

copper and a strip of zinc, both of which have been previously well cleaned. Do not let the strips of metal touch one another either inside or outside the vessel. If we watch the metals and the solution we shall not be able to see any evidence of chemical action going on. But now let us connect the metals together on the outside by a wire, and a violent chemical action is at once apparent in the vessel. Bubbles of gas are seen to rush across that portion of the solution which is between the metals from zinc to copper. Some of the bubbles rise to the surface and others adhere to the latter metal. The zinc is being decomposed, and, if allowed to remain long in the solution, would be quite eaten up. Let us now introduce in the outer connecting wire a galvanometer (which is an instrument specially constructed to indicate the presence of and measure electric currents, and of which more will be said hereafter), and we shall find a distinct deflection of the needle. This indicates the presence of an electric current in this outside wire. Or, let us bring near the wire a simple magnetic compass needle. The needle will be violently agitated, and thus give us another proof of the presence of an electric current.

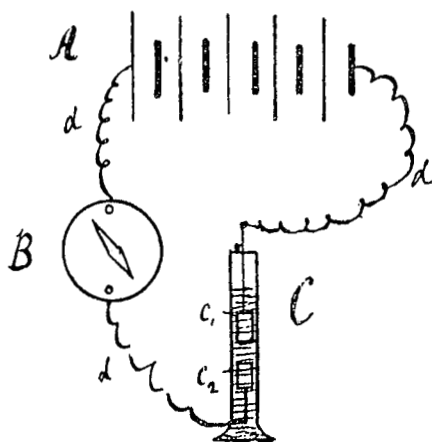


FIG. 2.

We have then in this arrangement, which is known as the simple voltaic cell, distinct evidence of chemical energy producing or being transformed into electrical energy. The chemical energy at work inside the vessel, or rather a portion of it, is transformed into electrical energy outside the cell. The electrical energy thus obtained may also be re-transformed into energy of its original form. To do this take several of such voltaic cells, arranged with the zinc of one connected to the copper of the next. Connect the copper of the first cell and the zinc of the last to metal conductors of silver or platinum,

which must be placed a short distance apart in a glass vessel, containing ordinary tap water. As soon as the connection is completed, chemical decomposition of the water will commence, the component gases, oxygen and hydrogen, coming off in bubbles, while the volume of water perceptibly diminishes.

Fig. 2 represents diagrammatically the arrangement of apparatus for experimental proof of the chemical energy cycle. *A* is the battery of voltaic cells; *B* is the galvanometer, showing its needle deflected; *C* is the vessel containing water, in which the silver or platinum conductors, c_1 and c_2 , are placed; *d, d, d* are conducting wires.

This process is called the electrolysis of water, and is best carried out with the aid of an apparatus called a voltameter, in which the gases can be collected and tested separately.

Here, again, we have an energy cycle completed. Chemical energy is transformed into electrical energy, and this in turn is re-transformed into chemical energy. We again have much loss of energy in the process.

(To be continued.)

WOMEN AND THEIR WORK.

THE PHOTOGRAPHER.

THE solar system and that hard round slippery thing that men call money are separated apparently by an indefinite space, but modern science has drawn even these two divergent points together, and now his majesty the king of day will, at the word of command, earn for the photographer a daily increment. Fifty years ago the art of photography was yet an unknown quantity; to-day it has attained an almost startling degree of perfection, as witnessed by the superb "gems" now so often exhibited, perfect as any picture, and true, because drawn by one who cannot deceive, will not flatter, and is ever natural. Beautiful, also, as an engraving are those new "departures" in photographs, such as are shown in Van der Weyde's window, and resemble so much the best style of "good old prints." The rapidity also of the process of that ordeal, "having one's photograph taken," is mightily increased of late years; it is verily now but "a twinkling of an eye" ere it is over, and one has to exercise patience till some few days after you behold yourself on paper, to be satisfied or dissatisfied as vanity bids. Amateur photography is the fashion, and many ladies have eagerly entered on the pursuit. I read that Lady Lansdowne has been trying her hand on her husband's guests in India. Also, a royal photographer has arisen, for the Czar of all the Russias has become enamoured of this com-

[previous page](#)

[next page](#)