G. K. THOMAS.

ELECTROLYTIC CELL.

APPLICATION FILED MAY 17, 1920.

1,360,055. **Patented Nov. 23, 1920.**

Fig. 1

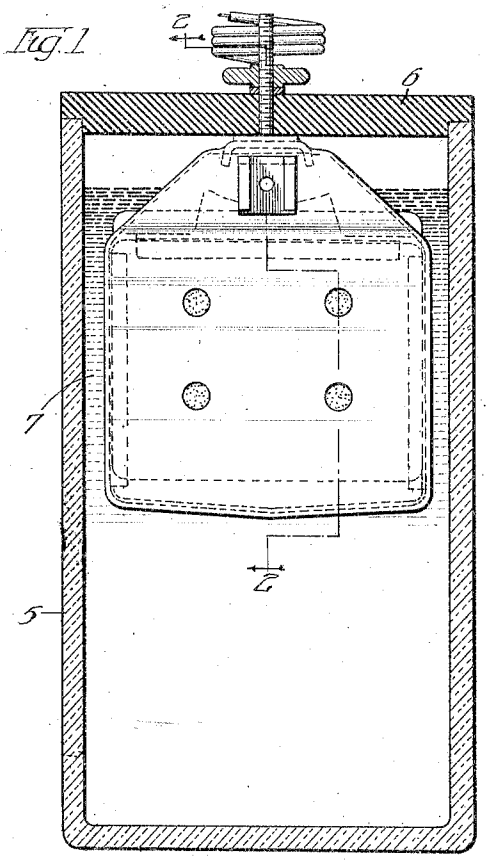


Fig. 2

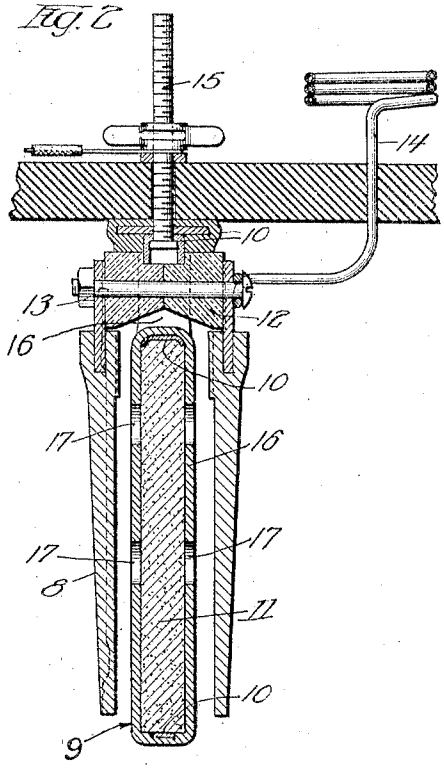


Fig. 3

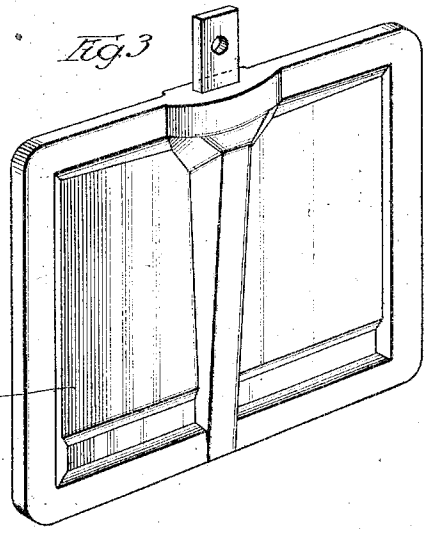
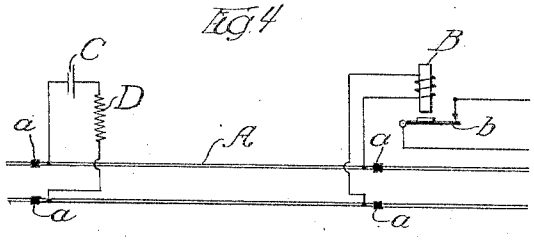


Fig. 4



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PATENT APPLIED COPY

To all whom it may concern:

Be it known that I, GEORGE K. THOMAS, a citizen of the United States, and resident of Topeka, in the county of Shawnee and State of Kansas, have invented a certain new and useful Improvement in Electrolytic Cells, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electrolytic cells and the object of the invention is to provide an electrolytic cell comprising simple, economical and efficient means whereby to limit the terminal voltage of the cell without substantially detracting from the ampere-hour capacity thereof and without limiting the period of usefulness thereof.

