

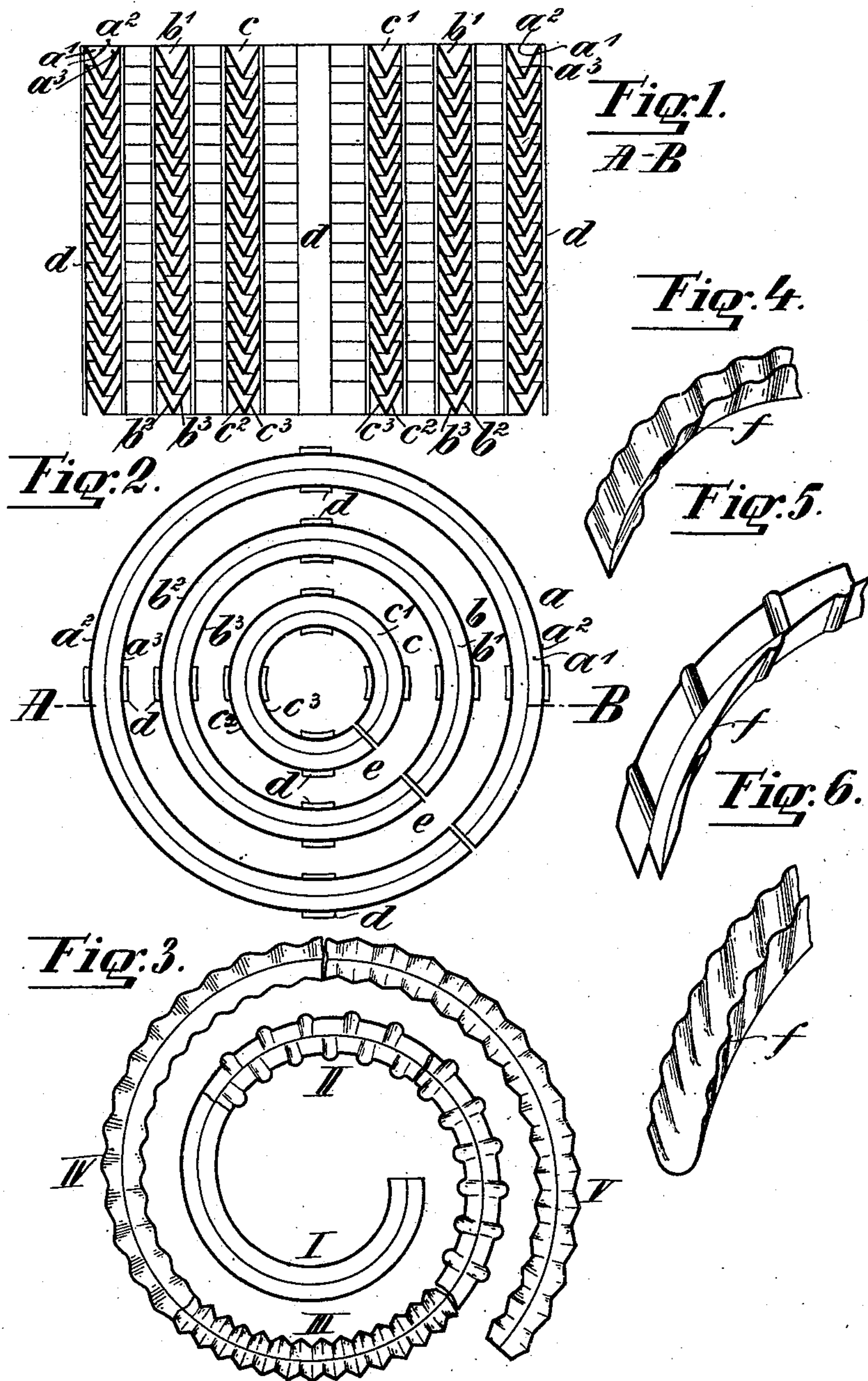
No. 749,185.

PATENTED JAN. 12, 1904.

R. HAGER.
ELECTRODE.

APPLICATION FILED JAN. 31, 1901.

NO MODEL.



Witnesses

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UNITED STATES PATENT OFFICE.

RUDOLF HAGER, OF HALENSEE, NEAR BERLIN, GERMANY.

ELECTRODE.

SPECIFICATION forming part of Letters Patent No. 749,185, dated January 12, 1904.

