

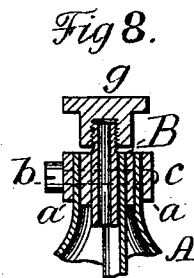
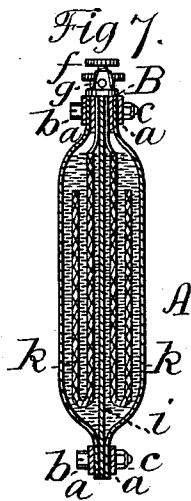
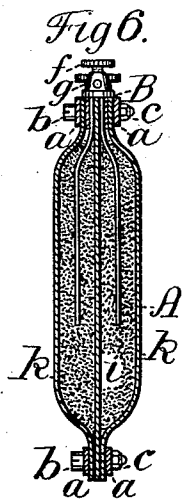
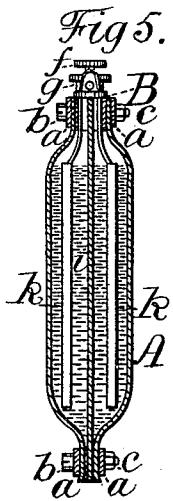
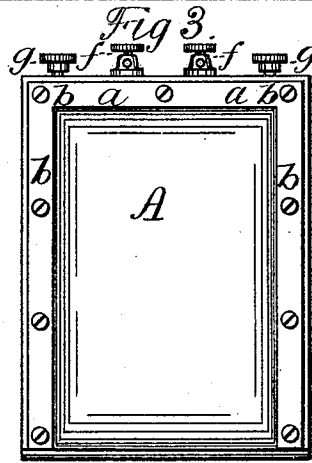
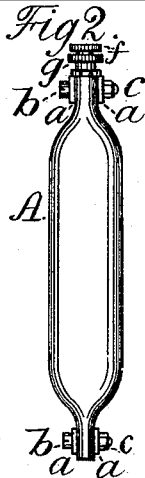
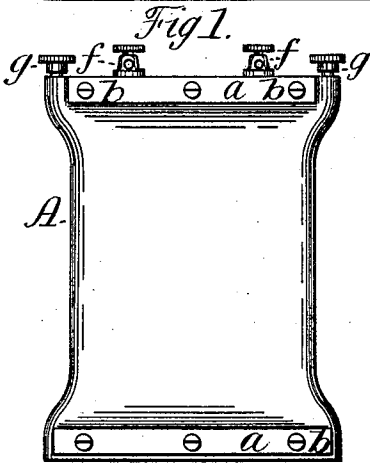
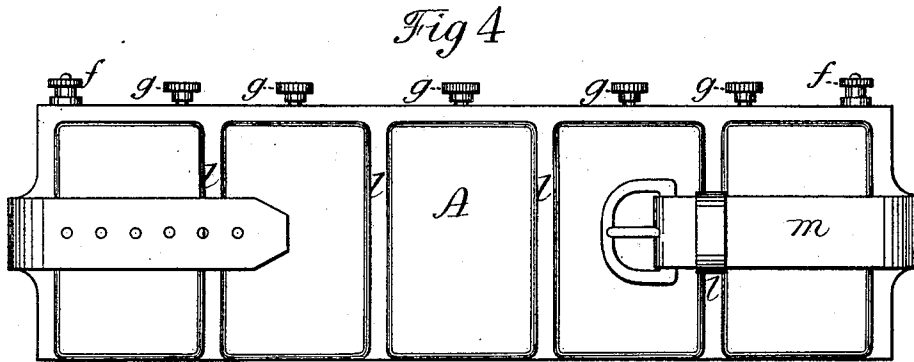
(No Model.)

M. BAILEY & J. WARNER.

FLEXIBLE SEALED CELL FOR SECONDARY BATTERIES.

No. 395,028.

Patented Dec. 25, 1888.



Witnesses.

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Thomas Simpson.

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UNITED STATES PATENT OFFICE.

MARK BAILEY AND JOHN WARNER, OF LONDON, ENGLAND.

FLEXIBLE SEALED CELL FOR SECONDARY BATTERIES.

SPECIFICATION forming part of Letters Patent No. 395,028, dated December 25, 1888.

Application filed August 28, 1888. Serial No. 284,029. (No model.)

To all whom it may concern:

Be it known that we, MARK BAILEY, electrician, residing at Holly Lodge, Wood Green, and JOHN WARNER, iron founder, residing at 21 Osborn street, Whitechapel, both situate in London, in England, subjects of the Queen of Great Britain, have invented new and useful Improvements in a Flexible Sealed Cell for Secondary or Primary Batteries, of which the following is a specification.

