No. 618,247. Patented Jan. 24, 1899.

# H. DOLTER.

## SECONDARY BATTERY.

(Application filed Apr. 23, 1898.)

(No Model.) 4 Sheets—Sheet 1.

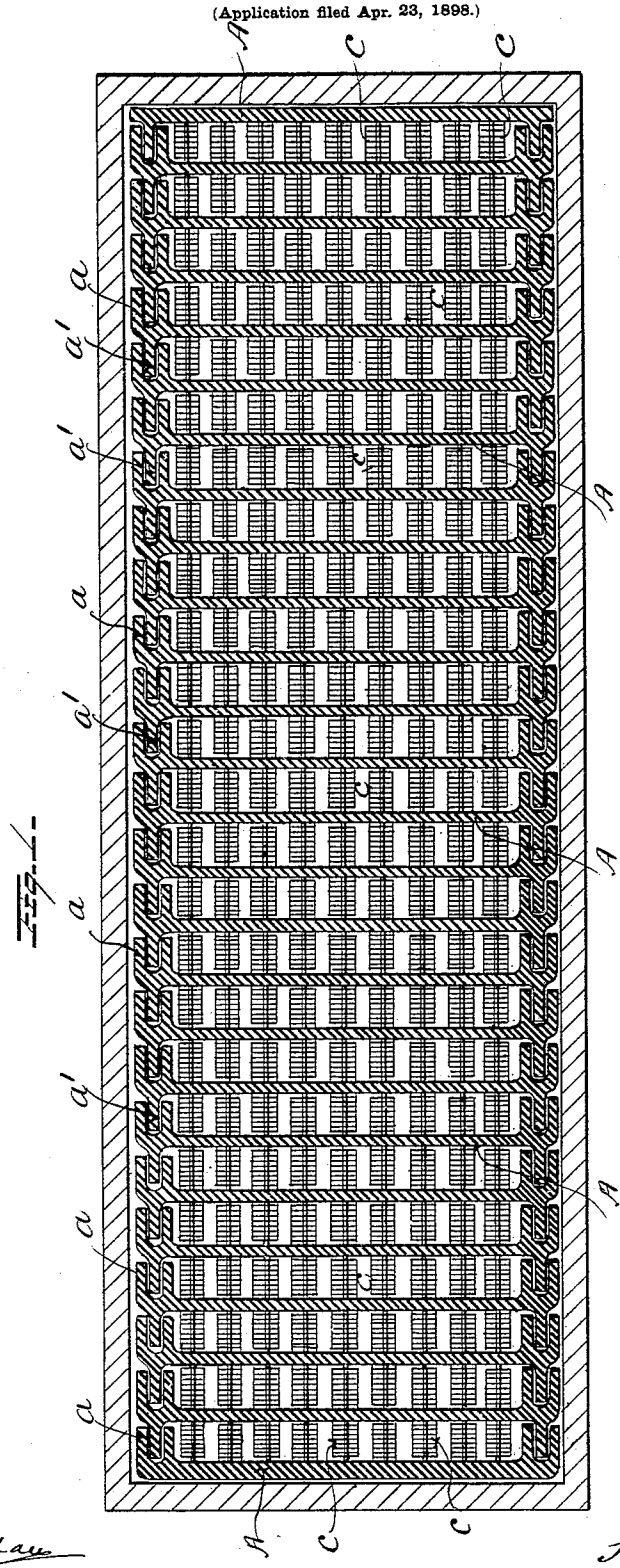



Fig. 1.

Witnesses.
A. J. Haddaway
E. Brosea.

Inventor
H. Dolter.
by his Attorney W. J. Haddaway

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(No Model.) 4 Sheets—Sheet 2.

