

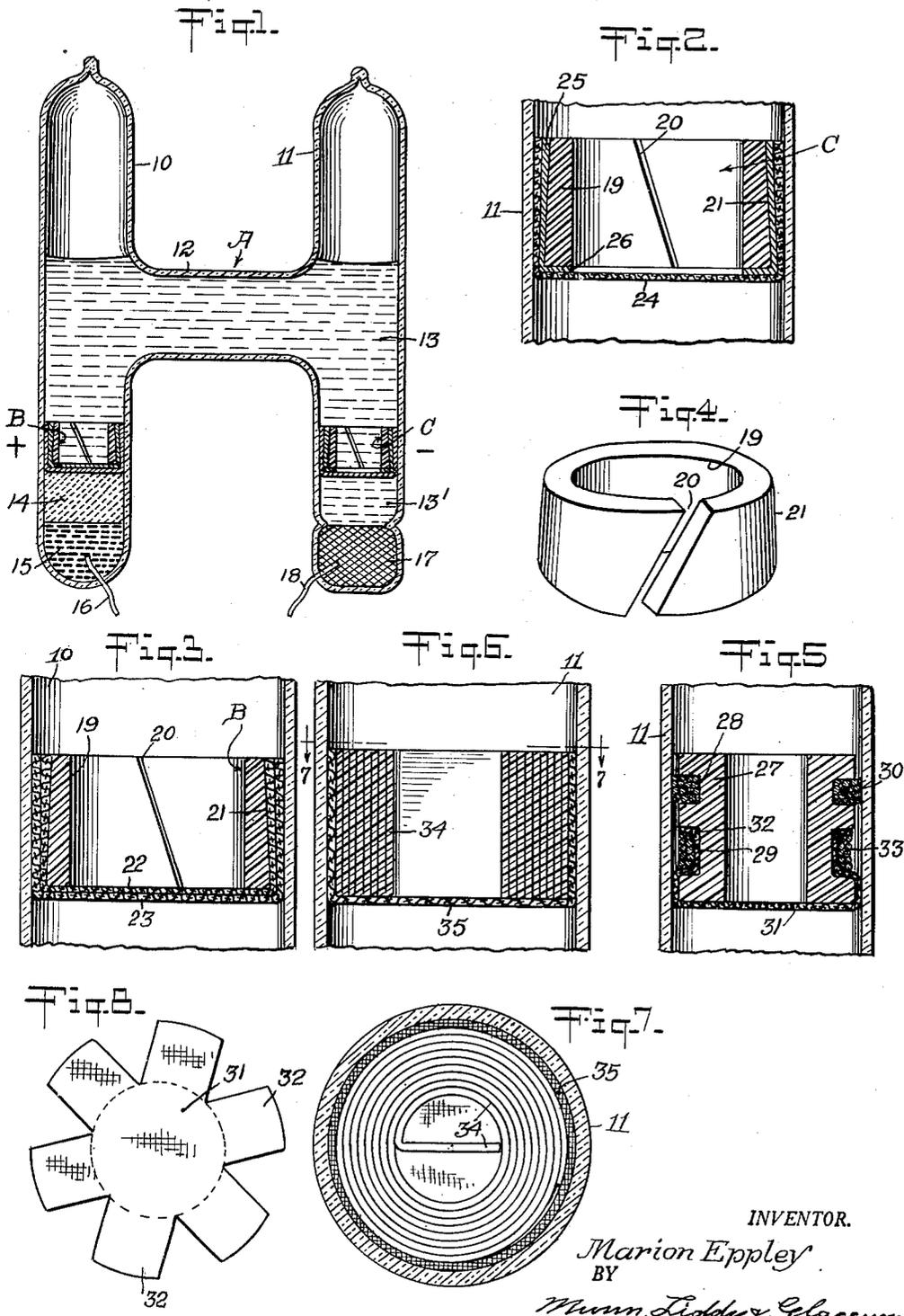
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PLUG OR SEPTUM FOR ELECTROLYTIC CELLS

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PLUG OR SEPTUM FOR ELECTROLYTIC CELLS

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This invention relates to new and useful improvements in standard electric cells.

In practice, the volt is established by a cell or battery. The constituents of this cell are generally contained in a glass vessel which usually has the form of an H. At the bottom of the two arms or limbs of the cell thus formed are generally platinum wires sealed through the glass. The top of each limb is usually sealed off to prevent evaporation.

In cells of this type especially the portable cells, the ingredients or certain constituents of the cell must be separated by means of suitable plugs or septa. For instance, in some cells the main upper portion of the cell is filled with a solution of cadmium sulfate whereas the limbs are filled with other ingredients and it is necessary to dispose a plug or septum between these ingredients. Previously plugs of porcelain have been used. Later plugs of perforated cork covered with linen have been employed. However, it has been found that materials contained in the cork and porcelain, which were not removed, acted adversely upon the behaviour of the cell.

