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ON A MODIFICATION OF MANCE'S METHOD OF MEASURING BATTERY RESISTANCE.

BY

OLIVER J. LODGE, B.Sc.

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On a Modification of Mance's *Method of measuring Battery Resistance**.

[Plate V.]

THE modification here suggested consists simply in using a galvanometer and condenser instead of a galvanometer alone, so as to detect variations in difference of potential instead of variations in current.

By this change it is converted into a strictly *null* method. Moreover it is now possible entirely to get rid of the effects of variations in the electromotive force of the battery, which are very annoying in any of the ordinary methods and prevent accurate measure. This is accomplished by breaking the galvanometer-circuit the instant after the battery is short-circuited. Fig. 1 (Pl. V.) is a diagram of the connexions for measuring the resistance of the battery d, with the keys shown on a large scale: m partially short-circuits the battery when depressed; n closes the galvanometer and condenser circuit *unless* depressed. The two keys are electrically independent; but the stand of the upper one is balanced so as to rest partly on the spring of the lower one (which must be strong). On depressing the upper key, the first effect is to close the circuit marked r at the point m; the second, and immediately succeeding, effect is to break the circuit marked g at the point n. The same object would be accomplished more conveniently by a single double-contact key made on purpose, as shown in fig. 4. The object of the double key is fully explained below. A B C D represents a box of resistance-coils; a and b are large and equal resistances; and c will be equal to d, the resistance of the battery, whenever the galvanometer-needle is unaffected by pressing down the keys.

Resistance-measurements in general.

Consider the arrangement of six conductors joining four points (commonly known as the Wheatstone's bridge) as forming the edges of a tetrahedron or triangular pyramid (fig. 2). It is obvious, (1) that, as far as position is concerned, every conductor has precisely the same properties as any other, and (2) that any one conductor is adjacent to four of the others and opposite to the remaining one. Call the resistances of pairs of opposite ones a and c, b and d, r and g, and let electromotive forces be caused to act in any manner through any of them; then it can be shown that when $ac=bd$, r and g are "conjugate conductors," or that variations in the conductor r have no effect whatever on the current in g, and *vice versâ*, no

* Communicated by the Physical Society.

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