

find them originate mainly in that country in which those larger spheres of practical work had grown unchecked and flourished—in Great Britain and its extensive dependencies. To Germany, on the other side, with its fully developed system of learning, we are indebted mainly for the complete recording, registering, and analysing of the scientific labours of the whole world. To France

Weber at Göttingen in the year 1833. The documents referring to this interesting application have recently been published in H. Weber's biographical notice of Wilhelm Weber, Breslau, 1893, p. 25, &c. We read there that soon after 1830 Gauss had been occupied with reducing his magnetical measurements to an absolute scale, having laid his celebrated paper, "Intensitas vis magneticæ ad mensuram absolutam revocata," before the Göttingen Society in December of 1832. He had induced Weber to take up similar investigations at the Physical Institute, which was situated about a mile distant from Gauss's Observatory. This distance was found to be an inconvenience, and in order to overcome it, the first longer telegraphic line in which galvanic currents were used, and which had two wires, was carried overhead between the two buildings, and the instruments and signalling arrangements perfected in the years 1833 to 1836. Both Gauss and Weber were well aware of the importance of their invention for practical purposes. The former wrote to Olbers on the 20th November 1833: "I do not know whether I have already written to you regarding a magnificent arrangement which we have made here. It is a galvanic chain between the Observatory and the Physical Institute, carried by wires in the air over the houses, up the Johannis tower and down again. The whole length will be about

8000 feet. . . . I have devised a simple arrangement by which I can instantly reverse the direction of the current, which I call a commutator. . . . We have already used this contrivance for telegraphic experiments, which succeed very well with whole words and short sentences. . . . I am convinced that by using sufficiently strong wires one might telegraph instantaneously in this manner from Göttingen to Hanover or from Hanover to Bremen" (see Scher- ing's address on the occasion of Gauss's centenary, Göttingen, 1877, p. 15, &c.) To Schumacher, 6th August 1835, Gauss wrote as follows: "With a budget of 150 thalers [£22, 10s.] annually for Observatory and Magnetic Institute together, really extensive trials cannot of course be made. But could thousands of thalers be bestowed thereon, I think that, for instance, electromagnetic telegraphy might be carried to a perfection and to dimensions at which imagination almost starts back." Gauss estimates that fifteen millions sterling of copper wire would suffice to reach the antipodes, and he says significantly, "I do not think it impossible to invent a mechanism by which a despatch could be played off almost as mechanically as a musical-box plays off a tune when it is once fixed on a roller" (see 'Briefwechsel zwischen Gauss und Schumacher,' ed. Peters, vol. ii. p. 411, &c.)