No. 646,894. Patented Apr. 3, 1900.

H. J. COGSWELL.

STORAGE CELL.

(No Model.) (Application filed Feb. 5, 1900.)

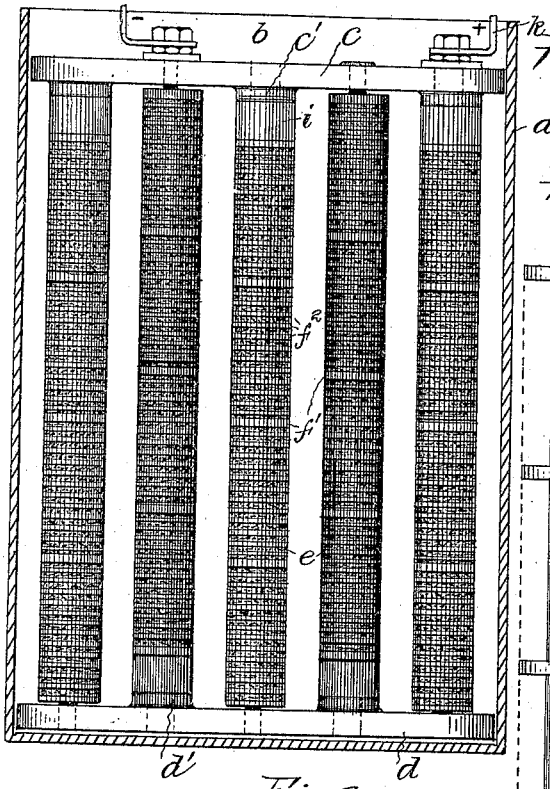

Fig. 1

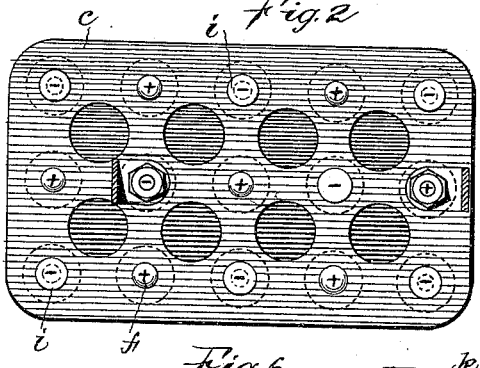

Fig. 2

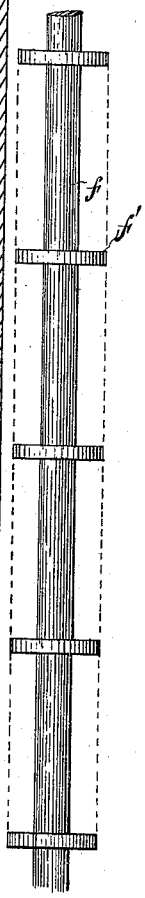

Fig. 3

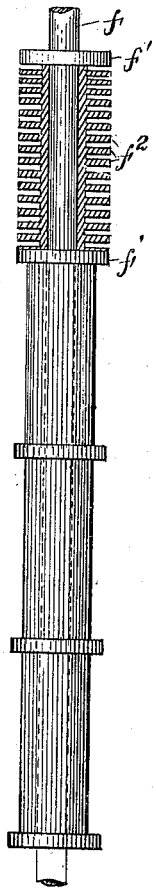

Fig. 4

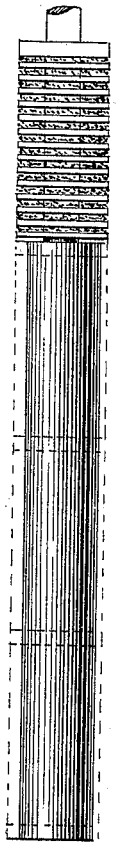

Fig. 5

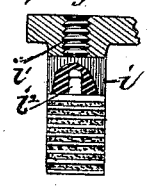

Fig. 6

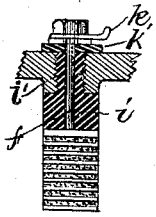

Fig. 7

Witnesses:
Wm. H. Barker.
Emma P. Coffin.

