

No. 685,797.

Patented Nov. 5, 1901.

A. RICKS.  
ACCUMULATOR ELECTRODE.

(Application filed May 18, 1900.)

(No Model.)

Fig. 1.

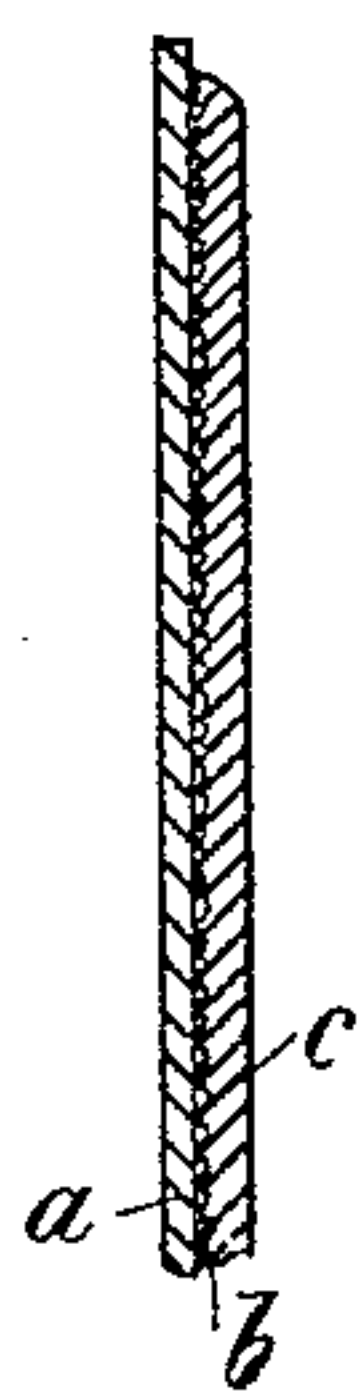


Fig. 2.

