

**A TREATISE ON THE PRINCIPAL
MATHEMATICAL INSTRUMENTS
EMPLOYED IN SURVEYING,
LEVELLING, AND ASTRONOMY;
EXPLAINING THEIR CONSTRUCTION,
ADJUSTMENTS, AND USE**

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A Treatise on the Principal Mathematical Instruments Employed in Surveying, Levelling, and Astronomy; Explaining Their Construction, Adjustments, and Use by Frederick W. Simms

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FREDERICK W. SIMMS

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C. E. Detmold

A TREATISE

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ON THE

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SURVEYING, LEVELLING, AND ASTRONOMY:

EXPLAINING THEIR

CONSTRUCTION, ADJUSTMENTS, AND USE.

WITH AN

Appendix, and Tables.

SECOND EDITION,

IMPROVED AND ENLARGED.

BY

FREDERICK W. SIMMS,

SURVEYOR & CIVIL ENGINEER,

LATE OF THE ROYAL OBSERVATORY, GREENWICH, AND FORMERLY
EMPLOYED ON THE ORDNANCE SURVEY.

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P R E F A C E

TO THE FIRST EDITION.

THE want of a work containing a concise and popular description of the principal Instruments used in Practical Astronomy and Surveying has long been felt, as the requisite information with respect to such instruments can only be obtained by consulting various expensive publications, which are not within the reach of many to whom such information is highly interesting and important.

It was the original object of the writer of this little tract, to place at the disposal of the young surveyor a description of the instruments which are required in his profession, and such an account of the method of examining and rectifying their adjustments, as would enable him to obtain from them the most accurate results; but he found that, without greatly increasing the size of the book, he might materially add to its utility, by including in his plan the most approved Astronomical Instruments, that amateur astronomers as well as scientific travellers might have at hand a manual of instructions, which would enable them to use their instruments with the utmost advantage.

Usefulness being the author's chief object, he has not scrupled to extract from the works of others whatever he found adapted to his own purpose; and to some kind literary and scientific friends he is under obligations, for which, if he had obtained their permission, he would be glad to thank them by name in this place.

Of Surveying Instruments, those only have been described which are applied in modern practice, no reference

being made to those which, having been superseded by better ones, may be said to be out of use.

To the article on Levelling has been added a description of Mr. TROUGHTON'S Improved Mountain Barometer, with an easy and accurate method of computing differences of level from barometrical observations. Table II. employed for this purpose, has been carefully recomputed from Mr. BAILLY'S Formulæ. The other tables will, for their several purposes, be found convenient and useful. Tables I. and VIII. are new.

Much attention has been paid to the accuracy of the formulæ given for performing the various computations, and each has been thrown into the form of a practical rule, that persons unacquainted with algebraic notation may be enabled notwithstanding to make the requisite calculations.

With respect to such astronomical problems as appertain chiefly to Navigation, and require extensive and special tables for their convenient solution, it has been thought better to omit all reference to them in this work, as in Mr. RIDDLE'S Treatise on Navigation, Captain THOMPSON'S Lunar and Horary Tables, and other similar works, all necessary information on the subject may be readily obtained.

The Appendix relates chiefly to the protraction of the work after a survey has been completed, and seems a suitable supplement to the account of Surveying Instruments given in the preceding part of this treatise.

P R E F A C E

TO THE SECOND EDITION.

IN preparing for the press a second edition of my "Treatise on Mathematical Instruments," I have endeavoured to make such additions and improvements as would render it still more acceptable to the reader. To the account of Surveying Instruments I have added a few remarks on the use of the Land Chain; and given some additional particulars, with an engraving, of Captain EVEREST'S Theodolite, which has hitherto been extensively used in India, and is now frequently employed in this country. To the Levelling Instruments I have added a representation and description of Mr. GRAVATT'S modification of the Spirit Level, and also of the new Levelling Staves; the article on Levelling has also been remodelled, and I hope will be found by the young beginner to contain some useful practical information.

Through the kind friendship of EDWARD RIDDLE, Esq. I have been enabled to insert his latest improvements in the practical solution of the problem for determining the *Longitude* by the Moon and Moon-culminating Stars; which will also be contained in the third edition of his valuable Treatise on Navigation, now in the press. Some additional examples and formula have likewise been given in the account of the Portable Transit Instrument, which it is hoped will not be without their use.

To the Appendix is added an account of the various methods of copying and reducing or enlarging Plans, &c.

including a description of the Pentagraph. Also an account of the method of executing a Survey, for the purposes of a Railway or Turnpike Road.

Table VII. has been improved in its arrangement, and the last four Tables have been added to this edition.

F. W. S.

GREENWICH,
Feb. 17, 1836.