Inventor:
Henry J. Cogswell.
by Chas. L. Burdett,
Attorney.

UNITED STATES PATENT OFFICE.

HENRY J. COGSWELL, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE HARTFORD ACCUMULATOR COMPANY, OF SAME PLACE.

STORAGE-CELL.

SPECIFICATION forming part of Letters Patent No. 646,894, dated April 3, 1900.

Application filed February 5, 1900. Serial No. 3,985. (No model.)

To all whom it may concern:

Be it known that I, HENRY J. COGSWELL, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented a new and useful Storage-Cell, of which the following is a full, clear, and exact description, whereby any one skilled in the art can make and use the same.

My invention relates to that class of electrical apparatus known in the art as "secondary batteries" or "storage-cells;" and the object of my invention is to produce a device of this class with a high ratio of efficiency in comparison with the weight of the cell and to so arrange the several electrodes making up the unit as to permit and insure an even and more rapid action of the electrolyte than has been done in similar structures of the prior art.

To this end my invention consists in the storage-cell as a whole, in the electrodes and their arrangement, and in the details of the several parts and their combination, as hereinafter described, and more particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a view in side elevation of a cell embodying my improvement with the incasing vessel cut in section. Fig. 2 is a plan view of the cell, showing the general arrangement of the electrodes. Fig. 3 is a view, on an enlarged scale, of the core of one of the electrodes. Fig. 4 is a view in side elevation of an electrode, showing the core with the soft lead formed about it, the upper end showing a finished portion cut in section. Fig. 5 is a view similar to Fig. 4, showing a modified form of electrode made up entirely of metal of the same density. Fig. 6 is a detail view in section of one end of an electrode and a portion of the connecting-plate, showing the method of attaching and insulating the electrode and plate. Fig. 7 is a detail view in section, showing the manner in which a terminal is connected with an electrode.

In the accompanying drawings the letter *a* denotes a vessel adapted to hold the electrolyte or active liquid in which the grid *b* is immersed. This grid is made up of a top plate *c* and bottom plate *d*, between which are secured the electrodes *e*. The electrodes *e* are preferably of the same length and of proper diameter to produce a battery of the required capacity. They are arranged to extend between and be supported by the plates *c* and *d* and comprise two sets of opposite polarity. One set (the negative) is in electrical connection with the plate *d* at or near the bottom of the vessel, and the other set (the positive) is electrically connected with the upper plate *c* at or near the top of the vessel *a*. As a convenient means of arranging these two sets of electrodes to properly insulate them from one plate and connect them with the other, the electrodes being of the same length, an insulating-stud *i*, of hard rubber or other suitable non-conductive material, is interposed between one end of each electrode and the plate of opposite polarity, the other end of the electrode being secured directly to the other plate. By this construction the lower ends of one set of electrodes, which are located in a vertical position in the grid, (in the present case the positive set,) are raised from the negative plate a sufficient distance to clear any accumulation of particles of material thrown off from the electrodes in the action of the battery. Should these particles come in contact with the active part of both sets of electrodes, an electrical bridge would be formed between the two, which would be extremely detrimental to the proper action of the cell. Each of these studs *i* is provided with a threaded shank *i'*, adapted to engage screw-threaded sockets in the plate, the plates being preferably provided with thickened portions *c' d'* to provide sockets of sufficient length to give a firm bearing to the studs. The opposite end of the stud is provided with a socket i^2, within which the projecting end of the electrode fits and is held, as shown in Fig. 6. When it is desired to attach a terminal for leading off the current of the cell or for charging it, the end of the electrode is screw-threaded and made of sufficient length to project through the insulating-bushing. To this screw-threaded end is secured any convenient form of binding-screw for securing the terminal *k*. To insure

proper insulation between the terminal k and the plate, a washer of non-conductive material, as k', is arranged between the two.

The electrodes may be arranged on the plates in any convenient manner; but the preferred form of arrangement consists in disposing them in rows extending across the plate in two directions and alternating in polarity in both directions. This arrangement is fully illustrated in Fig. 2 of the drawings, where each electrode is marked with its corresponding positive or negative symbol.