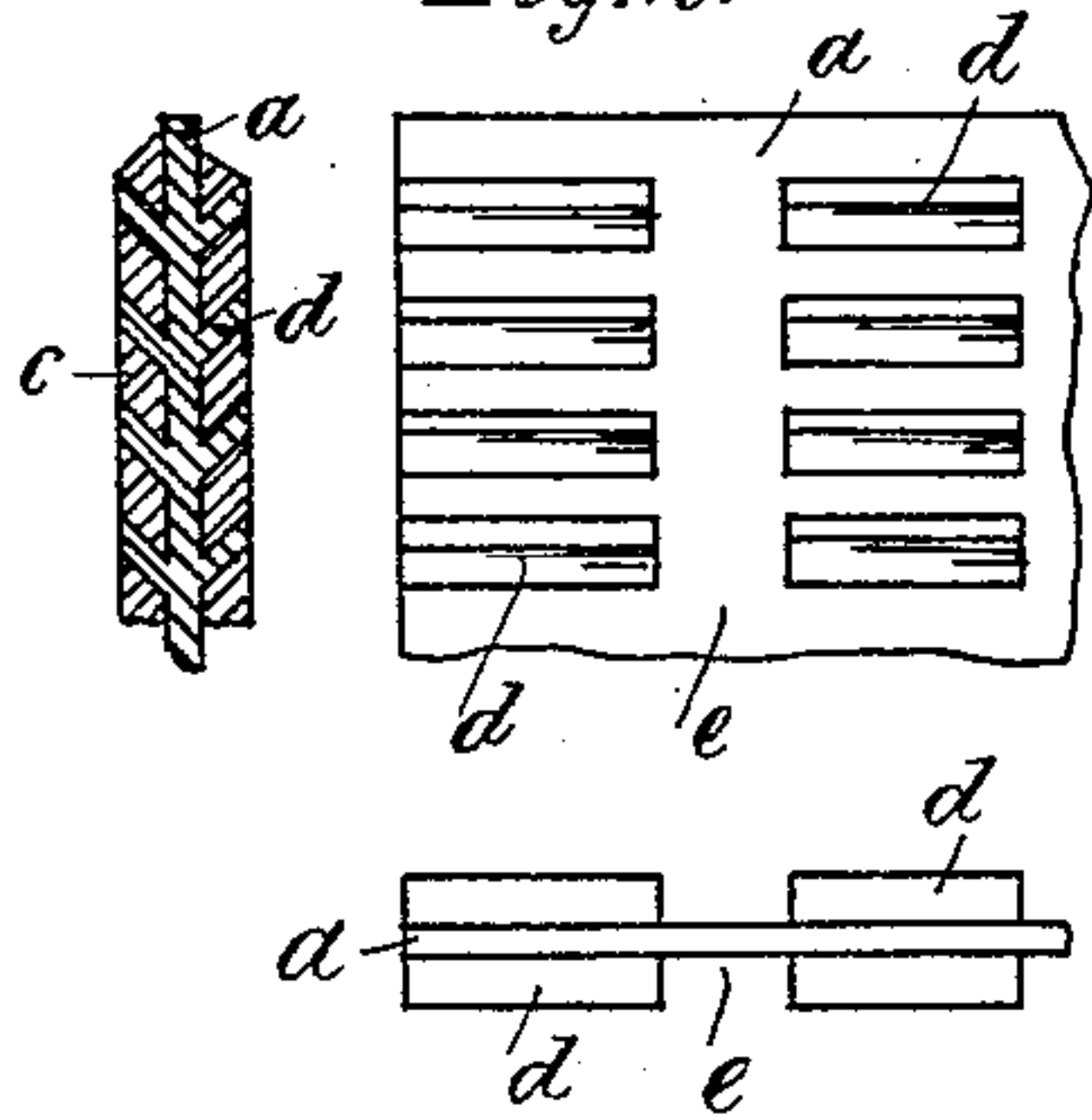


Fig. 3.

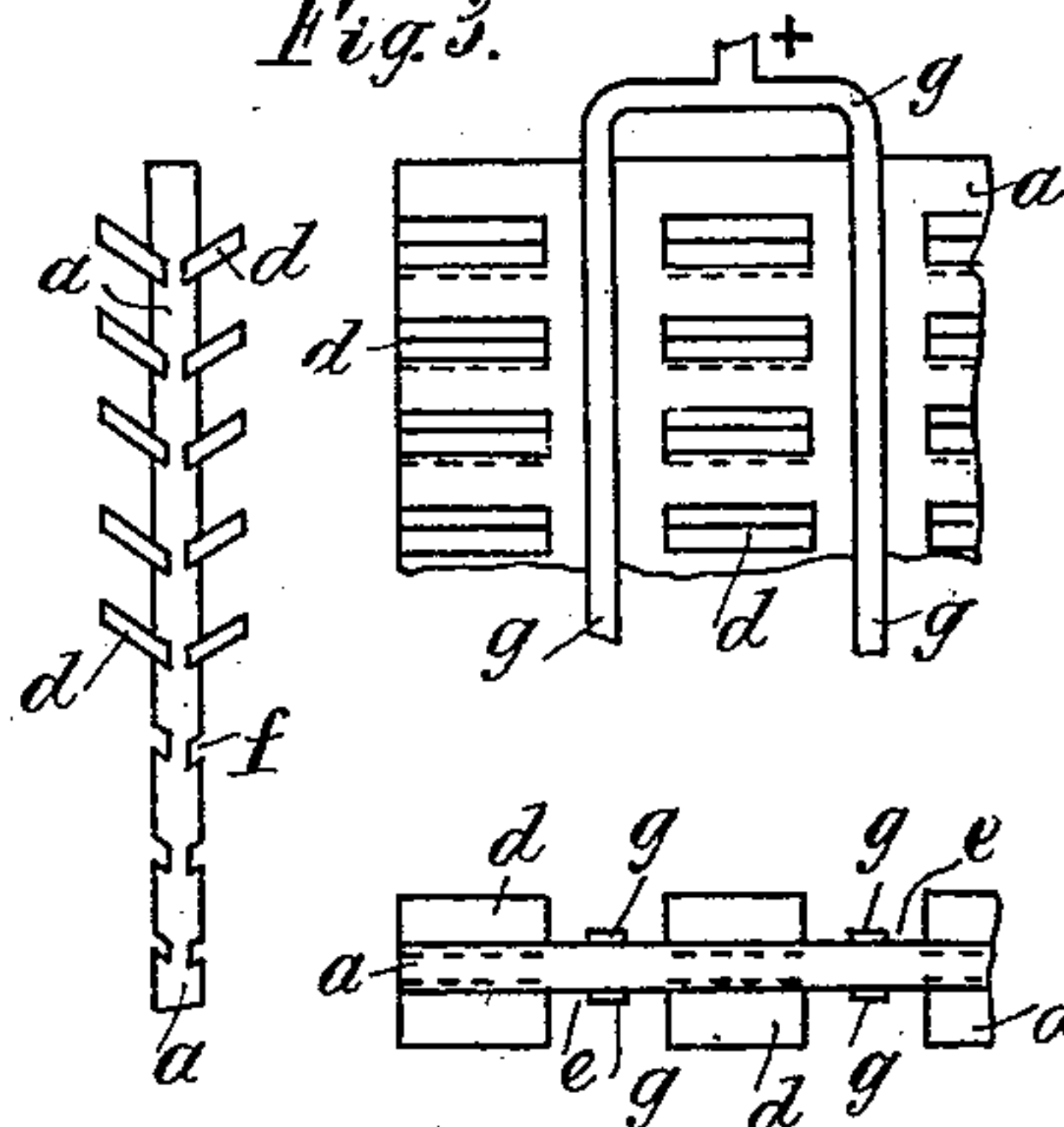


Fig. 4.

