in this is fixed, by means of corks, another glass cylinder B, 1½ inch in diameter, and 4 inches long, and closed at one end with a plug or bottom, D of plaster of Paris, 0∙7 of an inch in diameter. A piece of sheet copper C, 6 inches long, and 3 wide, loosely coiled up, and having the conduct­ing copper wire F, soldered to it, is placed, in the cylinder D, while an equal sized piece of zinc E, loosely coiled up, and furnished with a conducting wire G, is placed in the cylinder A. When the cylinder A is nearly filled with weak brine, and the smaller one B, with a saturated solution of sulphate of copper, the apparatus is complete ; and if the fluids in the two cylinders are kept at the same level, a con­tinuous current of electricity will be maintained for some weeks. The mode of connecting this battery with the de­composing cell, is shown in fig. 43. This cell is the counter­

part of the battery, consisting of two glass cylinders, A, B, the latter having a plaster of Paris bottom. The tube B, is about 3 inches long and half an inch wide, and receives the metallic or other solution to be decomposed, the outer tube A being filled with weak brine. Into this brine is plunged a strip of amalgamated zinc C, connected with the wire F, of the battery, while a strip of platinum foil D, is immersed in the metallic solution, and is connected with the wire G of the battery. This apparatus, therefore, consists of an ac­tive single battery, of which C, E, is one of the two metallic elements, and C and D the other ; and the fluid between C and E, separated by the porous diaphragm D, one fluid ele­ment, and the fluid between C and D, separated by a porous diaphragm, another fluid element.@@1

Another instrument necessary in voltaic researches is the volta-electrometer, or voltameter, invented by Dr Faraday, for measuring the quantity of voltaic electricity, by means of the quantity of oxygen and hydrogen generated by the battery. It consists of a graduated glass tube, *a*, fig. 44, closed at the upper end. Platina wires *b*, *b',* terminating in two platinum plates within the tube, pass through the tube, and are fused into the glass. The tube is fitted by grinding into one of the necks of a two necked bottle. If the bottle is ½ or 2/3ds full of dilute sulphuric acid. It will by enclosing the tube, flow into the tube, and fill it. When an electric current, therefore, is passed through the instrument between the plates, the evolved gases collect in the upper part of the tube, without being subject to the recom­bining power, of the platina, the stopper *c* is taken out.

By receiving the wires connected with δ, δ', replacing the stopper, and refilling the tube with the liquid by inverting the bottle, a second measure of gas may be obtained on replacing the wires at *b*, and *b'*.

Dr Faraday has given in fig. 45, an­other form of the vol­tameter, which he found very useful in experiments continued for days together, and where large quantities of indicating gas are to be collected. The gases, in place of be­ing measured in the tube, as in fig. 44, are carried by the bent tube δ, into a graduated jar, placed in a small pneumatic trough.

CHAP. II —ON THE GENERAI. PHENOMENA AND EFFECTS OF GALVANISM.

In our article on Electricity,@@4 we have already given a brief account of the results obtained by Dr Faraday, which established the identity of all the various kinds of electri­city, and the relation by measure of ordinary and voltaic electricity, as obtained by the same distinguished philoso­pher, and of his new law of electrical conduction.

Notwithstanding the identity of character of *common* and and *voltaic* electricity, the effects which they produce are almost infinitely varied, some of these effects being exalted, while others are diminished. All these variations, however, are explicable by the differences in quantity and intensity of these two kinds of electricity.

In the case of ordinary electricity, a piece of glass or sealing-wax, excited by friction and kept near the cap of a gold leaf electrometer, will produce a great and instantaneous divergence of the leaves ; but in voltaic electricity the same effect is not produced, even by a battery of 100 pair of plates.

When the extremities or poles of such a battery are ex­amined by the electrometer, they are found to be *positive* and *negative,* the gold leaves *repelling* each other at the *same* pole, and *attracting* each other at *different* poles, even when above half an inch of air intervenes. Hence *ordinary* differs from *voltaic* electricity, in having a much higher de­gree of *tension,* or *intensity,* that is, in acting with a greater elastic force in a given direction. From this property it acts so powerfully on the electrometer, and is discharged with such facility through air, whether highly rarefied or heated. On the other hand, *voltaic* differs from *ordinary* electricity in the enormous quantity of electricity which it delevopes and puts in motion, and in the continuity or perpetual re­production of the current.

In order to convey some idea of the immense difference in this respect of the two electricities, Dr Faraday has stated that “ the chemical action of a grain of water upon four grains of zinc, can evolve electricity equal in quantity to that of a powerful thunder-storm.” That if a Leyden bat­tery is charged with 30 turns of a large and powerful plate electrical machine in full action. It would require 800,000 such charges to supply electricity to decompose a single grain of water, or to equal the quantity which is naturally associated with the elements of that grain of water, endow­ing them with their mutual chemical affinity.@@3 Or to put the comparison differently, the quantity of electricity in 25¼ grains of water is equal to above 24 millions of charges of the Leyden battery above mentioned, or would keep any length of platina wire 1/104th of an inch in diameter, red hot for an hour and a half.

@@@1 See *Phil. Trans.* 1837, part i. p. 39—40 ; end Graham's *Elements of Chemistry,* p. 237, 8.

@@@’ Vol. viii p. 574, 5.

@@@∙ Faraday's Exp. Researches, p 263, 258, and 861, 873.