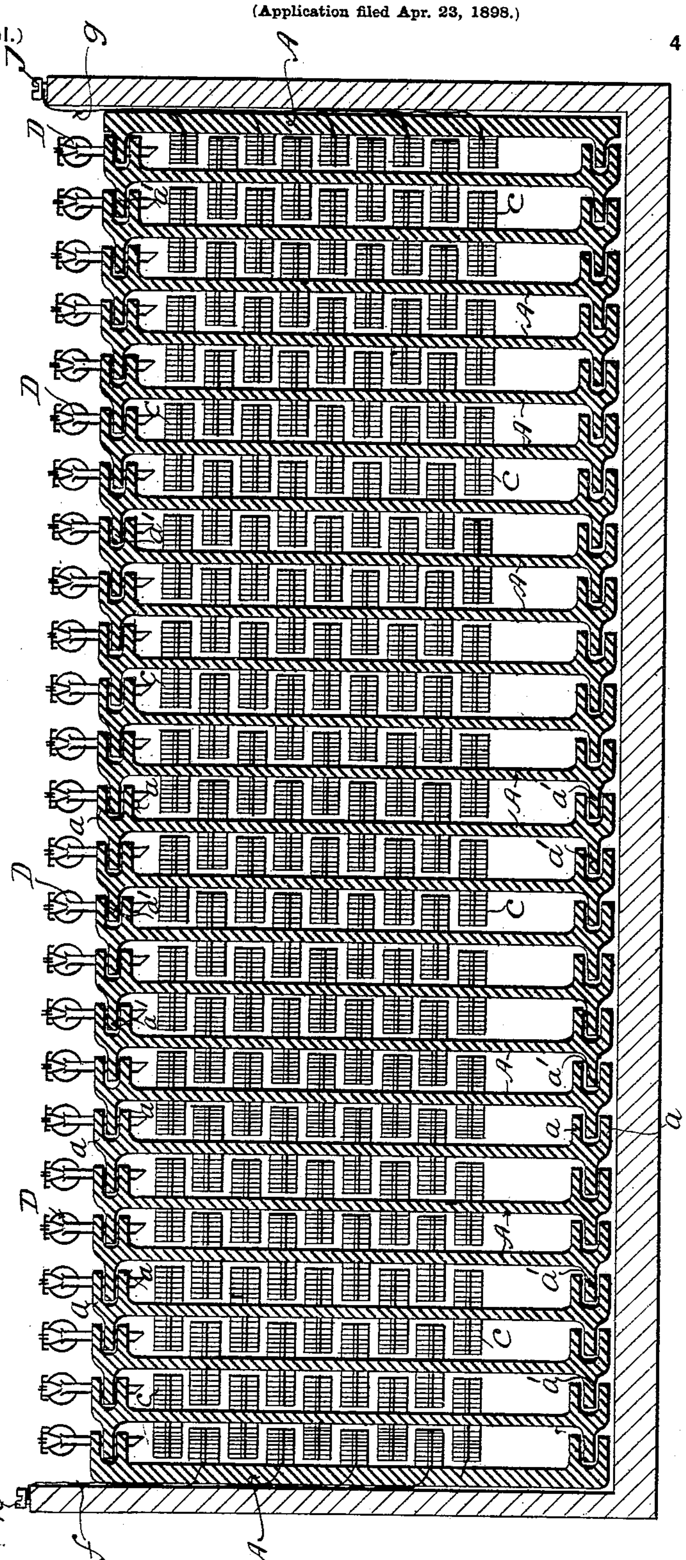


Fig. 2.

Witnesses
A. J. Haddan
E. Bowen

Inventor
H. Dolter
by his Attorney W. Haddan

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(No Model.) 4 Sheets—Sheet 3.

Fig. 4.