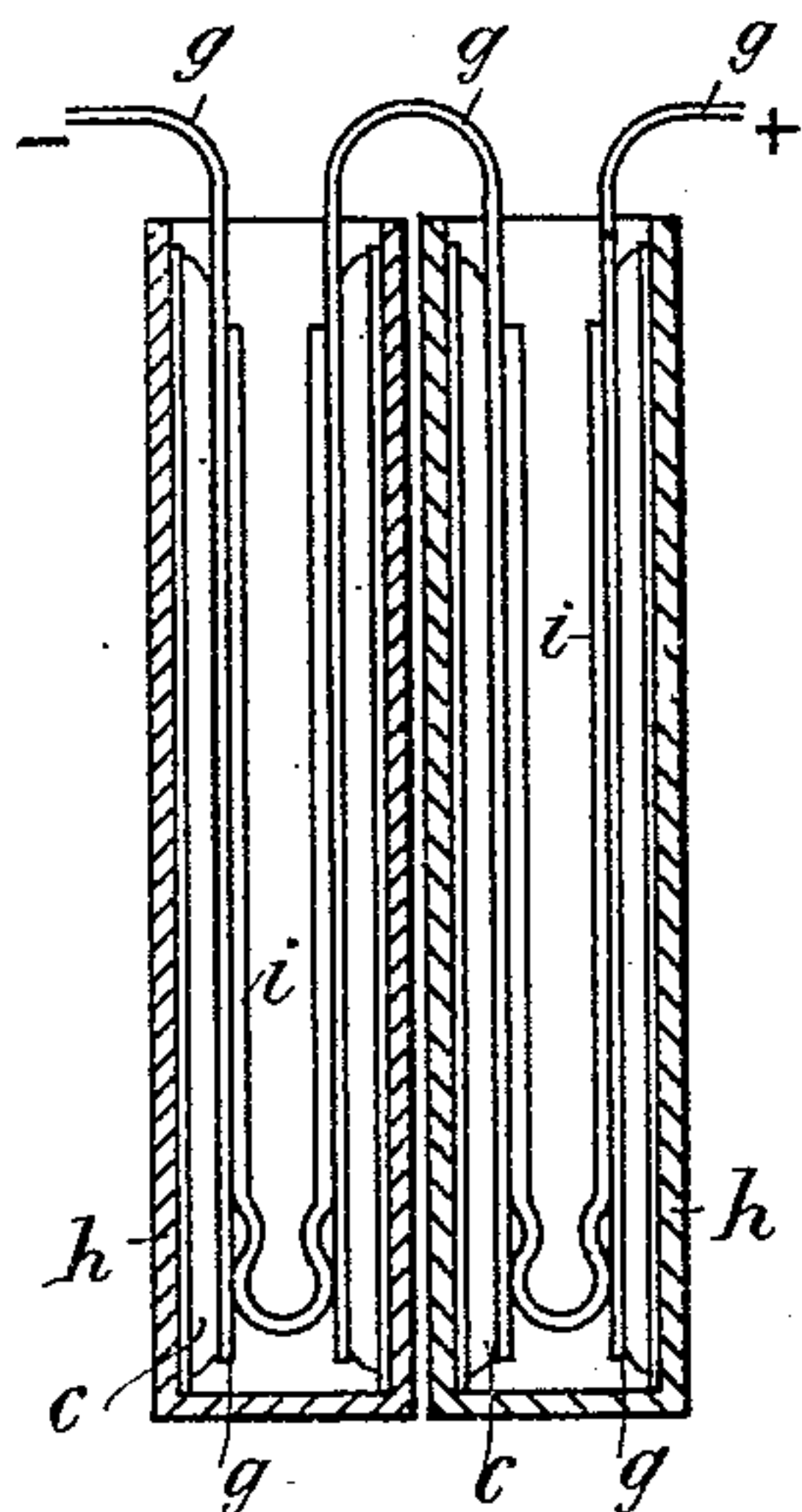


Fig. 5.

