and contains the excitant, together with the zinc element, and has also standing within it, and surrounded by the excitant, the inner jar or pot, which is of a porous nature, and contains a strip or block of carbon surrounded by the powdered binoxide of manganese.

The Leclànché cell is also made with only one jar, the binoxide of manganese being applied in a conglomerate mixture attached to the surface of the carbon elements. The porous inner jar or pot is thus not needed. This arrangement is known as the agglomerate form of Leclànché cell.

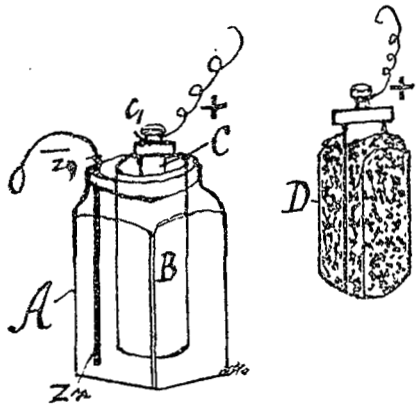

FIG. 6.—LECLANCHE CELL.

Fig. 6 shows an outline sketch of a Leclanché cell. A is the outer jar, B the inner porous jar, C the carbon element surrounded with binoxide of manganese, Zn is the zinc element, c_1 is the positive pole, and z_1 the negative pole. D shows an agglomerate block for use in the place of the porous jar B.

The chemical reaction of this cell is shown by the equation—

$$Zn + 2\,NH_4Cl + 2\,MnO_2 = ZnCl_2 + H_2O + 2\,NH_3 + Mn_2O_3.$$

That is to say, the ammonium chloride is decomposed and zinc chloride formed, while the hydrogen set free reduces the manganese dioxide.

The E.M.F. of the Leclanché cell is about 1·4 volt, so that it fairly fulfils condition 1. When required to work only a short time it is very constant, and as medical purposes generally only require currents for a short time condition 2 is fulfilled. Further, as this cell possesses the power of recovering itself by reason of the presence of excess of binoxide of manganese (which yields up oxygen and so destroys the hydrogen bubbles), it is specially suited to work which requires a constant current for a short time at frequent and irregular intervals. Condition 3 is not well fulfilled, for when the porous jar or pot is used the internal resistance is considerable, but in the agglomerate form, where this inner jar is dispensed with, the internal resistance is much reduced. There is no internal action when at rest, so that condition 4 is satisfied; 5 and 6 are also fairly fulfilled.

There are many forms of Leclanché cell and special adaptations of it to medical batteries by many makers. It would be needless and probably quite useless to attempt to enumerate and describe them. Any student who has grasped the main principles upon which the Leclanché type of cell is arranged, will have no difficulty in recognising any variation of the type.

(II.) The silver chloride cell has for its elements silver chloride and zinc, and for excitant zinc chloride or sodium chloride. It is generally made up of very small cells. The one containing vessel or jar is usually of vulcanite or glass. The silver chloride in a granular form (to increase its surface area) is fixed in a porous bag or case, whilst the zinc is in the form of a flat rectangular plate. The elements are tied together by india-rubber bands, but are separated from actual contact by means of a pad of blotting-paper, which pad is saturated in the excitant. Its E.M.F. is about 1·2 volt., and conditions 3, 4, 5, and 6 are well fulfilled, but 2 is not.

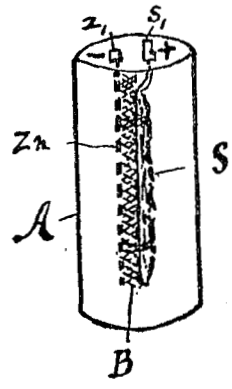

FIG. 7.—SILVER CHLORIDE CELL.

Fig. 7 shows in outline a chloride of silver cell as arranged by Gaiffe, of Paris, for pocket coil work. A is the containing vessel, B the porous pad saturated with the exciting solution, S is the silver chloride element, Zn is the zinc element, s_1 is the positive pole, and z_1 the negative pole.

This form of cell is useful for portable batteries in connection with small induction coils, as they are effective when made quite small, and can be carried in the pocket with perfect safety.

(III.) The sulphate of mercury cell, sometimes called after the inventor the Marie-Davy cell, has for its elements zinc and carbon, and for excitant sulphate of mercury. The single jar contains a

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