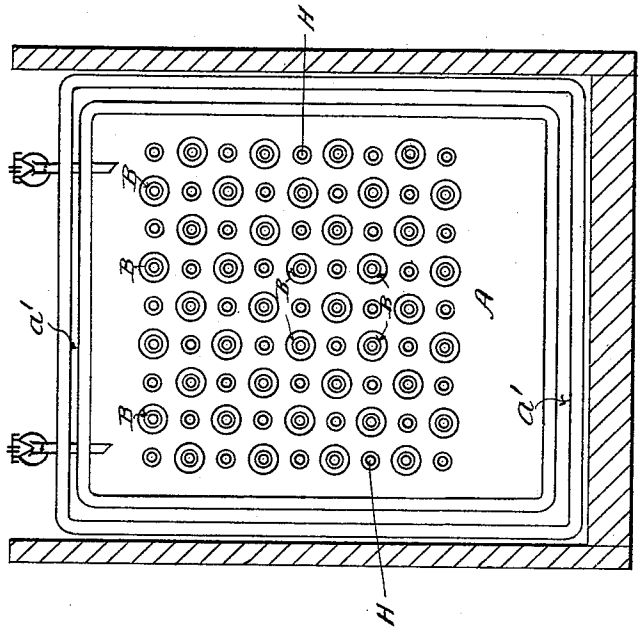
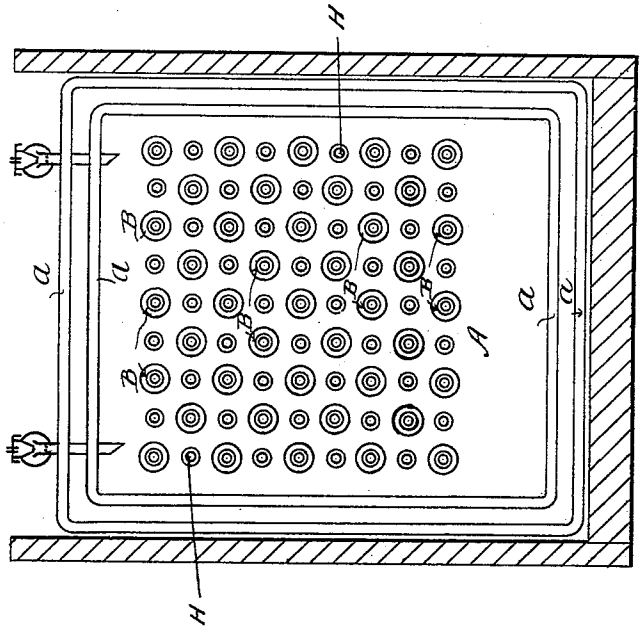



Fig. 5.




Witnesses
A. J. Haddaway
G. Bowen.

Inventor
H. Dolter
by his Attorney H. H. Haddaway

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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## SECONDARY BATTERY.

(Application filed Apr. 23, 1898.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 6.

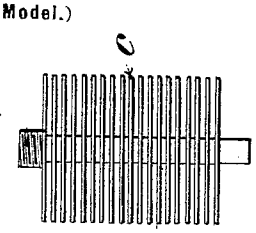



Fig. 12.

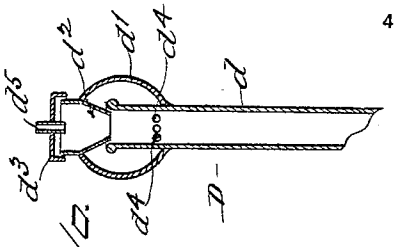



Fig. 5.

