leaf, the leaf is bent, or *attracted* and *repelled* laterally by the poles of the magnet, according as the current *ascends* or *descends,* the broad surface of the leaf becoming *convex* towards the magnet in the one case, and *concave* in the other. As the degree of curvature is easily ascertained, Dr Roget considers this instrument as affording “ the most delicate test possible of the existence and direction of a weak voltaic cur­rent.”@@1

We shall now conclude this part of the article with an account of a very ingenious contrivance of Am­pere’s for quickly altering the direc­tion of the electric current in vol­taic batteries. Two grooves R, R, fig. 71, are made in the table TT, some lines in depth, and also four similar cavities *νv', ttl,* communicating diagonally by means of the plates of copper *ll, mm,* which are kept separate at their crossing by a non-con­ducting substance. Mercury is then placed in the grooves and cavities, after they have been varnished with mastic. If the positive wire of a bat­tery is immersed in the groove R, and the negative one in the groove R', the current will not flow until a metallic communication is made be­tween each of the grooves, and one of the cavities. To do this, *b, bl* are two plates, fig. 72, for transmitting the current ; the plate *b* may become po­sitive or negative, according as the cavity R communi­cates with *t,* and R' with *tl,* or when R communicates with *v,* and R' with *v'.*

In the first case, the current follows the direction R*t*, *bb', t*'R', in the second it goes from R to *v,* then traverses the plate *ll',* and afterwards goes from *b'* into *bt,* and from*v'* into R. Now, these communications may be easily made or interrupted, by means of a wooden rod BB', which turns round its axis in the holes *o, o'.* Four metallic arcs *bbl, dd',* are fitted to this rod, so that by merely raising or de­pressing it, the communications are changed. W hen *b* and *bl* are depressed, R and *v* communicate through *rbc,* and R and *v*' by *r'b'c',* and when *d* and *dl* are depressed, R and *t,* and R' and t' communicate by means of the corresponding arcs.@@3

Mr Edward Clarke has improved this in­strument, and, we believe, given it the name of electripeter. It is shown in fig. 73, where *a, a, a', a'* are four mercury cups, communicating with wires be­neath the stand SS'. Large mercury cups A, A', B, B', are similarly con­

structed for conveying the current from the battery to a machine to be set in motion. The wires CC' are moveable about a horizontal axis. Suppose them to be in the position in the figure, and that the current is passing from A to B, and back again, from any apparatus from B' to A, then, by merely pressing the other ends of the wires CC' into their respective cups *a,a,* the direc­tion of the current will be immediately changed, and it will pass from A beneath the stand, to B', and back from B to A. By retaining the wires horizontally which keep their ends out of the cups, the passage of the current will be stopped.@@3

Among the applications of Electro-magnetism, two of the most interesting are the *Electro-magnetic Telegraph,* and the *Electro-magnetic Clock,* invented by Professor Wheat­stone, of King’s College, London.

*Wheatstone's Electro-magnetic Telegraph.*

Although the idea of conveying signals along wires by means of electric currents, must have occurred to many persons, yet the value and success of the invention must depend on the principles and methods by which that idea is carried into effect. Professor Wheatstone and Mr Cook have taken out a patent for this invention, and, in March 1840. It was in practical operation on the Great Western railway, throughout a distance of 14 miles from Padding­ton to West Drayton. It is also in operation on Blackwall railway. Professor Wheatstone has recently made an en­tirely new arrangement for his telegraph, which possesses great advantages over the old one : It is extremely port­able ; and any child can both read and send the messages with scarcely a minute’s instruction. It requires only a single pair of wires, and 30 or 40 letters can be successively sent by it in a minute. The telegraph with its accompany­ing alarm, is included in a case not larger than that of the smallest table clock. From the utility, simplicity, and cheapness of this new contrivance, we are convinced that its application will not be confined to long telegraphic lines, but will also be extensively employed in public and private establishments.

*Wheatstone’s Electro-magnetic Clock.*

To the same ingenious author we owe one of the most beautiful inventions of modern times, the electro-magnetic clock, the detailed construction of which has not yet been published. The following is a brief abstract of the account of it which was read at the Royal Society on the 26th No­vember 1840.

The object which Professor Wheatstone had in view was *to enable a single clock to indicate exactly the same time in as many different places distant from each other as may be desired.* In an observatory, for example, every apart­ment may be furnished with a cheap and simple clock, scarcely liable to derangement, and giving the time so ac­curately, *that it will beat dead seconds audibly with as great precision as the standard astronomical timepiece with which it is connected.* Hence the necessity is avoid­ed, in such scientific establishments, of having several clocks, and of being at the trouble of winding them up and regulating them individually. “ In like manner, in public offices and large establishments, one good clock will serve the purpose of indicating the precise time in every part of the building where it may be required, and an ac­curacy ensured which it would be difficult to obtain by in­dependent clocks, even putting the difference of cost out of consideration. In the electro-magnetic clock, which was exhibited in action in the apartments of the Society, all the parts employed in a clock for maintaining or regulating the power are entirely dispensed with. It consists simply of a

@@@1 Cumming’s Manual of Electro-dynamics, p. 178.

@@@a Becquerel, Traité D'Electricité, &c. tom. iii. pp. 9, 10.

@@@\* Noad’s Lectures, p. 319.