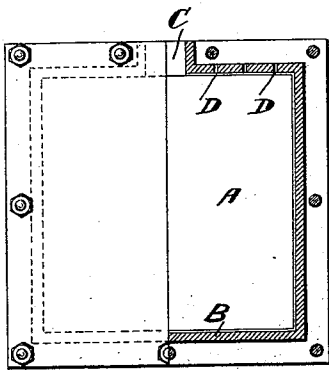


FIG. 1.

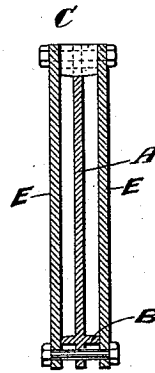


FIG. 2.

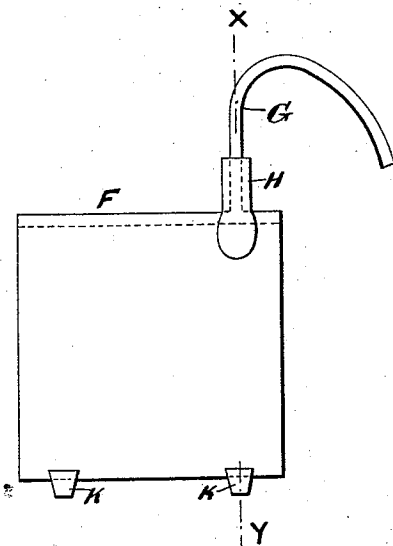


FIG. 3.

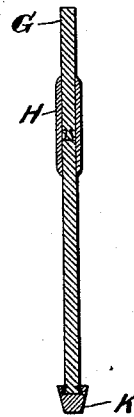


FIG. 4.

Attest  
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# UNITED STATES PATENT OFFICE.

HUGH FITZALIS KIRKPATRICK-PICARD AND HENRY THAME, OF LONDON,  
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METHOD OF MANUFACTURING ELEMENTS OR PLATES FOR SECONDARY BATTERIES.

SPECIFICATION forming part of Letters Patent No. 527,861, dated October 23, 1894.

Application filed January 10, 1894. Serial No. 496,432. (No specimens.)

*To all whom it may concern:*

Be it known that we, HUGH FITZALIS KIRKPATRICK-PICARD and HENRY THAME, both residing at London, England, have invented  
5 an Improved Method of Manufacture of Elements or Plates for Secondary Batteries, of which the following is a specification.

Our invention relates to an improved method of manufacture of elements or plates  
10 for secondary batteries, and has for its object the production of an element or plate, of which the body is of a finely crystalline and strong salt of lead, namely a sub-sulphide of lead, artificially prepared as hereinafter described,  
15 and though eventually becoming more porous by elimination of sulphur, is durable, and where desired is homogeneously and metallically connected to an upper rim or portion of a rim of lead, on which a pole piece may  
20 be formed with perfect metallic continuity from the body of the plate or element.

We are aware that many attempts have been made to produce a compound plate or battery element of lead and salts of lead, in  
25 which the salts such as lead sulphide have been packed within a supporting frame of lead, but such crushed, packed, lead sulphide has proved too rotten, under subsequent electrical action, to stand alone, and such plates  
30 have not attained the above objects for which our improved manufacture has been devised.

To carry our invention into effect we use a metallic mold, of which the internal walls are first lubricated by some suitable material,  
35 such as talc, chalk, or graphite (which last material is that we most prefer).

In order that our invention may be the better understood, we herewith illustrate and describe the appliances by which we carry out  
40 our method of manufacture of said elements for secondary batteries.

Figure 1— is a half sectional elevation and Fig. 2— a transverse section of a double metallic mold for the purpose of forming the  
45 plates. Figs. 3 and 4 are an outside elevation and transverse section through  $xy$  of the completed element and pole piece attached.