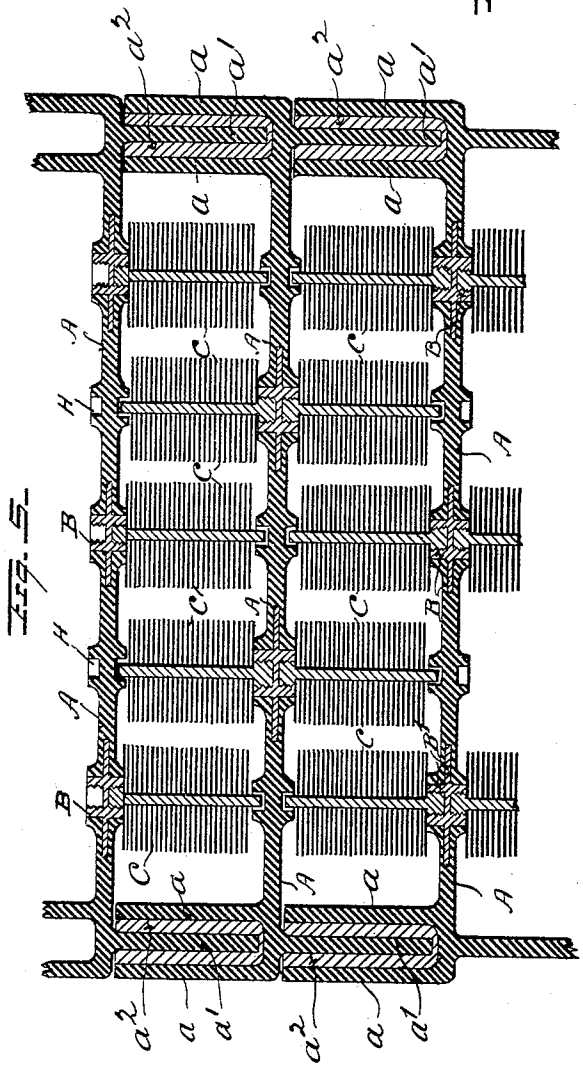



Fig. 7.

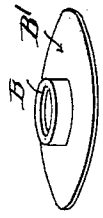



Fig. 8.

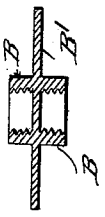
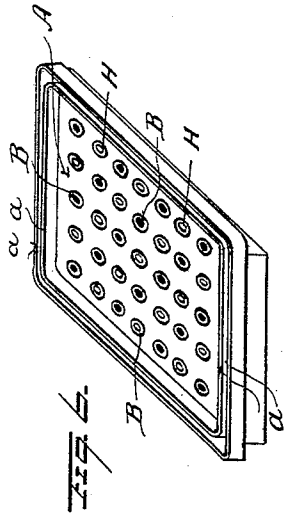



Fig. 9.




Witnesses
A. J. Hadaway
E. Bowen

Inventor
H. Dolter
by his Attorney. W. H. Hadaway

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

HENRI DOLTER, OF LYONS, FRANCE.

## SECONDARY BATTERY.

SPECIFICATION forming part of Letters Patent No. 618,247, dated January 24, 1899.

Application filed April 23, 1898. Serial No. 678,612. (No model.)

*To all whom it may concern:*

Be it known that I, HENRI DOLTER, a citizen of the Republic of France, residing at Lyons, France, have invented certain new and useful Improvements in or Relating to Secondary Batteries, of which the following is a specification.

This improved battery is constituted by the juxtaposition of flanged walls of insulating material supporting the electrodes, arranged symmetrically on their surfaces, of which when the battery is put together the electrodes on the one wall occupy spaces between those on the other wall.

In the annexed drawings, Figure 1 is a horizontal section, and Fig. 2 is a vertical section, of a fifty-volt battery. Fig. 3 is a view of one of the surfaces of one of the walls. Fig. 4 is a view of the reverse surface of the wall which will be adjacent to that shown in Fig. 3. Fig. 5 is an enlarged view in section, illustrating three walls with their electrodes. Fig. 6 is a perspective view of one of the flanged walls. Fig. 7 is a perspective view, and Fig. 8 a section, of a metal nipple for carrying the electrodes. Fig. 9 is an elevation of one of the electrodes, and Fig. 10 is a sectional view of one of the gas-outlets or ventilators.

The walls A are made to nest together, so as to form a number of chambers equal to the number of walls, less one, and the flanges of the walls are so made as to fit together and make a tight joint with the help of suitable luting. For instance, each wall (with the exception of the two end or final walls, in which the flanges on the outer side are omitted) may have two flanges *a a* on the one side and one flange *a'* on the other side, so that the flange *a'* may lie between the flanges *a a* of the next wall, the joint being luted, as at $a^2$; but the construction is not confined to that illustrated, but may be varied in many ways with the same effect and without departing from the spirit of this invention. These walls can be made of any material which is a bad conductor of electricity and not attacked by the liquid used nor by electrolytic action—for instance, a mixture of amiantus fiber with gum pyrocopal.

