28. A spout L, a quarter of an inch deep, is placed at the top of each cell, and these spouts overhang a wooden gut­ter extending along the frame. The solution of the sulphate must then be renewed by means of a funnel with a long neck, the long end being made to descend nearly to the bot­tom of the cell. When the fresh solution is thus poured in, the spent liquor will run out by the spout into the gutter. When a series of experiments is over, the battery must be emptied, and the plates well cleaned by dashing water be­tween the cells.@@1 Mr Noad justly recommends this battery as a very valuable one, and as likely to supersede the *acid charged* battery altogether. Its initial action was equal to one of Wollaston’s batteries of equal surface, and what is of far more importance. Its action was permanent.

Professor Daniel) has published in the Philosophical Trans­actions for 1836, an account of two new voltaic batteries, possessing valuable properties. The first of these he calls the *dissected battery,* by means of which he says, “ many detached facts well-known before, had become clear, and of more importance, from their connection and comparison with each other by its means.” The following is Mr Daniell’s own description of it :—The battery consists of ten glass cells, a section of one of which is represented in the accom­panying figures.

*"abcd,* fig. 29, is a foot of solid glass, containing a cavity *e f g h,* the upper part of which is fitted with a stopper, *g h.* Through this stopper the stems of the two plates *i j k l m n,* pass into the lower part of the cavity, which is divided into two cells by the partition *o p,* and each of which contains mercury, into which the wires respectively dip. This arrangement ad­mits of the plates being changed at plea­sure with little difficulty. The plates may be connected together, or with the plates of other cells, by means of wires, *ρ q,* passing through the lateral holes, *t, u,* and dipping also into the cups of mercury. To the glass foot thus arranged, a glass shade *v w x y z z,* is fitted by grinding, and constitutes a cell for the reception of the liquid. A graduated glass jar, A, B, may be suspended over either plate by means of a brass clip, proceeding from a rod placed by the side of the cell in the manner represented by fig. 30, which is a perspective drawing of a circular arrangement of ten such cells.

Fig. 31 represents the section of a cell which is adapted

to the same purposes, but is less expensive in construc­tion. It is supported in a per­forated table C, D, by its project­ing rim *v w y z,* and the stems of the plates pass through the glass stopper *a b c d,* into the exterior mercury cups *o, p,* by means of which all the necessary connexions may be made.

The circular arrangement of the cells of the battery, fig. 30, admits of their being combined together in various ways with the greatest faci­lity, by means of small cups of mer­cury *g, h, i,* placed at proper inter­vals. My next disposition was to connect all the platinum plates to­gether by wires radiating from them to a central cup *k,* of mercury, and all the zinc plates by wires, dipping into a ring of the same metal, placed in a groove *a b c d e f,* surrounding the whole arrange­ment. In this state of things no action was of course mani­fest, for there was no complete circuit ; but upon mak­ing a connection by means of a wire, between the centra) cup and the exterior circle of mercury, the current was enabled to circulate, and was manifested by the simultaneous evolution of gas from all the cells. The inequality of action became again apparent, and the differences between the cells was nearly the samc, as when they were connected in separate single circuits.”

Notwithstanding the numerous improvements which have been made in the voltaic battery, no successful attempts had been made till the time of Professor Daniell, to discover the causes of the variations and decline of its force, after the first immersion of the plates in the diluted acid. The principal causes of these variations he proved to be the evolution of hydrogen gas from the negative metallic surface, which not only consumes a considerable portion of the generated electricity, but reduces at the conducting plates the oxide of zinc, formed by the action of the battery at the generating plates, and here the conducting plates were ultimately so encrusted with metallic zinc, as to diminish and finally an­nihilate the circulating force. Hence he was led to the con­struction of what he calls a *constant battery,* for producing an invariable current of force, and therefore applicable to many important researches, which cannot be successfully carried on under variation of the voltaic current. But beside the attainment of this great object, Professor Daniell con­siders it as promising the following advantages :

1. The abolition of all local action, by the facility of ap­plying amalgamated zinc.

2. The trifling expense of replacing the zinc rods when worn out, and the total absence of any wear of the copper.

3. The dispensing with the use of nitric acid, and the substitution of the cheaper materials, sulphate of copper and oil of vitriol, and the absence of any annoying fumes ; and,

4. The facility and perfection with which all metallic communications may be made, and different combinations of the plates arranged.

The following is Professor Daniell’s description of this valuable instrument.

Fig. 32 represents a section of one of the cells, ten of which are shown in connexion at fig. 53 ; *a b c d* is a cylin­der of copper six inches high and three and a half inches wide ; it is open at the top *a b,* but closed at the bottom, except a collar, *ef,* one and a half inch wide, intended for the reception of a cork into which a glass siphon-tube, *g h i j k,* is fitted. On the top, *a b,* a copper collar, cor­responding with the one at the bottom, rests by two hori-

@@@1 London and Edinburgh Philosophical Magazine, April 1837, vol. x., p. 244.