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## THE BALLISTIC GALVANOMETER AND ITS USE IN MAGNETIC MEASUREMENTS.

THE ballistic galvanometer gives one of the most convenient and reliable means of measuring the total quantity of electricity conveyed through a circuit by a transient current when the conditions are such as to admit of its legitimate application. It is well known, however, to experienced ob-

servers that in a large number of the common applications of the instrument the results are doubtful because the fundamental principle on which the calculations are based is not sufficiently attended to. The object of the present note is to direct more particular attention to the conditions under which accurate results may be obtained.

Most text-books on electrical measurements give formulæ for the calculation of the quantity of electricity required to produce a given deflection, or throw, of the galvanometer needle, and also indicate how the constant of the instrument may be determined, and how the damping effect of the air and of induced currents may be allowed for. The formulæ assume as fundamental that the duration of the flow is negligibly small in comparison with the time which the needle takes to reach its greatest deflection. This fundamental condition is of course implied in the name ballistic, but it does not seem, from the applications which we find continually made of the instrument, that the simple statement, as commonly given, is sufficiently explicit to prevent a vicious use of this method of experiment. For the measurement and the comparison of the capacities of condensers and similar purposes the ballistic galvanometer is generally reliable, providing the constant is properly determined and suitable appliances used for manipulation. In magnetic measurements, however, it not

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