Nipples are arranged symmetrically in the walls, as shown in Figs. 3 and 4 of the drawings and indicated by the letter B. These nipples are of metal or metal alloy unattackable or little attackable by acids or by electrolytic action or of other metal or alloy of other metals of less density and of superior conductibility or of less cost, but coated with the beforesaid metal or alloy, rendering these nipples unattackable or little attackable by acids and but little susceptible to electrolytic action—such as platinum, lead, or their alloys—a suitable alloy being lead mixed with twenty-five per cent. of antimony. These nipples traverse the walls from one surface to the other and have intermediate of their ends an exterior flange B', by which the nipple is well secured in the wall during the manufacture thereof. Each end of the nipple forms a screw-threaded socket intended to carry the electrodes C, which are formed of plates of lead or alloy of lead with twenty-five per cent. antimony on a central stem. The plates of lead or lead alloy may be of a quarter to half a millimeter thickness, of a diameter of ten to fifty millimeters, and lie parallel to each other at distances of one to three millimeters from one another and connected at their centers by and to the stem, which is perpendicular to them and of the same metal, of a diameter of two to five millimeters, and ending with a screw-thread intended for fixing it in the nipple. Contact can be secured in a more certain manner by soldering.

Each nipple B supports and electrically connects two electrodes C, the one, positive, on the one side of the wall, the other, negative, on the other side. The size of each electrode is such with regard to length and width that when the walls are put together the electrodes on the one wall pass between and do not touch those on the opposite wall, while the free end of the stem of each electrode enters a socket H made on the surface and in the material of the opposite wall, by which means the electrode is the better supported.

The surface of the wall supporting the electrodes of the same sign faces the surface of the next wall supporting the electrodes of contrary sign in order to form one of the elements of the secondary battery. The connection of a desired number of these flanged

walls supporting, as aforesaid, the electrodes forms the secondary battery of the desired power.

The number of elements composing the battery will be equal to the total number of diaphragms, less one. The average total electromotive force will thus be equal to as many times two volts as the battery contains walls, less one.

In the annexed drawings, Figs. 1 and 2 show a battery composed of twenty-six walls, consequently of a power of fifty volts. The outermost walls are provided with electrodes only on one of their surfaces. The nipples are electrically connected on the other surface by means of metal—for example, wires *f* or *g*—and connected with a terminal *h* or *j*, respectively. The chambers formed by the flanged walls are filled with diluted sulfuric acid to immerse the electrodes. This acidulated water constitutes the electrolyte. Air or gas vents D are placed at the upper part of the chambers in order to allow the gas to escape or to renew the electrolyte, to empty and wash the apparatus. They are made as follows, so as to avoid any splashing out of the electrolyte: The pipe *d* projects upward into and within a special chamber *d'*, into which an inverted conical nozzle $d^2$ projects downwardly, extending to within the open mouth of pipe *d*. Any liquid which might splash up in the pipe *d* is carried outward by the outside surface of the cone $d^2$ and, running down inside the chamber *d'*, enters the pipe *d* again by the holes $d^4$. The cone $d^2$ is closed above by a cap $d^3$, in which is a central flanged gas-outlet $d^5$. The cap $d^3$ is removable for filling or emptying.

I claim as my invention—

The combination of a plurality of flanged walls of non-conductive material adapted to nest together to form a plurality of closed chambers, metallic nipples traversing said walls and fixed therein, positive electrodes having stems attached to said nipples on the one side of each wall, negative electrodes having stems attached to the same nipples on the other side of each wall, the said electrodes lying in the spaces between the electrodes of contrary sign of the adjacent walls respectively, and their stems having loose bearing at their unattached ends in recesses in said adjacent walls, two end walls having respectively positive and negative electrodes on one side only and terminals in electrical connection with the nipples of the end walls respectively.

In witness whereof I have signed this specification in the presence of two witnesses.

HENRI DOLTER.

Witnesses:
S. PREYSON,
MARIUS VACHOR.