Our invention consists in an improved construction of sealed battery-cells, having elastic or flexible walls, fitted with valves or equivalent device for permitting or preventing the escape of gases arising from or out of the contained elements, and for supplying liquids thereto or withdrawing the same therefrom. When fitted with secondary elements, preferably formed from granulated or leaf lead, lead wire woven with string soaked in shellac or asbestos fiber or equivalent material into a web or mesh, none of the gases evolved during the charging process escape, and consequently no initial energy is lost. The time of charging is thereby lessened and the rate of discharge is well maintained and lengthened. Considerable internal gaseous pressure exists at the time of complete charge, which falls steadily with the discharge. Owing to the flexible nature of the material employed in constructing the walls of the cells, a series of them may be united edgewise in the form of a belt, which may be worn upon the person, and when fitted with either primary or secondary elements is convenient for maintaining an electric lamp, exploding powder, or for other purposes.

The drawings will make clear the manner in which we carry out our improvements.

Figure 1 is a front elevation of a portable flexible sealed cell. Fig. 2 is a side elevation of the same. Fig. 3 is an elevation showing construction of cells of large size; Fig. 4, a series of cells arranged as a belt; Figs. 5, 6, and 7, vertical sections showing means employed for separating elements; Fig. 8, enlarged sectional view of valve.

We construct the cell-walls A of rubber insertion-cloth, rubber tube or hose, india-rubber, cloth, or equivalent material coated with rubber, shellac-varnish, or other suitable material for rendering the same gas and water

tight and resisting the action of acid or other liquid employed in the cell. The cells shown in Figs. 1 and 2 are of portable type, and are formed of rubber tube or hose coated with stout cloth. A suitable length—say eight to twelve inches—is cut off, packing-strips B, (see Fig. 8,) formed of rubber, gutta-percha, or other suitable elastic material possessing good insulating properties, are inserted at the top end, and at or about the center (in the case of cells fitted with secondary elements) a piece of cloth, *i*, soaked in varnish or formed from asbestos fiber or similar insulating substance, is clamped for the purpose of separating the elements. The elements R are now placed in position and connected to the terminals *ff*, which, with the valves *gg*, are placed between the packing-strips B. Metal plates *aa* are now placed on either side of the tube forming the flexible cell, and holes drilled through them, the cell walls and the packing, bolts *bb*, having nuts *cc*, are passed through these holes and the nuts screwed up, so as to form a sound joint. In some cases we employ screwed studs *bb*, (see Fig. 8,) which are tapped into the metal plate on one side. Suitable liquids can be introduced through the valves *gg* or inserted before sealing up the upper ends. The elements are now charged in the usual manner.

In constructing cells of large size we employ rubber insertion-cloth, india-rubber, or suitable material treated with shellac or other varnish, as already described. A piece of sufficient size is folded, (see Fig. 3,) fitted with packing-strips B and metal plates *aa* upon three sides; or, if more convenient, the walls A may be clamped together on four sides by means of plates, separating material *i*, as previously described, being clamped between the packing-strips B, and terminals *ff* and valves *gg* being also mounted therein. Connections are made from the elements to said terminals.

We construct a series of flexible cells, as shown in Fig. 4. A piece of rubber sheet, rubber insertion-cloth, or cloth coated with insulating material is folded and marked out for the number of cells required. Spaces *l* are pressed down and firmly cemented with rubber or other cement, separating material *i* being also cemented in. Primary or secondary elements are now placed within the walls

A and connected to terminals *ff*, which, with valves *g g*, are cemented into the upper part, as shown. A strap and buckle, *m*, may be mounted, as shown.

5 Figs. 5, 6, and 7 are sectional elevations showing construction employed in our flexible cells for single or double fluid primary or secondary cells.

10 Fig. 5 shows a single-fluid primary cell having elements R in the form of plates and flexible separating-cloth *i*.

15 Fig. 6 shows a primary double fluid cell having porous plate *i* and granular elements. This form of cell may also be filled with granular secondary elements, if desired.

20 Fig. 7 shows a secondary cell having flexible separating-cloth *i* and plates formed of lead wire woven; Fig. 8, enlarged sectional view of valve *g g*, packing-strips B, stud *b*, and plates *a a*.

Having now described our invention, we would wish it understood that we lay no claim to any form of plate or element, but claim—

25 1. The combination, with a flexible sealed battery-cell having elastic walls formed of rubber insertion-cloth capable of resisting internal pressure arising from and storing the gases eliminated by chemical action upon contained elements of secondary type, of ter-

30 minals *ff*, connected to said elements, and valves *g g*, for controlling pressure and supplying liquids thereto and emptying same therefrom, as described.

2. The combination, with the flexible or elastic sealed cell constructed as described, 35 of the strips B, metal plates *a a*, bolts *b b*, and nuts *c c*, or screwed studs for fastening the same together, as set forth.

3. The combination, with a series of flexible sealed battery-cells formed of rubber inser- 40 tion-cloth in the shape of a belt, of terminals *ff*, connected to contained elements, valves *g g*, and strap and buckle *m*, as set forth.

4. The combination, with a flexible sealed battery-cell of tubular form, of terminals *ff*, 45 connected to contained secondary elements, valves *g g*, packing-strips B, plates *a a*, and bolts *b b*, substantially as described.

In testimony whereof we have set our hands in presence of two witnesses.

MARK BAILEY.
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Witnesses:

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