



## On electromagnetic tractive force

M. Weber

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the west formerly existed over the Weald to the south of Dorking, and that the fragments now lying about the surface have been left by denudation, as described by Dr. G. J. Hinde (*op. cit.*). Since, however, as has been stated, the present Lower Greensand escarpment to the north consists of 'sandy beds' only, there must be a lithological change from south to north (deep-water beds to shallow).

Part 2 of the paper is devoted to the district east of the Mole. Where the escarpment rises above the alluvium of the river, the author finds the Bargate Beds with pebbles (at Park Hill, Reigate) separated from the Folkestone Sands only by a thin bed of Fuller's Earth and a layer of sandy chert. The section is now first described; the dip has been observed and proved, and by measurement this pebble-bed is shown to lie at approximately the same horizon above the Atherfield Clay as when it was last seen west of the Mole. From Reigate eastwards to Tilburstow Hill the same beds are seen in the numerous hollow lanes and pit-sections. The pebble-beds are found approximately on a definite horizon; but whilst they become of less importance eastward, the overlying cherts, first seen at Reigate, become of greater importance in that direction. The thin bed of Fuller's Earth, also first seen at Reigate, thickens to the east likewise.

2. 'On the Eastern Limits of the Yorkshire and Derbyshire or Midland Coalfield.' By W. S. Gresley, Esq., F.G.S.

The author attempts to throw light on the question of the easterly extension of the Yorkshire, Derbyshire, and Nottinghamshire coalfield beneath the newer rocks. He notices the general trend of the strata, the sizes of other British coalfields, the question of the origin of mountains, stratigraphical considerations, and the faults of the North of England. His object is rather to suggest what he believes to be novel ways of treating the subject than of reaching conclusions or locating limits.

3. 'On some Phases of the Structure and Peculiarities of the Iron Ores of the Lake Superior Region.' By W. S. Gresley, Esq., F.G.S.

The author has been studying heaps of ore brought from the region lying south-west of Lake Superior since 1890. He describes certain structural features of the ore-fragments, and discusses the evidences of mechanical movements and chemical alteration exhibited by these fragments.

#### LV. *Intelligence and Miscellaneous Articles.*

ON ELECTROMAGNETIC TRACTIVE FORCE. BY M. WEBER.

The author summarizes the results of his experiments as follows:—

(1) An iron wire of great length in comparison with its diameter, one end of which is in a magnetic field parallel to the lines of force, experiences a pull in the direction of its length which for unit area (the square centimetre) of the cross-section is  $p\sharp = IH = \kappa H^2$ .

(2) If the magnetic lines of force are at right angles to the longitudinal direction of the wire projecting into the field, the tractive force at right angles to the lines of force is smaller in iron than the force  $p_{\parallel}$ . The ratio  $p_{\parallel}/p_{\perp}$  (where  $p_{\parallel}$  and  $p_{\perp}$  are the tractive forces parallel and at right angles to the lines of force respectively), which with mean strengths (about  $H=100$ ) is greater than 100, rapidly decreases as the field increases and appears to approach unity.—Wiedemann's *Annalen*, No. 1, 1895.

ON THE INFLUENCE OF MAGNETIZATION ON THE CONSTANTS OF ELASTICITY IN IRON. BY A. BOCK.

The result of this research is stated as follows by the author:—By magnetization the constants of elasticity of soft iron, the modulus of torsion, and the modulus of elasticity are certainly not altered by more than  $\frac{1}{2}$  per cent. The series of observations indicate that the flexure diminishes, at the same time the torsion seems also to diminish, while the ratio of the lateral contraction to the longitudinal expansion increases. Iron is more incompressible in the magnetic field. Nothing can be alleged with certainty as to magnetized steel bars. These results are in perfect agreement with the well-known investigations of G. Wiedemann, and they may be deduced from the theory propounded by that author on the assumption of rotating molecular magnets.—Wiedemann's *Annalen*, No. 3, 1895.

ON THE MAGNETIZATION OF IRON BY VERY SMALL FORCES.

BY WERNER SCHMIDT.

The experimental results of this research are given by the author in the following statements:—

1. Steel follows small magnetizing forces more rapidly than iron.

2. The magnetization function  $\kappa$  of *mild steel* is greater for small forces than that of iron. In the present case  $\kappa$  (steel) is to  $\kappa$  (iron) as 4 is to 3. The stronger magnetization ordinarily observed in iron is only met with in greater magnetizing forces, for instance,  $H > 1$ .

3. The constancy of the magnetizing function  $\kappa$  for very small forces, first observed by Lord Rayleigh, is confirmed. The boundary of proportionality between magnetizing forces and magnetic moments may be taken with sufficient accuracy for technical purposes as near the magnetizing force  $H_1=0.06$ . This value represents a rather sudden transition in the curve  $\kappa=f(H_1)$ . Below this the deviations from proportionality are only very feeble, that is the curve  $\kappa=f(H_1)$  passes into a parallel to the  $H$ -axis. The point at which it can be identified with a straight line (parallel) is different according to the nature of the iron investigated, and especially according to the sensitiveness of the apparatus used for the measurements, without varying much from a certain mean value which may be regarded as lying between the magnetizing forces  $H_1=0.03$  and  $0.04$ .—Wiedemann's *Annalen*, No. 4, 1895.