cury, into which dip small bent and pointed wires, fixed to the magnet, as seen in the figure. When the voltaic circuit is completed in the usual manner, the current passes only through the lower half of the magnet, and being a moveable part of the circuit. It turns round on its two pivots with a velocity depending on the strength of the magnet, the power of the battery employed, and the freedom from friction at the pivots. A current from another battery might be passed from the top of the magnet to its centre, which, by producing a rotation in the same di­rection, would increase the velocity of revolution.

Upon the same principles, a conductor may be made to revolve round its axis. An instrument for shewing this was invented by Professor Barlow, and which has been im­proved by Mr Watkins, by applying it to the horse-shoe magnet.@@1

The rotation of liquid conductors may likewise, as Sir H. Davy has shewn, be produced by the pole of a magnet. If mercury is placed in a shallow dish, between the two poles of a battery, a magnet placed either above or below the mercury, will cause the mercury to revolve round the points from which the currents issue. The rotation of the flame produced by the passage of a powerful voltaic charge between two charcoal points, arises from the same cause. Professor Daniell gives the following pleasing method of shewing this effect. He makes a powerful horse-shoe magnet part of the conducting wire of a constant battery of a moderate number of cells; the flame which may then be drawn from one of its poles will revolve in one direction, while that from the other will revolve in the opposite direction.@@2

Soon after the discovery of electro-magnetism, Μ. Am­pere made the important discovery, that the conductors attract each other when they are transmitting electrical currents having the same direction, but repel each other when the currents have opposite directions. This may be proved experimentally by the apparatus in fig. 54, invented by Μ. Ampere. It consists of a bent wire, ABCDEFGH, the parts of which at B and G, are kept insulated by a non-conducting substance *m, to* which they are tied. The extremities A, H, with steel points dip into iron cups of mercury, K, M, at the ends of the brass wires, JK, LM, fixed into a piece of wood, NO. When the electric current en­ters at J, passes along the conductor ABCDE, &c., and issues at L, the conductor is put in motion by means of a magnet. When the south pole of a magnet is di­rected against the side BCD. It will repel the conductor, but will attract it when directed against the opposite side.

The conductor in the above apparatus may also be moved by the earth’s magnetism. For this purpose the plane, CDEF, must stand per­pendicularly to the magnetic meridian. When the current enters at A, the vertical part FE will be placed towards the west, but if the current enters at H, the part FE will be placed towards the east.

Ampere’s electro-dynamic cylinder is shewn in fig. 55, where M is the extremity of a wire, with a steel point rest­ing in a cup of mercury. The wire, after descending to A, passes horizontally through a glass tube AB, and is then wrapped round it to form a helix or spiral, returning to A. It then passes to C, where it is wrapped in a similar manner round the glass tube CD ; and when it reaches the end D. It returns through the tube to C, when it descends verti­cally with its steel point into another mercury cup N. This instrument is a complete imitation of a magnetic cy­linder, and, while an electric current is passing through it. It possesses all the properties of a magnet, and may in every case be substituted for one.

Another electro-dynamic cylinder, invented by Ampere, and improved by Mr Marsh, is shewn in fig. 56. It consists of a coil or helix of wire AB, the ends of which return along its axis to its middle point C, and are there fixed to the wires, *n, p,* of a small voltaic battery MN, which consists of a sin­gle plate of zinc z, surrounded by a plate of copper *cc,* and floating in a basin of diluted acid, in which it can freely move. This spiral ACB, will place itself in the magnetic meri­dian, when acted upon by the mag­netism of the earth, and will like­wise yield to the action of another magnet placed near either of its poles.

Various forms have been given to these electro-dynamic cylinders. In some the coils all lie in one plane, as in Fig. 57, where one face of the coil has north, and the other south polarity, the mag­netic poles being as it were si­tuated in the centre of each disc.

When the helix is constructed, as in fig. 58. Its power is so great, that a small steel bar SN, placed within it, and support­ed perpendicularly, will, as soon as the connection is made with the voltaic bat­tery, by means of the mercury cups P, *p,* start up, and place itself in the air, where, like Mahomet’s coffin, it will remain suspended without any visible cause, and in opposition to the power of gravitation.

We owe also to M. Ampere the very interesting apparatus of a small voltaic battery made to re­volve round a magnet. This is shewn in fig. 59, where ABCD, *abcd* exhibits a section of two cy- lindersof coppers oldered to a cop­per bottom, so as to hold a fluid. This double cylindrical vessel is suspended by a bent wire *a*F*b* (having a cavity at F,) upon the north pole N of a vertical magnet NS. A light cylinder of zinc *zz* is al­so suspended by a bent wire zEr, and a steel pivot at E upon the same pole N of the magnet. The cylinder *zz* can therefore re­volve upon this pivot. When the cylinder ABD*dbac*CA, is filled with dilute acid, so as to constitute a small battery, the cylinder *zz* will re-

@@@1 Popular Sketch of Electro-Magnetism.

@@@, Introduction to Chemical Philosophy, § 815.