Voltaic Electricity properly designates that branch of electricity to which the name of *Galvanism* is generally applied. The term *voltaic* has been given to it in conse­quence of the science having been founded by M. Volta, professor of natural philosophy at Pavia, although the ex­periments of Galvani were prior to those of his countryman. At present we propose to comprehend under this general title, the sciences of *galvanism, electro-magnetism, magneto-electricity,* and *thermo-electricity* ; and we have adopted this arrangement in order that we might avail ourselves of the various discoveries which might be made up to the close of the work.@@1

PART I.—GALVANISM.

The science of *galvanism* derives its name from some in­teresting experiments performed in 1789 by Μ. Galvani, professor of anatomy at Bologna. When one of his pupils was using an electrical machine, a number of frogs were lying skinned on an adjoining table for the purposes of cookery. The machine being in action, the young man happened to touch with a scalpel the nerve of the leg of one of the frogs, when, to his great surprise, the leg was thrown into violent convulsions. Madame Galvani, having ob­served the fact, communicated it to her husband, who speedily repeated and extended the experiment. He found that the convulsions took place when a spark was drawn from the prime conductor ; and when the blade of the knife, or any other good conductor, was brought into contact with the nerve. When a frog formed part of an electric circuit, a very small quantity of electricity, whether common or atmospheric, produced convulsions in the muscles. Having hung a number of frogs by metallic hoops on an iron railing, he observed that the limbs were fre­quently convulsed when no electricity was indicated in the atmosphere. In studying this experiment, he was led to the conclusion that the convulsions were not produced by extraneous electricity, but that they always took place when the muscle and nerve of a frog were each placed in contact with metallic bodies, themselves connected by a metal. A still more powerful effect was produced when two metals, such as *zinc* and *silver,* were employed, the nerve being *armed* or coated with one of these metals, the muscle brought into contact with the other, and the two metals joined by an electrical conductor.

This experiment is shewn in fig. 1, where Z is the rod of *zinc* and C the rod of *copper.* The extremity B, of the zinc is brought into contact with the *armed* muscle of the suspended limb FD, while the extremity of the copper is brought into contact with the nerve at D. When the two metals are made to touch at A, the limbs are con­vulsed, and take the dotted position Galvani explain­ed this phenomenon by saying, that the muscle of the frog was a sort of Leyden phial, the nerves representing the in­terior, and the muscles the exterior coating of the phial, and the discharge or shock taking place by the metal or metals, which form a communication between the two electrified coatings. The fluid which thus passed along the nerves and muscles was called the *Galvanic fluid.*

The publication of Galvani’s discoveries excited great interest. The subject was prosecuted by Valli, Fowler, Robison, Volta, Wells, Humboldt, Fabbrici, and others; but the labours of Volta were the most successful, and, by his discovery of the *Voltaic pile,* he may be considered as the great founder of the science. In his earliest inquiries, Volta saw the true cause of the phenomena described by Galvani. He maintained that the exciting fluid was ordin­ary electricity, produced by the contact of the two metals, and that the convulsions of the frog arose from the electri­city thus developed passing along its nerves and muscles. Volta afterwards proved that the force, which gave rise to these phenomena, was generated by the contact of hetero­geneous bodies, that it decomposed their natural electri­city at the point of junction, continually separating the two fluids, and making the *positive* electricity pass along the one and the *negative* along the other.

According to this view of the subject, every two hetero­geneous bodies form a *galvanic circle* or *are,* as it is some­times called, in which electricity is generated ; and hence Volta was led, in 1800, to invent the *Voltaic pile,* or *com­pound galvanic circle.*

This apparatus, shewn in figs. 2, 3, consists of a number of *single galvanic circles,* ZC, ZC, &c., each of which is com­posed of a disc of *zinc* and another of *copper.* These single galvanic circles are separated by a disc D, of paper, card, or cloth soaked in *water* or any other *fluid.* When thirty or forty *pair* or *couple* of zinc and copper discs, four inches square, are combined, as in fig. 2, the electricity developed will be sufficient to make the gilt leaves of an electroscope diverge, the *upper* or *zinc* end with *positive,* and the *lower* or *copper* end with *negative* electricity ; and if we touch the upper end with the wetted fingers of one hand, and the lower end with the wetted fingers of the other, a distinct electrical shock will be experienced.

The *zinc extremity* of the pile is therefore called the *positive extremity* or *pole,* and the *copper extremity* the *negative extremity* or *pole.* The *wet* card, or disc, which separates each pair of metallic discs is called the *conductor.*

@@@1 The names ***electro-magnetism*** and ***galvanism*** occur so early in the alphabet, that the arrangement referred to could not with propriety be avoided.