

**A TREATISE ON A BOX OF
INSTRUMENTS AND THE SLIDE-
RULE: FOR THE USE OF
GAUGERS, ENGINEERING,
SEAMEN, AND STUDENTS**

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A treatise on a box of instruments and the slide-rule: for the use of gaugers, engineering, seamen, and students by Thomas Kentish

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THOMAS KENTISH

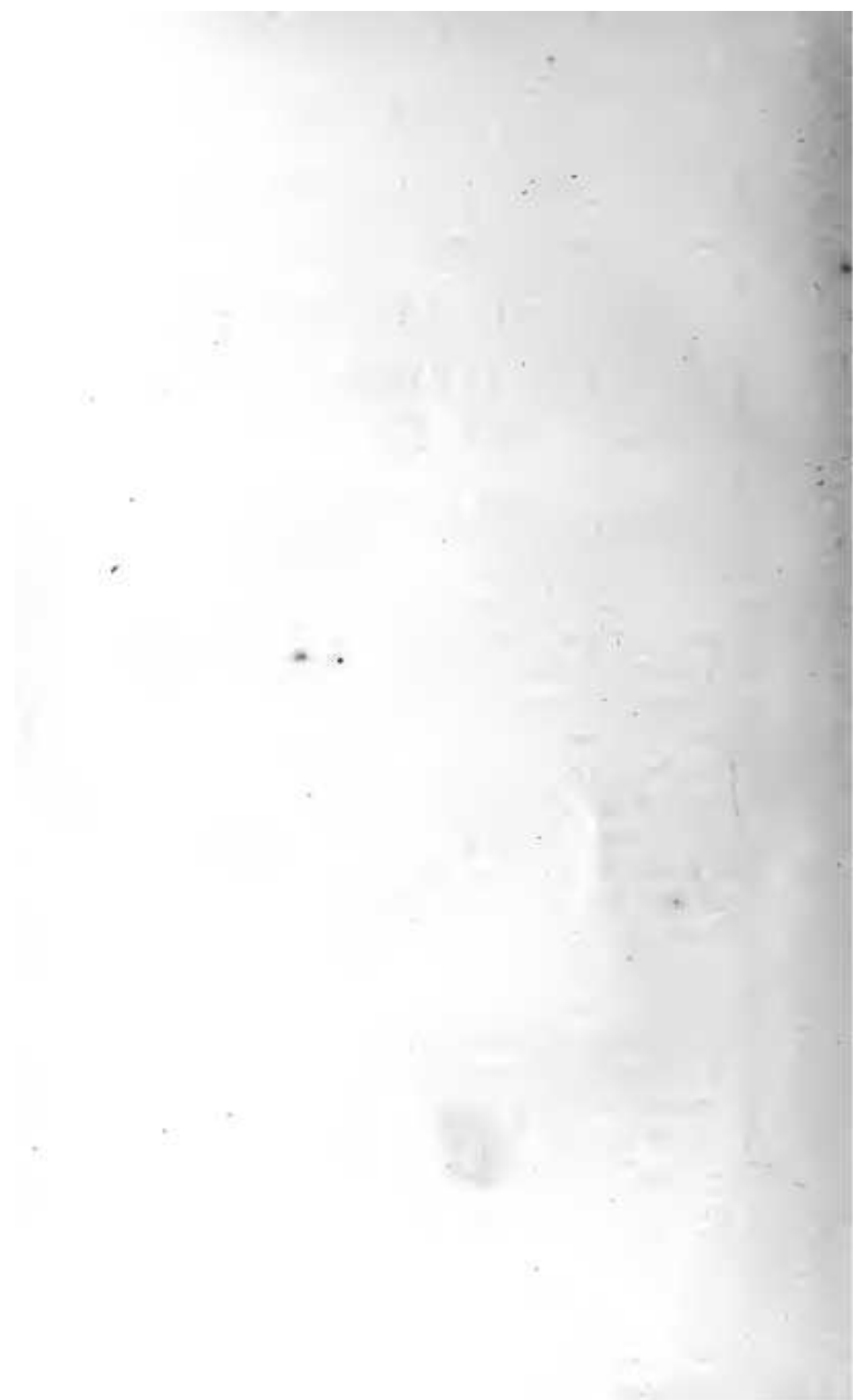
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BY THOMAS KENTISH.

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PREFACE.

IN the first edition of this Treatise, its utility, in the absence of other works upon the subject, was assigned as an apology for its publication. The instruments, whose uses it explains, are often so little understood, that scarcely half of them are of any service to their possessor. The Sector, in particular, the most important in the box, is generally regarded as unintelligible. The Slide-rule is briefly noticed in some of the treatises on Mensuration; but, as the pupil is presented merely with a few formal precepts *how* to use it, without knowing *why*, he never understands its nature, never understands the method of determining the real value of any result, and, accordingly, soon lays it by with dissatisfaction, and banishes it from his memory.

