Coulomb's Torsion Balance

branch of study: electrostatics/electrics
inventor: Charles Augustin Coulomb, 1785

Coulomb’s Torsion Balance is a setup based on two glass cylinders, one of 65cm length with a torsion micrometer (fig.2, right) is placed on a glass plate that rests on a larger cylinder with dimensions of diameter and height of 32cm each. An angular scale is fixed to the outside of the larger cylinder. Clamped to the torsion micrometer is a 76cm long metallic wire with a diameter of 0.04mm which holds a copper or iron rod (fig.3, bottom right) of 0.2cm diameter on its bottom end. The rod itself is a mounting stage for a sealing wax coated silk filament which in turn holds a paper disc on one end and on the other an elder pith ball.

The weight of the copper rod is used to tighten the metallic wire without disrupting it. In the glass plate towards its rim there is a hole through which another rod with a elder pith ball on its end is held into the chamber. The second pith ball is placed into the position of the first pith ball’s resting state.

Coulomb’s law is one of the core laws in physics not just because it can be seen as part of Gauß’s law and therefore of the Maxwellian equation system. Its importance lies in the possibility to determine the rest mass of the photon which is supposed to be 0, if the electrostatic force scales with the inverse square of the distance. That is the reason, why experiments to determine this relation were conducted until the late in the 20th century.

In his first two articles on electricity and magnetism, Coulomb described two experiments by which he demonstrated the relation between force and distance for electrostatic charges. This relation forms an integral part of the fundamental law that today bears Coulomb’s name.

In the first memoir, he described the torsion balance and his experiments to demonstrate his law for the case of electrostatic repulsion. Three years later, he presented a second apparatus and experiments by which he analysed the effects in the case of attractive forces.

further reading