Application filed January 31, 1901. Serial No. 45,514. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF HAGER, engineer, of Friedrichsruherstrasse 5, Halensee, near the city of Berlin, in the Empire of Germany, have invented certain new and useful Improvements in and Connected with Electrodes; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates to electrodes for electric accumulators, and more especially to electrodes prepared and formed according to the so-called "Planté" method, a process in which, as known, two or more plates of lead (electrodes) are placed in a bath of diluted sulfuric acid and an electric current is conducted through the bath, whereupon the positive electrode becomes covered with a layer of dioxid of lead. This said method of treatment when suitably repeated and the electrodes often reversed produces the formation upon the electrodes known, as hereinbefore indicated, under the name of "Planté."

In this connection my improvements consist in a peculiar shape or form being imparted to groove or channel shaped elements and each of the channels soldered to a lead strip in known manner. An electrode so formed when taken into use has been to an extent unsatisfactory in so far as the same is not durable, as in the formation of the layer as well as in the charging and discharging of such electrodes tensions are produced in the lead substance which have been found to effect a deformation of the separate channels, whereby a breaking off of the lead sponge or dioxid of lead on the surface of these channels can take place. I have now found that these deformations and the above-mentioned injurious consequences can be obviated if instead of each separate channel being caused to consist of an entirely complete square or a complete ring or a complete ellipse the said ring is at one point slit or when the separate rills, channels, or grooves are constructed in the form of a spiral. In my improved device each channel can in the forming of the layer, in the charging, or in the discharging so expand or contract that injurious tensions which might cause

the deformation of the channel no longer occur.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is an axial vertical section on the line A B of Fig. 2 through a number of electrode-plates constructed according to my invention and arranged coaxial to each other. Fig. 2 is a corresponding plan which shows the arrangement of the separate plates to each other. Fig. 3 shows in plan a number of variously-shaped groove or channel shaped pieces combined to form electrode-plates. Figs. 4, 5, and 6 show in perspective sectional portions of variously-shaped channel-plates for electrodes constructed according to my invention.

In the drawings the electrode-plates $a b c$ are arranged coaxially to each other. The plate a forms, therefore, the casing or envelop of the plate b , the latter being of considerably less diameter than the former. The same proportion as to size exists between the plate b on the one side and the plate c on the other. Each of these three plates $a b c$ consists of a more or less large number of channels $a' b' c'$, having flat smooth walls $a^2 b^2 c^2$ and $a^3 b^3 c^3$. Both walls $a' a^2$ or $b' b^2$ are arranged to meet at an angle which is preferably under ninety degrees, but which, however, may be ninety degrees or more. Furthermore, each of the plates are connected by upright lead strips d , and it should be noted that each of the lead strips d is connected to each of the channels. Instead of arranging these lead strips d in an upright position, they may evidently be given any other position desired. To these strips d other strips for leading off the current (not shown in the drawings) are connected, on which strips the terminals or clamps are arranged. Furthermore, each separate channel $a' b' c'$, although possessing the circular shape, does not form a continuous circle, but is open at one point, each channel being separated or divided, as shown at e , whereby the advantage hereinbefore described is attained.

In place of the previously-described channel-plates $a' b' c'$ with smooth walls I may also employ a modification—viz., channels with

corrugated or slanting walls—such as are, for instance, shown in Figs. 4 and 6. In these channels the undulated elevations or ribs *f* meet at an angle, or, as shown in Fig. 6, have a trough-like shape. In Fig. 3 further modifications of such channel-plates are shown. This figure illustrates a channel composed of various parts I, II, III, IV, and V. To obviate misunderstanding, I will remark that a combination of the parts I, II, III, IV, and V is not carried out on one and the same channel in practice. This figure has only the purpose of showing that either one of the channel-pieces I II III IV V, as also any similar channel-shaped pieces, can be employed for the production of square, round, or spiral electrode-plates, the important feature being that a number of spirally-shaped channel-plates are employed to form a single body of optional section. These spiral channel-plates are placed together in a manner similar to that shown in Fig. 1, the separate channel-plates with the stiffening-strips being, as hereinbefore indicated, soldered together, whereby firmness and solidity become imparted to the whole. As the plates are only used for the Planté process, a coating of the channels with the filling mass does not take place.

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

1. An electrode of the Planté form comprising separate plates coaxially arranged, each plate being composed of a series of channel-shaped plates arranged one above the other, each channel-shaped plate being provided with a slit extending transversely of the channel therein.

2. An electrode of the Planté form comprising separate plates coaxially arranged, each plate being composed of a series of channel-shaped plates arranged one above the other, each channel-shaped plate being provided with a slit extending transversely of the channel therein, and lead strips connecting each series of channel-shaped plates.

3. An electrode-plate consisting of a series of channel-shaped plates arranged one above the other, each channel-shaped plate being provided with a slit extending transversely of the channel therein.

In witness whereof I have hereunto signed my name this 24th day of September, 1900, in the presence of two subscribing witnesses.

RUDOLF HAGER.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.