The means provided for accomplishing the object above set forth is such that the same may be incorporated in the several types of cells now in general use with comparative ease and at slight expense.

In the accompanying drawings, I have illustrated my invention as applied to a primary cell of the type commonly employed in railway track circuits. It is to be understood, however, that my invention is not limited to cells employed in the circuits of the class mentioned; in fact I do not desire to restrict the scope of the appended claims to primary cells at all as it will be apparent to persons familiar with the art to which my invention relates that the invention may be employed in connection with secondary batteries, if desired.

In the accompanying drawings forming part of this specification,

Figure 1 illustrates the receptacle or container of an electrolytic cell in vertical section, the anode and cathode elements thereof being shown in elevation.

Fig. 2 is a sectional view of the anode and cathode elements and the supporting devices therefor, this view being taken on the line 2—2 of Fig. 1.

Fig. 3 is a view in perspective of one of the zinc plates or anode elements, of which the cell here shown comprises two, and

Fig. 4 is a diagram illustrating a conventional track circuit showing, among other things, a resistance, in series with the cell, which my present invention enables me to eliminate.

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

Referring first to Fig. 4, at A I have illustrated one block of a railway, the rails of which block are separated from the rails of contiguous blocks by insulated rail joints *a*. It is assumed that traffic moves from right to left over the track shown in this figure. Bridged across the rails of block A at or immediately adjacent the entrance to the block, is a relay B, the armature *b* of which controls a local circuit connected with and controlling a roadway signaling device located along the track at some point in advance of the entrance to block A. It will be unnecessary to illustrate the roadway signaling mechanism, as it will be understood that when the local circuit is closed, the signaling mechanism indicates safety but indicates danger when the local circuit is opened due to the deënergization of relay B. Bridged across the rails of block A, at or near the exit end thereof, is a primary battery C. It will be noted that relay B forms part of a closed circuit comprising battery C and the rails of block A. However, when a car or locomotive occupies block A, the current from battery C is short-circuited through the wheels of the car or locomotive with the result that relay B is deënergized and the local circuit controlling the roadway signaling mechanism is opened, thereby causing a danger signal to be displayed or sounded by the signaling apparatus in the usual manner. Briefly, this is the mode of operation of track circuits of the type shown in Fig. 4.

It has been found that primary cells of the caustic soda type are most desirable for use in track circuits of the type hereinbefore described. However, prior to the advent of my invention, the use of such cells has presented certain practical difficulties. Due to the low internal resistance of such cells, it has been necessary, in actual practice, to include an external resistance D in series with the cell in order to insure that the presence of a movable unit in the block A will certainly result in deënergization of the relay B. It has been found, however, that the use of such an external resistance in series with the cell is objectionable due to the fact that it consumes a certain amount of energy which is put to no useful purpose

and because of the further fact that the presence of such a resistance renders it possible for the man in immediate charge of the signals to tamper with the track circuit in such a way as to cause a safety indication to be given by the roadway signal at times when a danger indication should be given.

For example, an adjustment of the series resistance D which will cause the track circuit to function properly in dry weather is very apt to be such that in wet weather leakage between the rails will prevent energization of the track relay B when the block A is clear. It has been found that maintenance men are inclined to take out or short-circuit the resistance D to cause the track circuit to function properly under the abnormal conditions caused by wet weather. The results of this practice are oftentimes disastrous for the reason that when the damp weather passes and leakage across the rails ceases to a greater or less extent, the wheels of the car or locomotive are insufficient to completely short-circuit the track relay when the block is occupied. In such a case, the signaling apparatus controlled by relay B indicates safety, when as a matter of fact it should indicate a condition of danger.

