The chemical reaction that takes place is shown by the following equation :—

$$Zn + H_2SO_4 = ZnSO_4 + H_2;$$

or in words, zinc and sulphuric acid become sulphate of zinc and hydrogen. The zinc enters into combination with the radical of the acid and turns out the hydrogen. The sulphate of zinc produced in the reaction remains in solution, while the hydrogen escapes in bubbles, which may be seen sometimes lightly adhering to the metal strips, sometimes rising to the surface of the solution.

The electric action starts at the zinc plate (which is gradually eaten up during the decomposition), and passes across the solution to the copper plate. This may be seen by putting a cell into a lantern, and showing its magnified image upon the screen while the process is going on. A strong stream of cloudy bubbles will be seen, as it were, issuing from the zinc, and passing across the fluid to the copper. The zinc is therefore called the positive metal plate, when the *internal* action of a cell has to be considered ; but we must be careful not to confuse this with the positive pole of a cell or battery, for when the *external* action has to be considered, and the outer ends or poles of the metal plates have to be dealt with, the copper is positive and the zinc negative.

This is obvious when we remember that no effective electric action takes place until the elements are connected outside the cell, and the circuit, as it is called, is completed. We show this in the diagram (Fig. 5), where the zinc plate is represented by a thick line marked *Zn*, and also marked inside the excitant + or positive. The direction of the circuit is shown by the arrows ; and following these we see that it passes inside the cell from zinc to copper, and outside from copper to zinc. The part of the circuit from which we obtain electricity for useful work is manifestly the *external* portion, so that where the use of electric currents from a cell or battery is concerned, the copper is positive and the zinc negative.

The outer ends or terminations of the elements are called poles, and it is to these poles that the conducting wires are fixed, by means of which the current flows, or is assumed to flow, out from and back to the cell or battery. Inside the cell the zinc is always the *positive plate*, but outside its end or termination is always the *negative pole*.

This simple cell is not of much practical use, because it fails to fulfil several of the conditions named above as necessary for an efficient chemical electric generator. Let us take them in order :—(1.) Its E.M.F. (of which we will say more presently) is only moderate (about one volt). (2.) It is very inconstant both as regards E.M.F. and current strength. (3.) Its internal resistance, while fairly low to start with, soon becomes much greater by reason of local action set up by impurities in the metals and acid used. (4.) Considerable action goes on inside the cell when it is at rest, so that both the zinc and the acid of the solution are soon used up. (5) and (6) are fairly fulfilled ; but as these relate to convenience rather than electrical efficiency, they are of less importance than the others. The simple voltaic cell, therefore, had to be improved upon before the principle of Volta could be put to much practical use. Many forms of cell have been devised, some good for one purpose and some good for another. Bearing in mind that we are dealing solely with generators for medical work, we will only describe those forms of cell which are most useful for that purpose.

All such cells have for their essential parts two strips, plates, or other suitably shaped pieces of metal or similar substance, called the *elements*, and one or more exciting fluids called *excitants*.

The metals used are various ; though zinc always forms one of the pair, the other is generally carbon or copper, but is sometimes silver, platinum, tin, iron or gold. The zinc must be either *pure* or *amalgamated with mercury*. The exciting fluid is either saline or acid. Of the saline fluids, solutions of sal ammoniac and of chloride of sodium (ordinary salt) are the most common. Of the acid fluids, solutions of sulphuric, hydrochloric and nitric acids are generally adopted.

(To be continued.)

NURSES AND THEIR QUALIFICATIONS.

By William Blood.

THE writer was struck on reading the following words at the commencement of the review of a book in the *Athenæum*, namely, "Recollections of a Nurse," and believing that the advice given therein, and the just tribute paid by the reviewer of the book to a profession which demands, on the part of those who adopt it, the exercise of the greatest human qualities, the writer ventures to believe that the opinions held by the reviewer may be usefully transferred to the columns of your paper for the benefit of its numerous readers.

The words referred to are, "To no woman can we give higher praise than to say of her that she is a perfect woman." For, adds the reviewer, to find a perfect Nurse, we must first find a woman with a head so well furnished, a heart so good, and a temper so sweet that she might almost be termed a perfect woman, and he instances the cases of

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