

CHAPTER V.

DISCOVERY OF THE LAWS OF ELECTRO-MAGNETIC ACTION.

ON attempting to analyse the electro-magnetic phenomena observed by Oersted and others into their simplest forms, they appeared, at least at first sight, to be different from any mechanical actions which had yet been observed. It seemed as if the conducting wire exerted on the pole of the magnet a force which was not attractive or repulsive, but *transverse*;—not tending to draw the point acted on nearer, or to push it further off, in the line which reached from the acting point, but urging it to move at right angles to this line. The forces appeared to be such as Kepler had dreamt of in the infancy of mechanical conceptions; rather than such as those of which Newton had established the existence in the solar system, and such as he, and all his successors, had supposed to be the only kinds of force which exist in nature. The north pole of the needle moved as if it were impelled by a vortex revolving round the wire in one direction, while the south pole seemed to be driven by an opposite vortex. The case seemed novel, and almost paradoxical.

It was soon established by experiments, made in a great variety of forms, that the mechanical action was really of this transverse kind. And a curious result was obtained, which a little while before would have been considered as altogether incredible;—that this force would cause a constant and rapid revolution of either of the bodies about the other;—of the conducting wire about the magnet, or of the magnet about the conducting wire. This was effected by Mr. Faraday in 1821.

The laws which regulated the intensity of this force, with reference to the distance and position of the bodies, now naturally came to be examined. MM. Biot and Savart in France, and Mr. Barlow in England, instituted such measures; and satisfied themselves that the elementary force followed the law of magnitude of all known elementary forces, in being inversely as the square of the distance; although, in its direction, it was so entirely different from other forces. But the investigation of the *laws of phenomena* of the subject was too closely connected with the choice of a mechanical theory, to be established