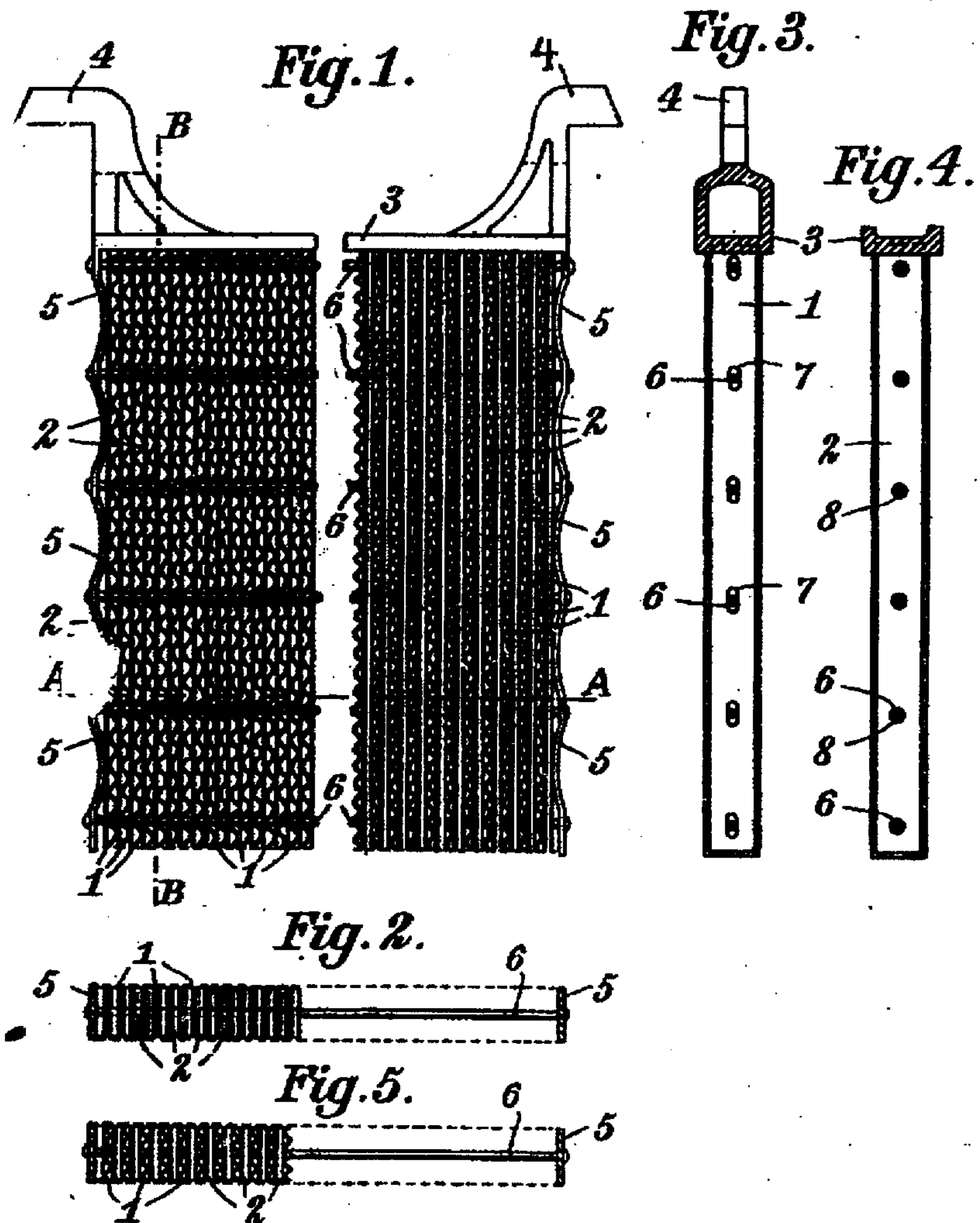


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M. MARGULIS.
ACCUMULATOR PLATE.
APPLICATION FILED JUNE 7, 1907.



WITNESSES

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ACCUMULATOR-PLATE.

No. 884,028.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, MICHAIL MARGULIS, a subject of the Emperor of Russia, residing at 12 Puschkinskaja, Odessa, in the Empire of Russia, have invented a new and useful Accumulator-Plate, of which the following is a specification.