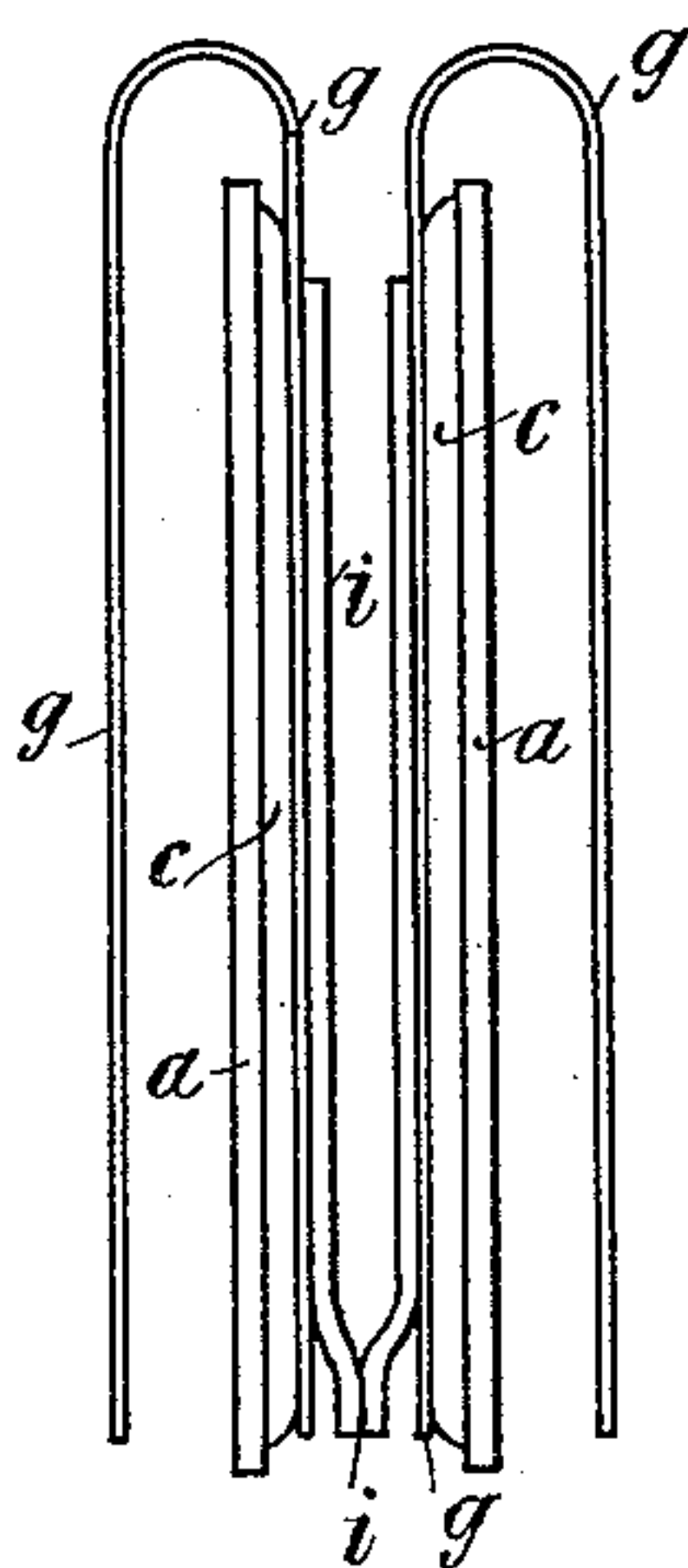


Fig. 6.

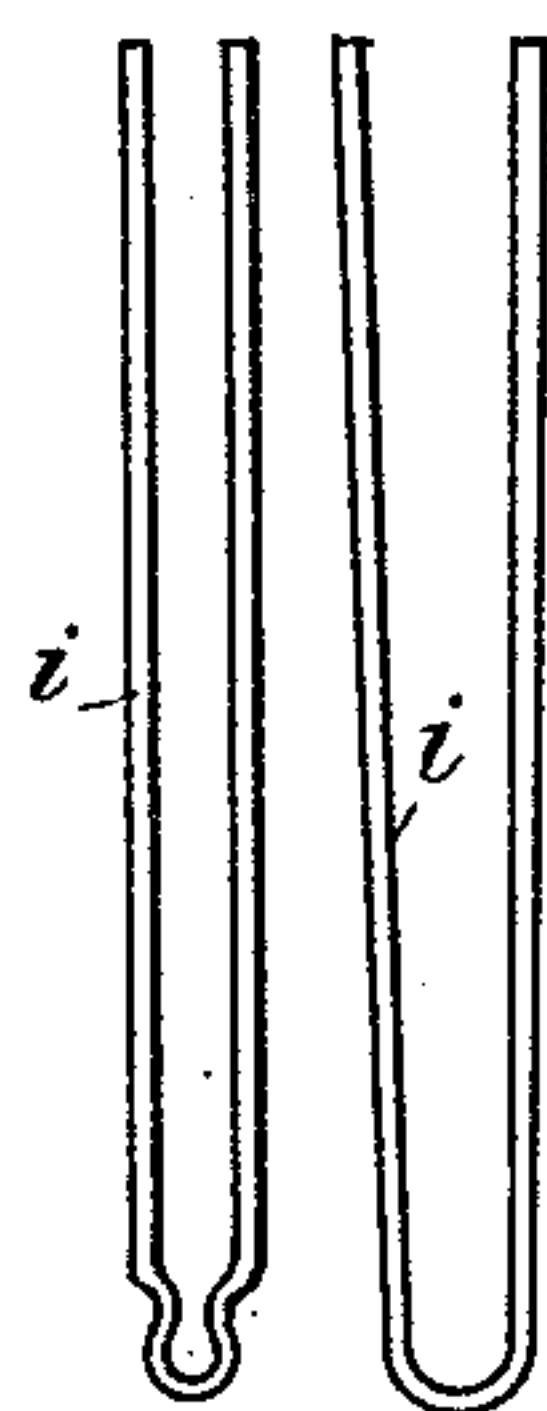


Fig. 7.