By means of the construction described the grid as a whole is made up of only two plates and the electrodes extending between them, and being arranged as described the electrolyte has a free and even circulation about the several electrodes, producing an even and rapid action between them.

Each of the electrodes e is made up of what is known in the art as "squirted" or soft lead. In the preferred form the lead is formed about a core of harder material, as antimonious lead, as shown in Fig. 4. The core f has at intervals along its length flanges f' of sufficient thickness and rigidity to form abutments, the function of which is to so divide the strains incident to the action of the battery as to resist the tendency to warp and buckle and to counteract the effects of expansion and contraction of the electrode, which, if unchecked, results in too great displacement of the active material, peroxid or spongy lead, held between the flanges of the electrodes. About this core and closely united to it is formed a jacket or cylinder of soft lead, as shown in the lower section of Fig. 4. Portions of this soft lead are then cut away or preferably forced out by suitable dies, forming the disk-like flanges f^2 and recesses f^3. These recesses are then filled with peroxid of lead for one set of electrodes and spongy lead for the other in the usual manner, and the flanges being arranged at substantially right angles to the axis of the electrodes provide a means for holding the active material in proper position.

In Fig. 5 is illustrated an electrode composed entirely of squirted lead. In this form flanges g are provided in the same manner and for the same purpose as above described. To provide abutments for taking up the strains due to the expansion and contraction of the electrode, it is divided as to its length into sections of thin disk-like flanges g, and at or near each end and between each two sections are formed flanges g' of increased thickness and of sufficient strength to withstand any ordinary strain.

The completed cell is simple and light in construction, compact in form, and has its elements so constructed and arranged as to give an extremely even and rapid action, with little liability to buckle or form short circuits within the cell.

A further advantage of the construction resides in arranging one set of electrodes with their lower ends raised above and insulated from the bottom plate which supports the opposite set of electrodes and is closely united to them. It is evident that this arrangement permits the accumulation of a considerable amount of active material upon the lower plate without danger of forming an electrical bridge between the electrodes of opposite polarity. This material thrown off from the electrodes being caught by the lower plate becomes an active material and serves to increase the capacity of the bottom plate and its electrodes. In batteries of the prior art all material thus thrown off from the electrodes either becomes dead material or becomes useless and even a detriment, as it often forms an electrical bridge between the electrodes of opposite polarity.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In combination in a storage-cell, a pair of conducting-plates of opposite polarity arranged substantially parallel to each other, electrodes extending between the plates and arranged in two sets of opposite polarity, a single set of electrodes being in electrical contact with each of said contact-plates, and means provided at one end of the electrodes whereby they are insulated from one of said plates and held at a distance from the surface of the plate.

2. In combination in a storage-cell, a pair of conducting-plates of opposite polarity, electrodes of substantially-equal length extending between the plates, arranged in two sets of opposite polarity and secured as to one end in electrical contact with their respective conducting-plates, insulating-bushings interposed between the opposite ends and the plate of opposite polarity and adapted to insulate the electrodes at one end and hold it away from said plate.

3. In combination in a storage-cell, a bottom plate, a top plate, two sets of electrodes with all the electrodes of one set in contact with one of the plates, but insulated from the opposite plate, an insulating-stud located between each plate and the electrodes of one polarity, and terminals attached to an electrode of each set.

4. In combination in a storage-cell, a bottom plate, a top plate, electrodes arranged in an upright position in the grid, each electrode having a peripheral jacket of soft lead divided into a closely-arranged series of flanges at substantially right angles to the axis of the electrode and connected at one end to one of the plates and insulated from the other, a stud of insulating material located at the bottom end of each of one set of electrodes and raising them above the level of the bottom plate to which are connected a set of electrodes of opposite polarity, the said elec-

trodes being arranged in rows in two directions and alternating in polarity in both rows.

5. In combination in a storage-cell, a bottom plate, a top plate, two sets of electrodes with all the electrodes of one set in contact with one of the plates but insulated from the opposite plate, and means interposed between the bottom plate and one set of electrodes whereby an electrical bridge between the two sets of electrodes is prevented.

HENRY J. COGSWELL.

Witnesses:
ARTHUR B. JENKINS,
ERMA P. COFFRIN.