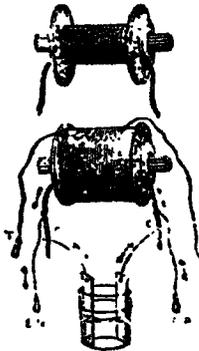


magnet, the intervening wire being no hindrance to their development. The top coil must also be insulated, and be unconnected with either the wire beneath, the iron, or the battery.

The current produced on breaking contact runs in the same direction as the battery current, and that on its junction in the opposite way. Faradic currents, as already stated, may be produced by a coil of wire, and pair of plates, alone, but the inducing power of an electric magnet so far exceeds it, that the soft iron helix is never omitted in these instruments, but is withdrawn when a diminution of strength is required. If a bundle of annealed wires, each insulated, be substituted for the bar of iron, forming, as they would, so many distinct magnets, the currents would be still farther intensified; they must not however be encircled by any metal which partially does away with this increase of power.

The wood cut is intended to illustrate the formation of the coil machines. The top spool has its inducing wire arranged to receive the finer, which is placed over it in the second. The rheotome is not inserted. The electrodes *r.* would give the to and fro currents on separating or connecting the wires at *c*.



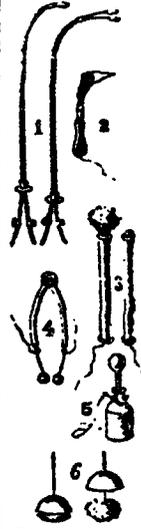
*Extra currents.*—The Voltaic apparatus possesses an advantage over the magneto-electric instruments, in generating an extra current of induction in the larger wire at the instant that the battery is cut off, and unlike that induced in the finer wire, it runs but one way, which is the same as that of the battery; it lasts but for an instant and may be felt strongly at the disks *m.* and *n.* It is an induced current in the inducing wire, after each stoppage of the electricity from the Voltaic plates, and is very convenient as a therapeutic agent. And if the to and fro currents, formed in the finer wire, can be divided at pleasure, it gives a very perfect instrument with three sets of currents, the to and fro, and single currents, from the long fine wire, and the extra current from the coarser. Those from the first, according to Duchenne, being more penetrating and having an especial action upon cutaneous sensibility, and likewise upon the retina; and those of the larger wire upon muscular contractibility.

Induced currents differ, as a therapeutic agent, from Voltaic electricity, in moving alternately in opposite directions, and in being a quick succession of minute shocks; it is to the latter alone however that its superiority is due, for effects, similar in every respect, may be obtained from a small galvanic battery, if its current be made discontinuous by means of a rheotome.

Induced electricity is decidedly medical electricity, and, apart from its other advantages, is superior to all other forms in producing powerful muscular contractions, without exciting cutaneous sensibility, causing shocks, or tearing the capillary vessels. And its employment is unaccompanied by risk of altering the tissues by chemical action, an effect which is liable to occur with continuous Voltaic currents.

*Electrodes.*—By this term is understood the poles

or handles attached to the ends of the wires, by which the application of the electricity is made to the different parts of the body. The pair most universally applicable are brass cylinders with wooden handles, as shown at 5; they are intended to hold sponges saturated with salt water. Duchenne's cup and sponges as may be seen, are much larger than those ordinarily employed. Disks, balls, cones of metal, and wood, similar to those used with frictional electricity may all prove useful in Faradization. The exciters fig. 1. are intended for the bladder, and when made a little



less curved, answer admirably for Faradizing the os uteri in amenorrhœa. The wires are run through an elastic catheter with a divider to keep them isolated. Fig. 2. is for the ear; the cone should be made of wood or ivory. Fig. 3. is a wire brush for stimulating the skin, and producing counter irritation. It should be attached to the negative conductor, when the apparatus allows of divided currents.

A pair of very convenient sponge electrodes may be made by cutting a hollow India-rubber ball in two, and inserting a sponge into each half as shown in fig. 6.

In applying electricity, it must be recollected, that the stream passes into the body at the positive electrode, and out at the negative one, its way to complete its circuit.

By a direct current is understood one that follows the course of a nerve and consequently of nerve force; it is produced by placing the positive conductor on a nerve nearer to its origin in the brain or spinal cord, than the negative one. Or in other words, to cause a direct current, the negative electrode must be placed upon a nerve near to its point of distribution than the positive one. Inverse currents, as their name implies, run in a contrary way to nerve force, and the electrodes are reversed to produce them.

Direct currents, although occasioning contractions in the muscles to which a nerve is distributed has the effect of decreasing for a time the excitability of the nerve itself. It is owing to this important power, that it is so desirable to be able to employ them alone; for the reverse currents of the to and fro instruments stimulate and counteract this effect. But when these double currents are very intense, the inverse become overpowered by the direct.

From these facts it will be deduced that fresh and long continued to and fro currents are best adapted to rouse vitality and exercise a tonic influence upon weak or atrophied tissues.

The human body is not a good conductor of electricity when compared to metals; its most impregnable part, however, is the epidermis, the resistance of which when dry has been placed by Lenz, after many experiments, as high as 36 times that of the conducting wire alone. The skin once passed, however, he found the structures beneath not to exceed five times. Persons accustomed to working with Voltaic batteries, are perfectly aware of this great difference, from the increased facility and power with which the current enters the hands.