My present invention contemplates the provision of an electrolytic cell which is particularly adapted for use in track circuits of the class described, which renders it possible to dispense with the hereinbefore mentioned external series resistance, this being accomplished without substantially diminishing the ampere-hour capacity of the cell.

In Fig. 1, I have illustrated a cell comprising the usual jar or receptacle 5 provided with the cover 6. It will be understood that the receptacle 5 contains a suitable electrolyte 7 which, in the form of battery shown, is preferably a solution of caustic soda. Positive and negative plates are illustrated at 8 and 9 respectively, there being two anodes and a single cathode in the form of battery shown, although it is obvious the number of positive and negative plates employed may vary as required. The cathode construction consists of a copper framework 10 within which is molded the usual copper oxid plate indicated at 11. The upper portion of the copper cathode frame 10 is conformed to provide an opening for the reception of the porcelain blocks 12—12. The blocks 12—12 are held in position by the screw 13 which likewise supports and electrically connects the zinc anode plates 8—8 which are held in suspension with their plane inner faces spaced from the cathode element. Screw 13 is electrically connected with a conductor 14 which extends upwardly through an aperture in the cover 6 and constitutes one terminal of the cell. The anode and cathode elements are suspended from the cover 6 by a screw 15 which, being in electrical contact with the frame of the cathode element, constitutes the other terminal of the cell.

As thus far described, the form of primary cell shown in the accompanying drawings does not differ essentially from primary cells now in general use and it is to be understood that the materials of which these elements are made, as well as the formation and arrangement thereof may be varied within wide limits in so far as the application of my invention thereto is concerned.

Attention is directed to the fact that the copper oxid plate 11 of the cathode, as well as all parts of the cathode framework 10, are sheathed by an envelop 16 in which is formed a plurality of small apertures 17—17. The form of envelop shown in the accompanying drawings is provided with eight of these apertures, there being four on each side of the cathode element. It is desirable that this envelop be of non-porous material so that it will effectively prevent the electrolyte from coming into contact with any portion of the cathode element, save through the comparatively small apertures 17—17. While the envelop 16 may be formed of a variety of different materials, and while I do not wish to limit myself to an envelop formed of any particular material, I will say that I have found that a comparatively thick coating of pitch applied to all parts of the cathode structure and provided with the small apertures 17—17 affords excellent results. It is obvious that the envelop may be made of any metal which is not electrolytically affected by any other elements of the cell. I have found that by employing the envelop 16 and thus protecting the cathode plate from direct contact with the electrolyte save through the small apertures 17—17, I am enabled to limit the current discharge of the cell to that rate of discharge which is best suited to the particular requirements of the circuit in which the cell is included. By virtue of this arrangement, when using the cell of my invention in a track circuit of the type shown in Fig. 4, I am enabled to dispense with the resistance in series with the cell.

While I have herein illustrated and described but a single application of my present invention, I wish to have it understood that I do not limit myself to the specific embodiment of the invention herein shown but desire to claim all other applications of the invention coming within the terms and spirit of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. In an electrolytic cell, the combination with an electrolyte and the positive and nega-

tive elements of the cell, of means for limiting the current discharge of the cell, said means comprising an apertured envelop inclosing one of said elements and preventing the electrolyte from coming into contact with said inclosed elements, save through the apertures in said envelop.

2. In an electrolytic cell, the combination with an electrolyte and the positive and negative elements of the cell, an apertured envelop of pitch, inclosing one of said elements and preventing the electrolyte from coming into contact with said inclosed element, save through the apertures in said envelop.

3. In an electrolytic cell, the combination with an electrolyte and the positive and negative elements of the cell, an apertured envelop of amorphous material, inclosing one of said elements and preventing the electrolyte from coming into contact with said inclosed element, save through the apertures in said envelop.

4. In combination with the electrolyte and the positive and negative plates of an electrolytic cell, means for limiting the current discharge of the cell comprising an envelop of non-porous material, inclosing one of said plates, said envelop provided with a plurality of apertures through which and only through which the electrolyte may come into contact with the inclosed plate.

In witness whereof, I hereunto subscribe my name this 5th day of May, 1920.

GEORGE K. THOMAS.

Witnesses:

ANDREW WINTERCORN,

ALBIN C. AHLBERG.