The mold is formed of an inner plate A with a projecting ridge B on each side outlining  
50 the form of the element of plate to be cast, and having a throat C and vent holes D D by

which the molten metal may be poured and the displaced air or gases escape. Outer plates E E are bolted on the said inner plate  
to form the mold. The pole rim of metallic  
55 lead F is first poured in the bottom of the molds. When the plate is cast and cooled, the leaden pole piece G is dovetailed into the leaden pole rim F and the joint is covered completely by gutta percha or vulcanite H.  
60 Feet of vulcanite K are then dovetailed upon the bottom of the plate on which the plate may rest when placed in the battery.

We heat the mold, and gates of the mold, to prevent the chilling of the molten material  
65 when poured into the mold, and to maintain the molten condition of a first charge of lead to form a pole rim, until the body of the plate has formed a homogeneous and metallic attachment thereto. The mold is preferably  
70 placed in a vertical position, and a suitable amount of metallic lead is poured into the bottom of the mold to form a pole rim, on which a pole piece can be afterward burned.

When a complete lead pole rim is not  
75 needed, we have found that our plate, made as described above, is so strong and durable, that a part rim, or a piece restricted to a corner, is sufficient for the attachment of the pole piece, and the plate is sufficiently durable  
80 and homogeneous to enable us to cut out a piece of the plate, cast without a lead pole rim, and to burn in a pole piece. While the said lead pole-rim, where used, is still molten, the body of the element or plate, prepared as here-  
85 inafter described, is poured into the mold, and on cooling, the salt of the body of the plate is found to be finely crystalline in structure, and though even somewhat porous now by crystallization, and afterward still more porous by  
90 elimination of the sulphur, to be strong, durable, and self-supporting without a frame, and also to be homogeneously and metallically connected to the lead pole rim.

The body of the plate or element is prepared as follows:—We melt galena in one  
95 crucible, and metallic lead in another crucible, raising them to about the same temperature. We then mix the molten lead and galena together, preferably in about equal  
100 weight for negative plates, but with a lower percentage of galena up to say twenty per

cent. for positive plates. This is most conveniently done by pouring the lead slowly, and from a considerable height, into the crucible containing the molten galena, and the mixture, which thus becomes an artificial sub-sulphide of lead, and is finely crystalline on cooling, and homogeneous, is poured into a heated metallic mold, to form a plate or element.

10 The plate may be cast in any desired form, either flat, corrugated, cylindrical, or in any convenient shape.

If it is thought desirable, the plate may be submitted to a roasting process, to oxidize the lead salt forming the body of the plate, means being taken to protect the lead pole rim from excessive or oxidizing heat.

20 These plates may, after having been prepared by our above described method of manufacture, be submitted to any suitable vulcanizing process, to insulate them from one another and the cell; or feet of vulcanite or other insulating material may be fitted into the under side of the plate. The plates are now ready to be put into cells, and formed by any suitable method.

25 Having now described our invention, what we claim, and desire to secure by Letters Patent, is—

30 1. A method of manufacture of elements or plates for secondary batteries, consisting

of melting separately galena and metallic lead, mixing the same, and pouring the mixture in a molten condition into a heated metallic mold, substantially as described. 35

2. An element or plate for secondary batteries, composed wholly as to its operative body of lead sub-sulphide as described from a mixture of molten lead and galena, manufactured substantially as and for the purpose herein described. 40

3. In the manufacture of elements or plates for secondary batteries, the placing of a molten lead pole rim or portion of a rim at the bottom of a heated mold, and pouring thereon a molten mixture of metallic lead and galena, to form a homogeneous plate, substantially as described. 45

4. An element or plate for secondary batteries consisting as to its operative body of lead sub sulphide, and as to one end or portion of one end of a pole rim of metallic lead homogeneously and metallically connected to the said body, substantially as described. 50

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses. 55

HUGH FITZALIS KIRKPATRICK-PICARD.  
HENRY THAME.

Witnesses:

RICHARD A. HOFFMANN,  
CHARLES H. CARTER.