A main object of the present invention is to provide a simple, efficient, and durable arrangement of plug and associated elements whereby the hysteresis of the cells thus produced have not been affected in over a year of repeated tests.

In brief and general terms, the invention relates to the provision of a plug or septum for such cells formed of non-porous material. Preferably, this material is a synthetic plastic material of the non-porous type. Also preferably, these non-porous plugs of synthetic material are so formed as to be springy and be associated with certain covering layers of material such as linen and/or paper to form a proper seal between the lower limbs of the cell and the upper portions thereof.

In further particulars, the invention relates to the specific form of the improved plug and to the particular association with it of layers of linen and/or paper. Furthermore, the invention relates to a special structure of plastic plug with a special form of linen covering.

The present preferred forms which the invention may assume, are illustrated in the drawings, of which:

Fig. 1 is a vertical cross section through a cell showing the application of the invention thereto;

Fig. 2 is an enlarged vertical partial cross section through a limb of the cell showing one form of plug and covering layers;

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Fig. 3 is a similar view showing the improved plug with a different arrangement of covering layers;

Fig. 4 is an enlarged perspective view of the improved form of plug;

Fig. 5 is an enlarged cross section vertical view of a modified form of plug and showing the construction for sealing it into the limb of the cell;

Fig. 6 is an enlarged vertical cross sectional view of a still further modified form of plug;

Fig. 7 is a horizontal section taken on the line 7—7 of Figure 6; and,

Fig. 8 is a particular form of covering layer adapted especially for use in connection with the modification shown in Figure 5.

Referring now merely to the specific forms of the invention shown in the drawings herein, it is to be noted that the invention has to do with improvements in voltaic electric cells which are used as standards for purposes of comparison and testing. In the drawings, in Figure 1, a cell form generally denoted by the letter A, is shown embodying my invention and has two vertical limbs 10 and 11 which at a medial point, are connected by a cross tube 12. The main body of the cell in a particular instance, may be filled with the solution of cadmium sulfate 13. In the form shown, the lower portion of the left hand limb 10 acts as the positive connection or electrode as indicated by the "plus" sign, and the lower portion of the right hand limb 11 acts as a negative connection or electrode as indicated by the "minus" sign.

Intermediate the height of the lower portion of the limb 10, is disposed a plug or septum generally indicated by the letter B, and similarly disposed intermediate the height of the right hand lower portion of the limb 11, is a plug C. The details of these plugs will be hereinafter described. These plugs or septa are disposed in the limbs for the purpose of separating the ingredients above them from those below. In the form shown, below the septum or plug B, may be disposed a suitable quantity of mercurous sulfate 14 and beneath this, a layer or portion of mercury 15 to which latter layer in any suitable manner, a connecting wire 16 is associated.

Below the septum or plug C in the form shown, there may be disposed a portion or layer of cadmium sulfate solution 13' and beneath this, may be disposed a portion or layer of cadmium amalgam 17, to which latter layer a connecting wire 18 may be associated in any suitable manner.

The function of these plugs or septa and their

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associated parts, is to hold the ingredients in place and separate. Previously, septa of porcelain and cork have been used, but for many reasons have been found to be unsatisfactory and also have been found to act adversely upon the behaviour of a cell. Considerable experimentation has been conducted and septa of non-porous plastic material had been found to possess qualities eminently suited for the purpose. Plastic materials to form these septa have included such well known materials as "Lucite" and "Plas-tubing." These examples, which are only two of many which may be used, have been shown to give excellent results and did not effect the hysteresis of the cell adversely in more than a year of constant test and observation.

Referring now to the details of the plug or septum employed, reference may be had to Figure 4, which shows merely a preferred form thereof. This septum or plug is in the form of an annular body 19, the vertical wall of which is interrupted or split by a sloping slot 20 and the side walls of which are tapered as shown at 21, so that the upper diameter is slightly less than the lower diameter for reasons which will be explained. This septum is of non-porous material and preferably made of some of the modern non-porous plastic compositions now on the market. By reason of the shape and construction described, these septa are elastic and springy and consequently, will automatically adjust themselves within the limb of the cell in which they are disposed and in association with suitable covering material to be described. The septum B disposed in the positive limb of the cell shown in Figure 1, is of the nature and construction described with respect to Figure 4 and it is shown in place in the limb in enlarged form in Figure 3. As shown in Figure 3, the septum or plug 19 is surrounded at its sides and across one face preferably the bottom face, with a double layer of linen. These layers are indicated by the numerals 22 and 23. These layers of covering material, which are interposed between the material below the plug and above the plug and on the sides thereof, are firmly packed to seal the connection. The taper of the plug is to provide ample space for the covering material to prevent its tendency to bunch up in this particular area. As the covering layers are placed over and around the bottom and sides of the plug, the layers will tend to bunch up near the top portions of the sides of the plug. This is because more covering material collects than is necessary to cover the side surfaces of the plug. In order to compensate for the bunching and in order to provide a uniformly tight connection between the walls of each limb of the cell and the plug therein at all points along the sides of the plug, the plug is made with a frustrum shape, i. e., it is tapered downwardly and outwardly. Thus there is ample space between the plug and the walls of the limb for the bunched up material to collect without detracting from the tight seal.