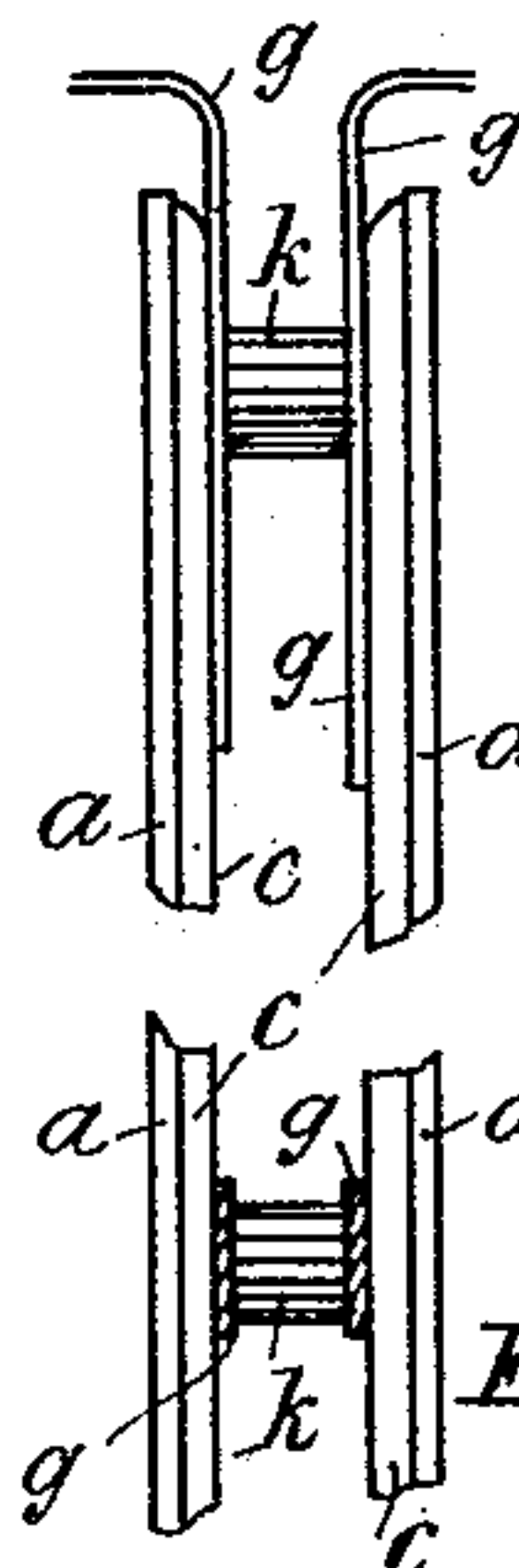


Fig. 8.

Fig. 9.



Fig. 10.