In place of the old accumulator-plates having active material introduced into them other accumulator-plates have already been employed, on which great surfaces were produced by cutting them with tools in a certain manner, so that they could be at once formed. Such accumulator plates, although superior to the old plates for various reasons, yet presented various defects, the chief defects being, that particularly the positive plates were subjected to distortions due to extension and contraction during the formation or charge and the discharge respectively, which distortions easily produced short circuits. The known accumulator-plates comprising a frame and a plurality of loose alternately straight and wavy lead strips are not subjected to distortions, it is true, but they present other defects. Either the extension of the lead strips during the formation or charge forced them with the frame outwards, so that the width of the plates was as a rule increased on certain places, which in view of the restricted space at disposal for the plates was objectionable; or, if the frame was made sufficiently strong to prevent the lead strips from bending out, the several strips were so much compressed as to reduce the spaces between them and to increase their surfaces in contact with one another and consequently to diminish their active surfaces, in other words to reduce the capacity of the accumulator-plate.

My invention relates to improvements in such accumulator-plates, whereby the said defects are avoided.

The objects of my improvement are, first, to employ a rigid head-piece of lead in place of a frame; second, to suspend the several alternately straight and wavy lead strips from the head-piece; third, to provide elastic pressure strips which are suspended from the head-piece and are adapted to yieldingly compress the straight and wavy lead strips; and, fourth, to provide a plurality of cross rods for connecting together the elastic pressure strips.

I will now proceed to describe my inven-

tion with reference to the accompanying drawing, in which—

Figure 1 is an elevation of the accumulator-plate, a part of the straight and wavy lead strips being omitted to show the connecting cross rods. Fig. 2 is a horizontal section through the same on the line A—A in Fig. 1, Fig. 3 is a vertical cross section through the same on the line B—B in Fig. 1 and shows a straight lead strip, Fig. 4 is a similar section and shows a wavy lead strip, and Fig. 5 is a horizontal section similar to Fig. 2, in which the straight lead strips are longitudinally corrugated.

Similar characters of reference refer to similar parts throughout the several views.

Instead of a frame as in known accumulator-plates I employ a rigid head-piece 3 of lead and provide it with suitable supporting projections 4—4. From the head-piece 3 I suspend the known series of straight lead strips 1, 1 and wavy lead strips 2, 2, which strips alternate with one another and bear on each other, so that spaces are left between them, as is clearly shown at Fig. 1. These lead strips 1, 1 and 2, 2 may be fastened with their upper ends on the head-piece 3 in any known manner, for example by soldering. At the ends of the head-piece 3 I provide two pressure strips 5, 5, to afford lateral support for the electrode strips 1, 1 and 2, 2; and said pressure strips may be made in one piece with the head-piece 3 or may be rigidly connected therewith in any known manner. As is clearly shown in Fig. 1, the two pressure strips 5, 5 are each divided into several (here five) sections, which are bent inwards. They are preferably connected together by means of several (here six) cross rods 6, 6 of hard lead or any other suitable material, which rods are shown as provided at their ends with heads for bearing on the pressure strips 5, 5. However, the ends of the rods 6, 6 may also be secured on the supporting strips 5, 5 in any other known manner. The rods 6, 6 are made to pass through the series of straight and wavy lead strips 1, 1 and 2, 2. Preferably the straight lead strips 1, 1 are provided with lengthy slots 7, 7 so as to permit the rods 6, 6 to vertically move in their slots, when they extend during the formation or charge of the accumulator-plate and contract during the discharge of the latter. The wavy lead strips 2, 2 are on the contrary, provided with circular holes 8, 8 which more

or less closely fit the rods 6, 6, so that the strips 2, 2 may rest on the latter and be thereby supported, since they are by reason of their shape permitted to extend and to contract freely. It is obvious, that the bent parts of the two pressure strips 5, 5 are elastic so that they will more or less bend outwards, in other words they will be more or less straightened, if during the formation or charge of the accumulator-plate the several lead strips 1, 1 and 2, 2 extend in the horizontal direction. The elastic strips 5 may be made of hard lead, of hard rubber or also of other material, especially of metal. When during the discharge of the accumulator-plate the lead strips 1, 1 and 2, 2 contract, of course the pressure strips 5, 5 will resume their original shape. Thus the series of straight and wavy lead strips 1, 1 and 2, 2 is permitted to extend and to contract in the horizontal direction, while the length of the rods 6, 6 and consequently also of the accumulator-plate remains practically constant. It is also evident, that the areas of the spaces between the several straight and wavy lead strips 1, 1 and 2, 2 will remain practically constant during the vertical extension and contraction of the accumulator-plate, so that no strains will be produced in the active material within the said spaces. The oval shape of the holes 7, 7 in the straight lead strips 1, 1 permits the latter to extend and to contract independently of the pressure strips 5, 5. Where so preferred, also the wavy lead strips 2, 2 may be provided with oval slots similar to those 7, 7 instead of the circular holes 8, 8, so as to permit the cross rods 6, 6 to freely move in the vertical direction. The rods 6, 6 may move in the said direction either wholly or partially at the ends, in which latter case they are more or less bent downwards. In all cases the accumulator-plate is protected from distortions, so that the several accumulator-plates contained in a cell can not possibly come in contact with one another and consequently no short circuits can be produced. The several accumulator-plates will simply extend and contract in the vertical direction during their formation or charge and discharge respectively without producing any evil effects. The width of the accumulator-plate is prevented from varying.