With respect to the plug or septum C disposed in the lower portion of limb 11 which forms the negative electrode of the cell, this is of the same material and construction as shown in Figure 4, but in this case, the covering layers are an outer layer of linen 24 which extends around the sides of the plug and across the bottom thereof and an intermediate layer of paper 25, which extends around the side of the plug between it and the linen layer and only across the solid bottom of

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the plug as shown at 26. In other respects, this arrangement is the same as for the positive electrode.

In Figure 5, we show a modified form of plug 27 made of the same material as above described, but in this case, it is in the form of a hollow cylinder with straight sided walls formed with upper and lower circumferential grooves 28 and 29. The upper circumferential groove 28 has disposed therein a sealing washer in the form of a series of bindings of string 30 which project beyond the outer face of the groove and contact the walls of the limb, which has been indicated as the limb 11 although of course, it is to be understood that that sort of plug can be used with the other limb if desired. This plug is provided with a covering layer of linen of the form shown in Figure 8, which has a main central portion 31 to be disposed across a face of the plug and having radially extending spaced arms 32 formed integrally thereon, which extend up the sides of the plug and which are disposed in the lower groove 29 and held therein by a suitable binding of string 33. Of course, it can be readily understood that if necessary, a layer of paper may be used in connection with this linen layer 31 if desired.

In the form shown in Figure 7, a limb of the cell such as 11 and as shown in Figure 6, in vertical cross section, may be filled with a spiral coil of a flat strip of plastic material 34 of sufficient length to fill the tube. This of course, is of plastic elastic material which will tend to press out against the walls of the limb. A preferred form of this material which has been used and proved satisfactory, is nationally known under the name of "Saran Tape" and is a non-porous plastic. In a manner similar to the above constructions, this spiral roll of tape 34 has a layer of linen 35 across one face and disposed up along its sides between it and the inner walls of the limb with which it is used. Intermediate layers of other material such as paper may be employed if desired and this form of plug may be used with either limb, as the occasion requires. Having thus in detail described the constructions of the several forms of which the invention may assume, it is clearly apparent that I have provided a simple, efficient, durable device which can be readily disposed within the cell as above described, to form an effective septum between the several ingredients in the limb, of such a nature as not to introduce into the electrolytic medium any deleterious substances.

The plug is springy and elastic and non-porous, and is shaped to permit disposition therearound of suitable layers of covering material to permit a continuous path for current flow and to prevent bunching of the material around the sides of the septum or plug, which bunching would lessen the effectiveness of the seal between the plug and the cell into which it was disposed.

The several modifications shown are presented merely as indicative of variations of the main idea and which are adaptable for different special conditions and purposes.

While the invention has been described in detail and with respect to the preferred form shown in the drawings, it is not to be limited to such details and forms since many changes and modifications may be made in the invention without departing from the spirit and scope of the invention in its broadest aspects. Hence, it is intended to cover any and all forms and modifications of the invention which may come within the lan-

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guage or scope of any one or more of the appended claims.

What I claim as my invention, is:

1. In an electrolytic cell having a straight cylindrical portion of tubing, the combination with said tubing of a hollow frustrum shaped plug of non-porous synthetic plastic material and a layer of porous material covering the large end of the plug with the remainder of said layer passing over the plug toward the reduced end thereof, said plug and porous material disposed tightly within the tubing, and said plug being split generally longitudinally.

2. In an electrolytic cell having a straight cylindrical portion of tubing, the combination with said tubing of a hollow frustrum shaped plug of non-porous synthetic plastic material and a layer of porous material covering the large end of the plug with the remainder of said layer passing over the plug toward the reduced end thereof, said plug and porous material disposed within the tubing, and said plug tending to expand radially so that it has a tight fit within said tubing.

3. In an electrolytic cell having a straight cylindrical portion of tubing, the combination with said tubing of a hollow frustrum shaped plug of non-porous synthetic plastic material and a layer of linen covering the large end of the plug with the remainder of said layer passing over the plug toward the reduced end thereof, said plug and said linen disposed tightly within the tubing, and said plug being split generally longitudinally.

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4. In an electrolytic cell having a straight cylindrical portion of tubing, the combination with said tubing of a hollow frustrum shaped plug of non-porous synthetic plastic material, a layer of porous material covering the large end of the plug with the remainder of said layer passing over the plug toward the reduced end thereof, a layer of paper intermediate said layer of porous material and the plug, said layer of paper covering the outer wall and the solid bottom of the plug only, said plug, paper and porous material, all disposed tightly within the tubing, and said plug being split generally longitudinally.

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