most persuasive of his physical attempts. If a magnet be placed among iron filings, these arrange themselves in curved lines, which proceed from one pole of the magnet to the other. It was not difficult to conceive these to be the traces of currents of ethereal matter which circulate through the magnet, and which are thus rendered sensible even to the eye. When phenomena could not be explained by means of one vortex, several were introduced. Three Memoirs on Magnetism, written on such principles, had the prize adjudged[3] by the French Academy of Sciences in 1746.

But the Cartesian philosophy gradually declined; and it was not difficult to show that the *magnetic curves*, as well as other phenomena, would, in fact, result from the attraction and repulsion of two poles. The analogy of magnetism with electricity was so strong and clear, that similar theories were naturally proposed for the two sets of facts; the distinction of bodies into conductors and electrics in the one case, corresponding to the distinction of soft and hard steel, in their relations to magnetism. Æpinus published a theory of magnetism and electricity at the same time (1759); and the former theory, like the latter, explained the phenomena of the opposite poles as results of the excess and defect of a magnetic "fluid," which was dislodged and accumulated in the ends of the body, by the repulsion of its own particles, and by the attraction of iron or steel, as in the case of induced electricity. The Æpinian theory of magnetism, as of electricity, was recast by Coulomb, and presented in a new shape, with two fluids instead of one. But before this theory was reduced to calculation, it was obviously desirable, in the first place, to determine the law of force.

In magnetic, as in electric action, the determination of the law of attraction of the particles was attended at first with some difficulty, because the action which a finite magnet exerts is a compound result of the attractions and repulsions of many points. Newton had imagined the attractive force of magnetism to be inversely as the cube of the distance; but Mayer in 1760, and Lambert a few years later, asserted the law to be, in this as in other forces, the inverse square. Coulomb has the merit of having first clearly confirmed this law, by the use of his torsion-balance.[4] He established, at the same time, other very important facts, for instance, "that the directive magnetic force, which the earth exerts upon a needle, is a constant quantity, parallel

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[3] Coulomb, 1789, p. 482.

[4] *Mem. A. P.* 1784, 2d Mem. p. 593.