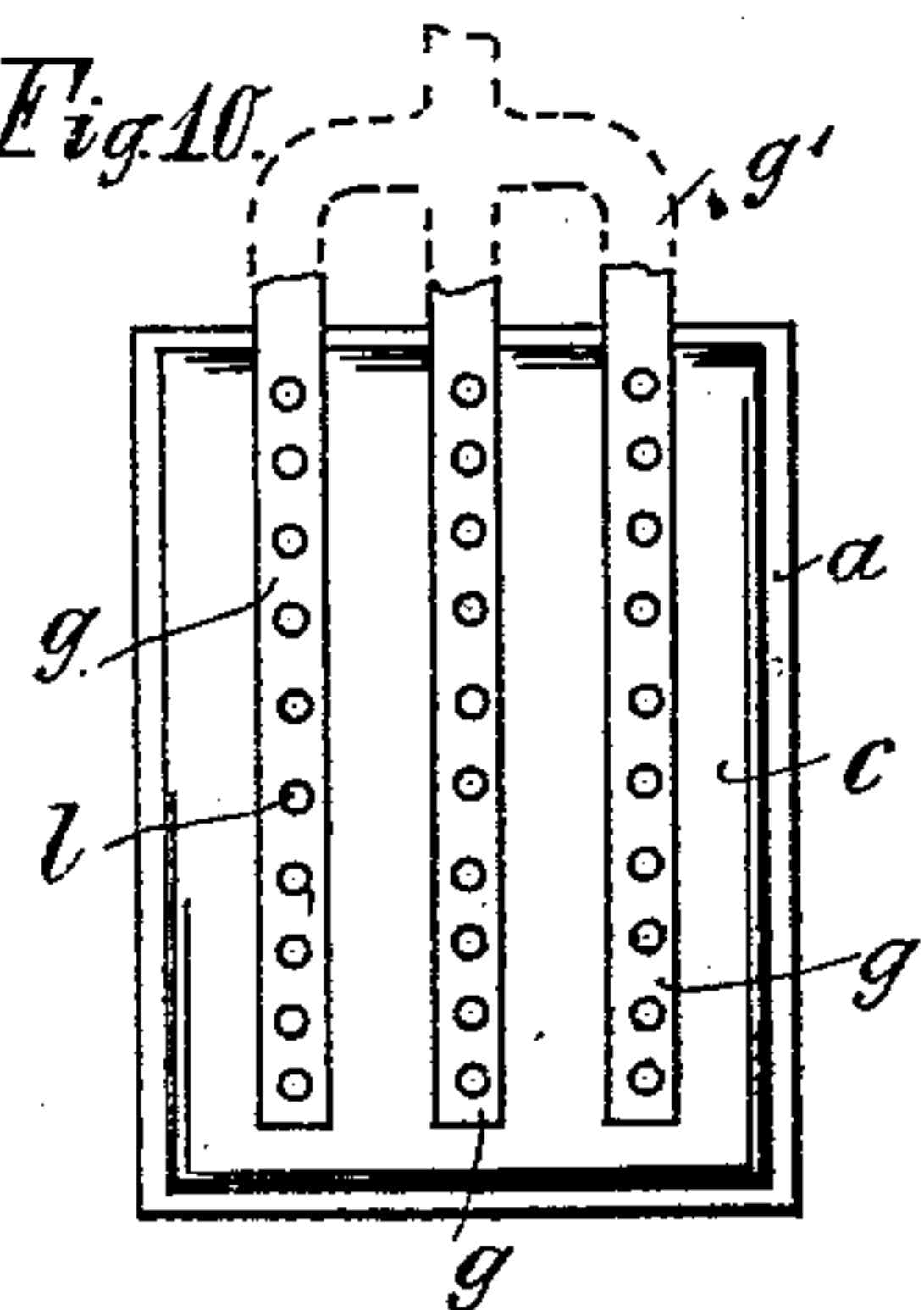
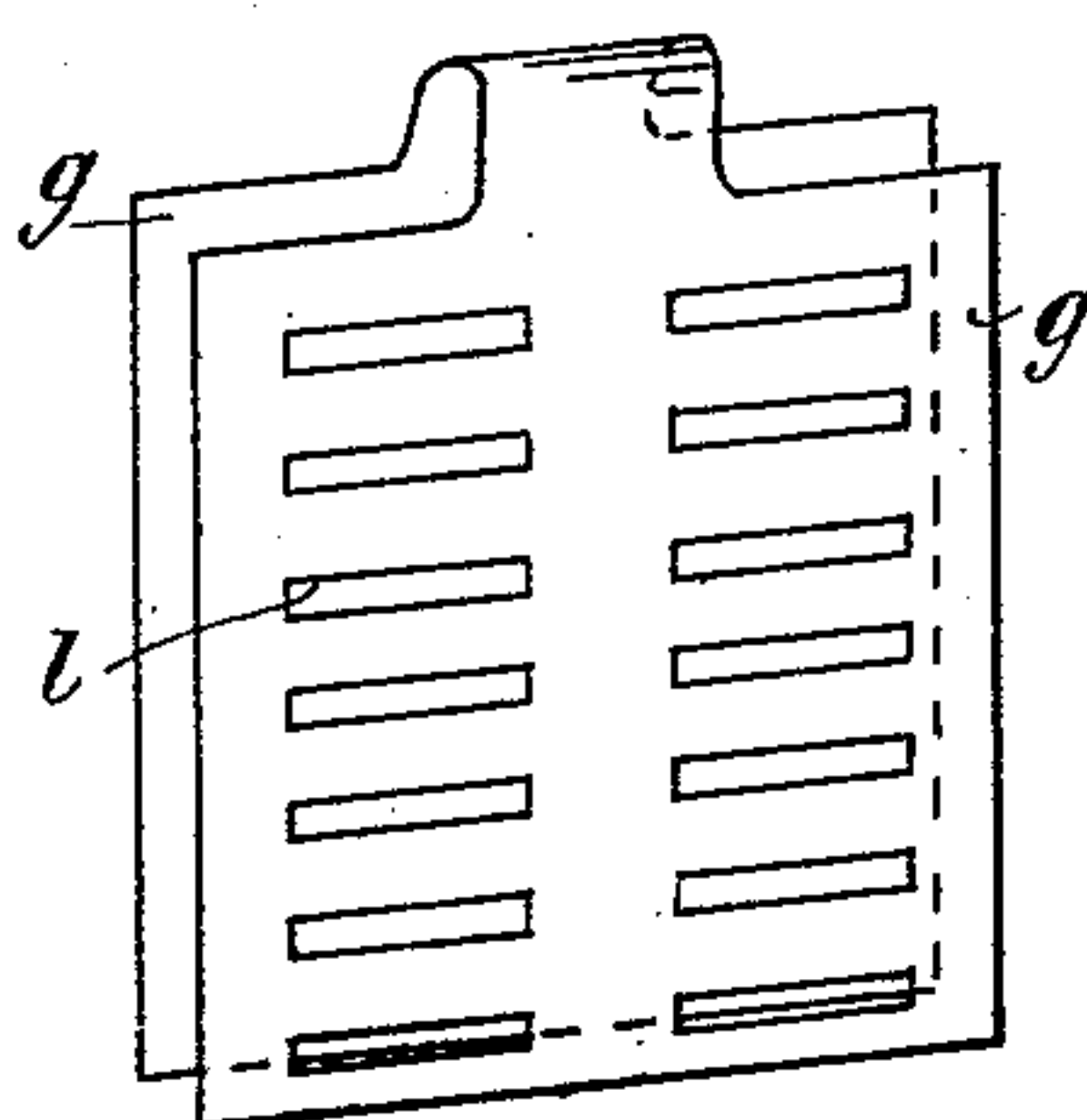