As already explained above, during the extension and contraction of the accumulator-plate the areas of the several spaces between the straight and wavy lead strips 1, 1 and 2, 2 will remain practically constant, so that the surfaces of contact between the several strips will also remain constant, which means that the active surface of the accumulator-plate will remain practically constant and consequently also its capacity during the formation or charge and the discharge. This is a great advantage of the

new accumulator-plate in opposition to the known accumulator-plates.

The even straight lead strips 1, 1 hitherto shown may be replaced by longitudinally corrugated straight lead strips 1', 1' if so preferred, as is shown in Fig. 5. Thereby of course the active surface of the accumulator-plate and hence its capacity will be increased. The even straight lead strips 1, 1 may also be replaced by otherwise shaped lead strips for attaining a similar effect.

The accumulator-plate may be varied in many respects within the scope of the appended claims without departing from the spirit of my invention.

I claim:

1. An accumulator-plate consisting of a head-piece, a plurality of alternately straight and wavy lead strips suspended from the head-piece and provided with holes, a plurality of pressure strips suspended from the head-piece and adapted to yieldingly compress the straight and wavy lead strips in the horizontal direction, and a plurality of horizontal cross rods passing through the holes of the straight and wavy lead strips and adapted to connect together the pressure strips.

2. In an accumulator-plate, the combination with a head-piece, of a plurality of vertical alternately straight and wavy lead strips secured with their upper ends on said head-piece and provided with holes, a plurality of elastic pressure strips suspended from said head-piece and adapted to yieldingly compress said straight and wavy lead strips in the horizontal direction, and a plurality of cross rods passing through the holes of said straight and wavy lead strips and adapted to connect together said pressure strips while being permitted to vertically move in the holes of the straight lead strips.

3. In an accumulator-plate, the combination with a leaden head-piece, of a plurality of vertical alternately straight and wavy lead strips secured with their upper ends on said leaden head-piece and provided with holes, a plurality of elastic supporting strips suspended from said leaden head-piece and adapted to yieldingly compress said straight and wavy lead strips in the horizontal direction, and a plurality of horizontal cross rods passing through the holes of said straight and wavy lead strips and adapted to connect together said supporting strips while being permitted to vertically move in the holes of the straight lead strips.

4. In an accumulator-plate, the combination with a head-piece, of a plurality of alternately straight and wavy lead strips suspended from the head-piece and provided with holes, the straight lead strips being longitudinally corrugated, a plurality of pressure strips suspended from the head-piece and adapted to yieldingly compress the straight and wavy lead strips in the horizontal

zontal direction, and a plurality of horizontal cross rods passing through the holes of the straight and wavy lead strips and adapted to connect together the pressure strips.

5 5. In an accumulator-plate, the combination with a head-piece, of a plurality of vertical alternately straight and wavy lead strips secured with their upper ends on said head-piece and provided with holes, the
10 straight lead strips being longitudinally corrugated, a plurality of elastic pressure strips suspended from said head-piece and adapted to yieldingly compress said straight and wavy lead strips in the horizontal direction,
15 and a plurality of cross rods passing through the holes of said straight and wavy lead strips and adapted to connect together said pressure strips while being permitted to vertically move in the holes of the straight lead
20 strips.

6. In an accumulator-plate, the combination with a leaden head-piece, of a plurality

of vertical alternately straight and wavy lead strips secured with their upper ends on said leaden head-piece and provided with 25 holes, the straight lead strips being longitudinally corrugated, a plurality of elastic supporting strips suspended from said leaden head-piece and adapted to yieldingly compress said straight and wavy lead strips in 30 the horizontal direction, and a plurality of horizontal cross rods passing through the holes of said straight and wavy lead strips and adapted to connect together said supporting strips while being permitted to ver- 35 tically move in the holes of the straight lead strips.

In witness whereof I have hereunto set my hand in presence of two witnesses.

MICHAIL MARGULIS.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.