The steady sale which the first edition has met with has convinced the Author that his labours were not in vain, and that he has extended among many thousands a knowledge of intrinsic value to all employed in the delineation of mathematical figures.

No attempts, however, are perfect in the beginning; and much was wanted in the first edition to render the work complete. This additional information has been supplied. Several problems have been prefixed, requiring only the compasses and ruler, which, together with those that follow, embrace all that are truly useful, and preclude the necessity of referring to other works on Practical Geometry.

In books upon this subject, it is not usual to annex reasons for any of the operations, but it has been thought advisable to do so, in a few instances, with the more difficult problems; with the rest it is not attempted, because, to have entered fully upon the subject, would have been to transcribe the whole of the Elements of Euclid, a work which is within the reach of every one, and which every one *must* study, who desires thoroughly to understand Geometry.

The part relating to Trigonometry, though concise, will be found to comprehend every thing necessary to enable the student to obtain a clear conception of the subject, and when carried out in connection with the portion devoted to Navigation, will render its acquirement alike easy, pleasing, and useful.

The chapter on Logarithms is written simply to show the mode of adapting them to instrumental computation; a purpose to which every part of the work is, as a matter of course, as much as possible made subservient.

The section relating to the Slide-rule has been entirely re-written; and, in this portion of the work, the Author flatters himself there will be found much

that is perfectly new, and many remarks calculated to awaken and stimulate the youthful mind to think for itself; a habit of the utmost value in mathematical science, which, being based on truth, courts investigation, and requires that we shall never assent till we can comprehend. In this part, the formulæ for surfaces and solids have been so modified as to embrace almost every species of mensuration under the simplest form; questions for practice are interspersed throughout, that the student may test his proficiency, and acquire facility in the use of the rule; and tables are inserted at every step, for the purposes of computation; a practice in all cases advisable, as the instrumental operation and numerical calculation necessarily check and illustrate each other.

The reciprocals of divisors, employed as factors, are convenient in practice; but it was deemed advisable, upon the whole, to omit them, as the formulæ for numerical computation would have then been different from those suited to the Slide-rule, which would have tended to perplex the mind of the learner; whereas, by retaining the same form for both operations, it is obvious that to understand one is to understand the other; and the student, instead of coming to regard the instrumental mode of solution as something entirely distinct from the numerical, and looking upon the agreement of the two rather as a coincidence than a consequence, as is too often the case, will see that, in fact, they are identical, and cannot fail, in a short time, of having

the very clearest conception of the whole of the subjects treated of.

It is somewhat surprising, that, after the lapse of two hundred years, so excellent an instrument as the Slide-rule should be so little known and appreciated by mathematical students in general. To the engineer and the excise officer it is perfectly familiar, and of daily utility; but, from its having been almost exclusively confined to them, there is an idea prevalent among gentlemen engaged in education, that it can neither be understood by their pupils nor be of any utility to them. A more erroneous conception, on both accounts, cannot be formed; for a knowledge of the instrument is acquired with little or no effort, and it may be truly stated, that it is the most valuable adjunct to mathematical study that can possibly be desired. Nothing imprints a fact so firmly on the mind as repeated exercise. As Demosthenes, when asked the three principal requisites in oratory, summed them up in the word action; so may we say of learning, that the three great essentials to its success are contained in the word repetition. Dexterity in every art, and skill in every science, must be acquired by this means, and by this alone. But, in the solution of questions that are necessarily laborious, every one feels a great disinclination to work through *many* examples, much less to *repeat* them; the consequence is, so little impression is made on the memory, that the knowledge is, in many instances, forgotten as soon as acquired. Now, by the Slide-rule, the most

tedious calculations are effected nearly as easily as the most simple. The student can, therefore, after accompanying them the first time with the numerical solution, go over the operations again and again with the rule, with the greatest ease and rapidity, deepening the impression each succeeding time, and rendering the knowledge obtained distinct and permanent.

In the truth of this, the Author is not only borne out by his own experience, but he can refer, with pleasure, to schools in which they have been adopted, and in which they have proved of the greatest assistance; and no one, really fond of knowledge, who may give them a trial, will regret the little extra trouble they may cause, but will rejoice in having found so excellent an aid to study. Mathematical science is of such extensive utility that it ought to be universally understood; and it is impossible to go five or six times through the present work, which, after the first, may be done in a very few days, without being as familiar with the Surfaces and Solids, and with Trigonometry and Navigation, as with the multiplication table; and this is the great object to be attained. To be barely acquainted with them is not sufficient; knowledge, to be useful, must be at the moment accessible, so that we may be enabled to proceed without error or hesitation; and that the most intimate familiarity with the above-mentioned studies will be obtained by the method here pointed out, has been again and again tried, and with the happiest results.