in figs. 37 and 38. It consists of a copper trough, C C, three inches deep, and two and a quarter wide, divided into as many compartments, with copper partitions, as we wish to have zinc plates. A section of a trough, for *five* plates, is shewn in fig. 38. The zinc plates are soldered firmly to a copper bar, and this copper bar is fastened by a screw to a piece of hard wood which serves as a cover to the bat­tery. The *pole director,* shewn at the top of fig. 37, for directing the course of the electric current, is constructed thus. In the wood cover, C C, there is cut a groove on each side of the screw B, in connexion with the zinc, and into this groove is fitted a copper slide, which carries two moveable wings, D*d*, Ee, which may be easily brought into contact with the copper or zinc. When the wing D*d* is in contact with C, and Ee with B, the current of electri­city will go out from the wire in connection with the wing D*d* and return by the wire connected with the wing Ee, into the zinc plates through B. If we now shift the slide, so that E*e* is in contact with C, and D*d* with B, the cur­rent will be reversed, going out by the wire at Ee, and re­turning by the wire at Dd, to the zinc through B. In order to prevent any precipitation of the sulphate of copper upon them, the zinc plates should be lightly covered with bladder. When the trough is to be employed for sustain­ing a weight, the membranes should be slipped off, and diluted nitrous acid used instead of the sulphate of copper solution.

A galvanic battery of a very simple kind, and easily con­structed, has been employed by M. Bachhoffner.@@2 A piece of thin sheet copper, coiled up in the form of a cylinder, 4 inches by 2½, is kept in that state by a fine copper wire. The cylinder is then placed in a small bladder tied round the copper with pack-thread. The bladder is open at top, and its bottom forms the bottom of the cylinder. A sheet of rolled zinc is coiled up in a similar manner, and a piece of copper wire, previously soldered to each zinc and copper cylinder, forms the connexion between them. This battery may then be placed in a jelly-pot. It is excited by a satu­rated solution of sulphate of copper, poured into the copper cylinder. Another solution of common salt is poured in on the outside of the copper, and in contact with the zinc. If it be required to keep the battery in action for two or three days, a few crystals of sulphate of copper must be added, to keep up the strength of the solution within the copper cy­linder.

Before concluding this part of the subject, we must notice the spiral galvanic batteries. The first battery of this kind on a large scale, was made by Dr Robert Hare, who call­ed it a *calorimotor* from its remarkable power of pro­ducing heat. It consists of sheets of zinc and copper formed into coils, the copper coil encircling the zinc at a distance not exceeding a quarter of an inch. The sheets of zinc were about 9 inches by 6, and the copper 14 by 6, more of the copper being necessary as shown in fig. 39, where ZZ represents the zinc, and C C the copper coil. Each coil was about 2½ inches in diameter, and they were 80 in number. All these coils were let down by means of a lever, into 80 glass jars, 2¾ diameter, and 8 inches large, containing the acid solution for exciting them.@@3

Μ. Pouillet constructed one of these with twelve couples for the Faculty of Sciences at Paris, and found it very powerful in producing great quantities of electricity with low tension.

Mr Pepys constructed a similar instrument on a grand scale, for the London Institution, in 1822, for electro-mag­netic purposes. It is represented in fig. 40, where M is the battery, C C the conductors, W the counterpoise weight, and T T the tubs, one for holding the dilute acid, and the other water. The battery M, consists of two plates of cop­per and zinc each *fifty* feet long, and *two* wide, exposing a superficial surface of 400 feet. They are rolled or wrapped round a cylinder of wood, with three ropes of horse hair be­tween each fold to keep them from contact, and these ropes are kept in their position by notched sticks, occasionally in­troduced in the rolling. Two conductors CC, of copper about three quarters of an inch thick, are soldered to the end of each plate, from which the electric force is obtained when the instrument is in action. The battery is suspended by ropes and pullies, with a counterpoise W, to permit its immersion in a tub of diluted acid, or when not in use in a tub of water. It requires about 55 gallons of fluid, and the solution used contains about 1/40th of strong nitrous acid.@@4

A very excellent galvanic battery for producing electri­city of different intensities, has been described in 1835, by Mr Joseph Henry, of New Jersey college.@@4 The object of the apparatus is to exhibit most of the phenomena of galvanism, and of all those of electro-magnetism on a large

1 Sturgeon's Annals of Electricity, April 1887, p. 224.

@@@» Id. Id. p. 214.

@@@’ Phil. Transactions, 1823, p. 187.

@@@‘ Trans. American Philosophical Society, vol. v.

@@@∙ Silliman’s Journal, vol. iii. 1821, p. 105.