Fig. 11.



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# UNITED STATES PATENT OFFICE.

ALBERT RICKS, OF BERLIN, GERMANY.

## ACCUMULATOR-ELECTRODE.

SPECIFICATION forming part of Letters Patent No. 685,797, dated November 5, 1901.

Application filed May 18, 1900. Serial No. 17,109. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT RICKS, a subject of the Emperor of Germany, and a resident of Berlin, Germany, have invented a new and useful Accumulator-Electrode, of which the following is a specification.

The invention is fully and clearly set forth in the following specification and then pointed out in the claims.

In the accompanying drawings, in which similar letters of reference refer throughout to similar parts, Figure 1 is a vertical cross-section of an electrode embodying my invention. Fig. 2 represents in different views certain modifications. Fig. 3 is a similar representation of other modifications. Fig. 4 shows the electrodes connected as an accumulator. Figs. 5 to 11 illustrate on different scales details of my invention.

As known to those skilled in the art, there exist at present many disadvantages in the electrodes employed by the different systems of accumulators, among which especially are the short duration of their effectiveness and the excessive weight involved in their construction. In the present invention, however, these as well as certain other objectionable features are eliminated or greatly reduced, as will be hereinafter explained.

In the construction of my invention the electrode is formed as follows: In order to give an active mass proper and sufficient stability, a plate *a*, (see Figs. 1, 2, 3, and 5,) formed of the thinnest possible material, as celluloid or mica, properly insulated, is employed as a base or support. This plate *a* is first coated with some adhesive material, as gum-arabic or celluloid solutions or any other serviceable and desirable adhesive substance, and then covered with a working mass *b* in finest granular form, (see Fig. 1,) which granular mass is of the same stuff as the active mass which was previously by means of cement well connected and hardened. This tough bearing hardened granular and active mass forms a perfect adhesive and complete cover to the plate approximately at all points of equal thickness and height. When the adhesive material is dried—as, for instance, an adhesive substance formed of a solution of gum-arabic on hard rubber—then it will be found that the same is so tightly cemented that it is impossi-

ble to remove it save by breaking it in pieces. By this it is obvious that a plate is obtained which can be substituted in place of the excessively-heavy lead grids heretofore employed. It is adapted to receive an active mass applied in any known manner, cementing or binding the grains together in extraordinary solidity. In order that the adhesive material may be given even a greater stability to the plate *a*, the latter can (see Figs. 2 and 3) be provided with ribs *d* or with grooves *f*. Between the ribs or projections spaces *e* are formed, thus giving additional room for applying the active mass. These ribs or grooves in the supporting-plate *a* may be arranged horizontally or diagonally, as desired, their object being to give the adhesive material as well as also the active mass an increased tenacity against the volume alteration of the mass in a vertical direction. In the horizontal direction the adhesive material (gum-arabic) which is between the base and the active mass serves here as a buffer, which reduces the effect of volume alteration in the direction of the said base or supporting plate.

As serviceable adhesive materials it is to be understood that all are included which are able to form a strong connection between plates and active masses, and it can consist of other or essentially the same material as that from which the stiff plate is formed.

In place of fastening the active granular mass *b* to the base-plate *a* through the means of an adhesive material, as before mentioned, the same results can be obtained by an application of heat or by means of solutions to the plate *a*, so that the latter is made sticky, in such a manner that the part *b* is squeezed in, so that when the plate is hardened or stiffened the connection between the two is achieved.

