

- V. "Electrodynamic Qualities of Metals. (Continued from Phil. Trans. for February 28, 1856.)—Part VI. Effects of Stress on Magnetization." By Prof. Sir W. THOMSON, LL.D., F.R.S. Received May 27, 1875.

(Abstract.)

Weber's method, by aid of electromagnetic induction and a "ballistic galvanometer" to measure it, which has been practised with so much success by Thalén, Roland, and others, has been used in the investigation of which the results are at present communicated; but partial trials have been made by the direct magnetometric method (deflections of a needle), and this method is kept in view for testing slow changes of magnetization which the electromagnetic method fails to detect.

The metals experimented on have been steel pianoforte-wire, of the kind used for deep-sea soundings by the American Navy and British cable-ships; and soft-iron wires of about the same gauge, but of several different qualities.

I. *Steel.*

The steel wire weighs about $14\frac{1}{2}$ lbs. per nautical mile and bears 230 lbs. Weights of from 28 lbs. to 112 lbs. were hung on it and taken off, and results described shortly as follows were found:—

(1) The magnetization is diminished by hanging on weights, and increased by taking the weights off, when the magnetizing current is kept flowing.

(2) The residual magnetism remaining after the current is stopped is also diminished by hanging on the weights, and increased by taking them off.

(3) The absolute amount of the difference of magnetization produced by putting on and taking off weights is greater with the mere residual magnetism when the current is stopped than with the whole magnetism when the magnetizing current is kept flowing.

(4) The change of magnetization produced by making the magnetizing current always in one direction and stopping it is greater with the weights on than off.

(5) After the magnetizing current has been made in either direction and stopped, the effect of making it in the reverse direction is less with the weights on than off.

(6) The difference announced in (5) is a much greater difference than that in the opposite direction between the effects of stopping the current with weights on and weights off, announced in (4).

(7) When the current is suddenly reversed, the magnetic effect is less with the weights on than with the weights off.

II. *Soft-Iron Wires.*

Wires of about the same gauge as the steel were used, but, except one of them, bore only about 28 lbs. instead of 230. All of three or four kinds tried agreed with the steel in (1).

The first tried behaved (except a seeming anomaly, hitherto unexplained) in the reverse manner to steel in respect to (2), (4), (5), and (6); it agreed with the steel in respect to (7). Another iron wire*, which, though called "soft," was much less soft than the first, agreed with steel in respect to (1) and (2), but [differing from steel in respect to (3)] showed greater effects of weights on and off when the magnetizing current was flowing than when it was stopped.

Other soft-iron wires which were very soft, softer even than the first, agreed with all the steel and iron wires in respect to (1), but gave results when tested for (2) which proved an exceedingly transient character of the residual magnetism, and were otherwise seemingly anomalous.

The investigation is being continued with special arrangements to find the explanation of these apparent anomalies, and with the further object of ascertaining in absolute measure the amounts of all the proved effects at different temperatures up to 100° Cent.

The Society then adjourned over the Election-day, to Thursday, June 10.

June 3, 1875.

The Annual Meeting for the election of Fellows was held this day.

JOSEPH DALTON HOOKER, C.B., President, in the Chair.

The Statutes relating to the election of Fellows having been read, Mr. A. J. Ellis and Admiral Ommanney were, with the consent of the Society, nominated Scrutators to assist the Secretaries in examining the lists.

The votes of the Fellows present having been collected, the following candidates were declared duly elected into the Society:—

* It was tested magnetically with weights up to 56 lbs., and broke, unfairly however, when 63 lbs. were hung on.