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# SURVEYING

AND

# SURVEYING INSTRUMENTS.

BY

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## PREFACE.

FOR some time past it has seemed to me that a concise work upon Land Surveying, in which modern instruments and modern methods of working were described, would be welcomed by many. The result has been the preparation of this small volume, which, having already appeared as a series of articles in the *Building News*, is now put before the public in book form. Its production would have been impossible without the co-operation of the leading instrument makers, to whom my thanks are heartily tendered, and especially to Messrs. Elliott Bros., Mr. W. F. Stanley, Mr. J. H. Steward, and Messrs. Watson and Sons, who have lent me instruments from which to prepare my illustrations; while I must also own my indebtedness for much useful information to a perusal of Usill's *Practical Surveying* and Stanley's *Surveying Instruments*.

G. A. T. MIDDLETON.

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### CHAPTER I.

#### SURVEYS WITH CHAIN ONLY.

WHILE many of the instruments used in the higher branches of land surveying are elaborate and costly, others, and these the ones in most common use, are of quite a homely and inexpensive character. This is particularly the case with those used for land surveys of comparatively open and level country, in which many surveyors have a considerable practice who do not even possess any instrument for the measurement of angles in the field—sufficient accuracy being obtained by dividing the land into a series of triangles connected together, and each triangle tied across one of its angles at least by a connecting line as a check upon its accuracy. Of course, the direction of a line once decided, as that of one side of a known triangle, it can be continued to any length, and this is frequently taken advantage of in various ways.

A great deal of care is necessary in selecting the lines for a survey of this class, that they shall be properly connected and tied together so as to plot without risk or