PRACTICAL LESSONS IN ELECTRO-THERAPEUTICS.

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LESSON IV.

Work Outside the Battery—Electro Physical Action—Cataphoresis; Electro-Chemical Action—Electrolysis; Electro-Physico-Chemical Action—Catalysis.

HAVING in our previous lessons dealt with the common modes of generation of the continuous current when used in its application to medical purposes, as well as with conduction and with resistance, we are prepared to consider some of the phenomena dependent on the transformation of electrical energy into physical and chemical work.

This transformation takes place outside the battery, and is an accompaniment, as it is an evidence of resistance, and the work done—allowing for the loss referred to in Lesson I.—is the equivalent of electrical energy, expended in overcoming the resistance between positive and negative poles.

As examples of these properties of the continuous current, we propose to discuss *(a)* Cataphoresis, (*b*) Electrolysis, and (*c*) Catalysis, for it is upon the functions named that many important uses of the continuous current are dependent.

Cataphoresis (*a*).

In order that this function may be explained, it is necessary to refer briefly to the well-known purely physical phenomenon of *osmosis*. Speaking generally, the theory of osmosis is, that when two fluids of varying density are separated from one another by a porous septum or animal membrane, diffusion takes place from the fluid of less, through the septum, to the fluid of greater density.

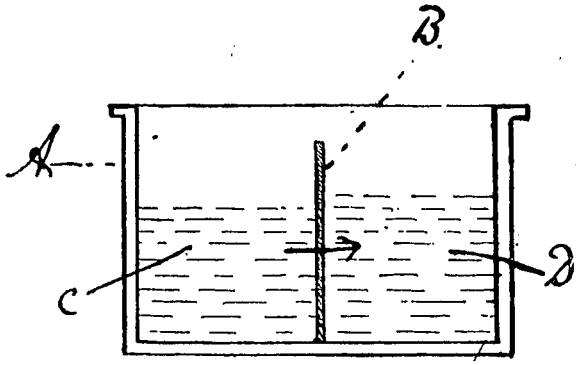

FIG. 18.

Fig. 18 illustrates a vessel (A) divided into two parts by a porous septum (B). Into one compartment we pour a fluid (C) of a certain density. In the other compartment we place an *equal bulk* of a fluid (D), whose density has been previously increased by the addition of a salt, such as sulphate of soda. After some minutes we note that the surface level of D rises, while that of C falls. There has been a transference of fluid from one compartment to the other in spite of the force opposed by gravity to such an alteration in level. But the process is extremely slow.

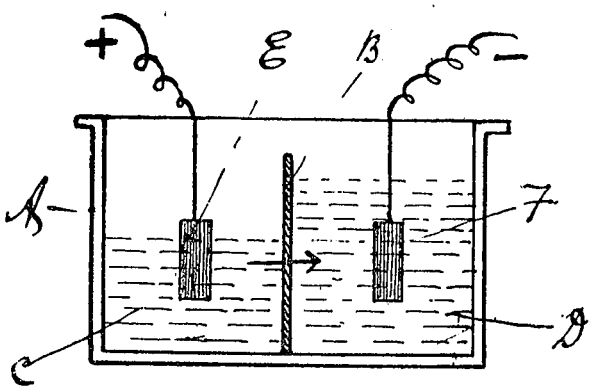

FIG. 19.

If, however, in C we place an electrode (E) connected with the positive pole of a battery, and in D an electrode (F) connected with the negative pole of the same battery, we shall find that the process of transference of fluid from C to D (other conditions being the same as in Fig. 18) will be much accelerated. In a given time the level of D will be very much higher when a current is passing from E to F than when osmosis, unaided by electricity, is the agent at work. But further than this, *independently of the respective densities of C and D*, there will be a transference of fluid from C to D when electrical energy from E to F is transformed into mechanical motion. There is an actual mechanical transference of fluids from C to D. This is what is meant by cataphoresis.

Further to illustrate this important process, upon which the method of *cataphoric medication*, to be hereafter referred to, is based, the fluid C may be replaced by a weak solution of iodine, and D by a weak solution of starch. The current passing from E (+) to F (—) through the fluids will carry with it through the septum (B) a portion of the solution of iodine. On that

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