In using stiff gum-arabic as the base-plate *a* the part *b* can be brought upon the said plate before vulcanization of the latter—that is, after it is in a white or kneadable condition. Should, however, gutta-percha be employed as a base-plate, the connection between it and the mass *b* can be effected through the means of heat, inasmuch as the application of the latter makes the gutta-percha sticky. If soft rubber, celluloid, or



such material be chosen as the base-plate, it can be made after a treatment of some substance—as benzin, turpentine, ether, acetone, &c.—adaptable for binding the mass *b* when the latter is pressed against the plate, so that after the stiffening of the latter the two are firmly cemented together. Finally, this process allows the use of similar processes employed in other arts for handling the base-plate—as, for example, the said plate can be changed into a stiff body through the application of heat, as in handling clay, &c., or by use of heat can be first made a liquid, as with glass, and then afterward cooled and hardened. In all these cases the body *a* remains in connection with the part *b*, carrying the active mass *c*, and consists of a non-lead material or that the body-plate *a* is coated by application of, for example, aluminium with non-conducting substances, and the active granular parts *b* in the working mass and which supports the latter consists of the same material as this active mass *c*, so that a complicated connection within the mass with metals, as with lead grids, is now avoided.

Conduction of the current to and fro is effected by means of lead strips or plates *g*, which without consideration of the aforementioned deficiencies can be laid between the active mass and the base-plate *a*. (See Fig. 3.) Should it be desired, however, to eliminate these deficiencies and obtain a current-conducting means which is changeable and adapted to hold fast to the active mass, the manner illustrated in Figs. 4 to 11 can be employed. This new means eliminates all necessity of employing lugs on the electrodes and, further, does away with all soldering, &c., which hitherto caused so much work, cost, and trouble. These changeable conducting strips or plates are adapted not alone for mass electrodes, as mine, but also for lead grids or frame systems of electrodes or for such electrodes as consist only of lead, for with their employment to annexed, thick, and heavy lugs and the heavy lead rabbets are entirely eliminated. For this purpose one or more very thin lead strips *g* are led from one electrode to another, (see Figs. 4, 5, 7, 8, and 10,) which last at the pole are joined together, as shown at *g'* in Fig. 10. In place of the strips I may employ plates *g*, Fig. 11, which are provided with suitable openings *l*, so as not to afford any interference with the electrolyte acting upon the working mass and to allow the gases to easily escape. The strips shown in Figs. 4 to 10 are adapted for slow charging, while that shown in Fig. 11 is adapted for rapid charging. These strips or plates are adapted to be held firmly against the active mass by means of springs or of stiff elastic bodies *i* or soft bodies *k*, made of non-conducting material, as gum-arabic, so

that the contact is always maintained, inasmuch as the conducting strips or plates follow at all times the electrode-surfaces as the volume alteration takes place in charging and discharging the accumulator. It is immaterial whether the elastic bodies *i* or *k* are arranged in horizontal order, as shown in Figs. 4, 5, 6, 7, and 8, or in vertical position, so long as the pressure is adapted to hold the said bodies in continuous contact with the electrode. Further, it is obvious that the construction of these elastic bodies permits the conducting strips or plates to aid in firmly holding the active mass *c* in its correct position.

It will be seen that through my invention an accumulator is provided which is very light, which can be quickly charged and discharged, which can be cheaply manufactured, inasmuch as the great amount of work and labor heretofore expended is done away with, and which will maintain its effectiveness much longer than those now known in the art.

What is claimed as new is—

1. An accumulator-electrode, consisting of a non-conducting base provided with ribs or grooves, an active mass, and an adhesive substance of inactive material firmly connecting said base and mass, substantially as described.
2. An accumulator-electrode, consisting of a stiff non-conducting base an adhesive material thereon, an active mass in connection therewith and supported thereby, and means bearing with spring-pressure to continually press upon the mass to suitably conduct the current therefrom, substantially as described.
3. An accumulator-electrode consisting of a stiff non-conducting base and an adhesive material of inactive substance thereon, an active mass in fine granular form covering said adhesive material, and a conductor, all substantially as shown and described.
4. An accumulator-electrode consisting of a stiff non-conducting base and an adhesive material thereon, an active mass in fine granular form covering said adhesive material, and lead strips arranged between the active mass and the base, as set forth.
5. An accumulator-electrode consisting of a stiff non-conducting base, and an adhesive material thereon, an active mass in fine granular form covering said adhesive material, lead strips, and springs holding said strips firmly against the active mass, substantially as shown and described.

In witness whereof I have hereunto signed my name, this 30th day of April, 1900, in the presence of two subscribing witnesses.

ALBERT RICKS.

Witnesses:

HENRY HASPER,  
WOLDEMAR HAUPT.