THE LAND DRAINER'S CALCULATOR

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The land drainer's calculator by John Ewart

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JOHN EWART

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PREFACE.

Those who may expect the following pages to contain a treatise on land draining will not find such to be the case. The work is simply what its title page indicates it to be, viz. :—"THE LAND DRAINER'S CALCULATOR;" not in any way professing to give instructions in the practice of draining, but presenting, to the adept in the art, concise rules for calculations incidental to so important an operation in promoting the fertility of the soil; and, whenever the calculations are such as to be frequently required, or where any of the rules require more than a few figures in the rudimentary rules of arithmetic, or in any way complicated in their process, the results are given in tables, for the use of those who may *not* be, and to save trouble to those who may be, proficient in figures.

One of the most frequent causes of error in designing and laying out draining work, is the neglect of the proper adjustment of the size of duct in the lower portion of main or outfall drains, to the rate of fall in such drains, and to the extent of ground to be drained. Where the ducts are larger than the circumstances just mentioned may demand, unnecessary expense will be incurred, not only in the cost price of the ducts, but also in the expense of carriage—perhaps from a considerable distance—of heavier and more bulky material than may be required; and, where the ducts are smaller than such circumstances call for, the draining will be inefficient in its operation. The most important use of the principal table in the following pages, is, to furnish the means by mere inspection, the adjustment already pointed to; and so to obviate the necessity of a calculation, the rule for which, under the most concise form in which it can be given, is tedious to any one, and beyond the educational proficiency of the persons usually engaged in carrying out draining works.

Besides the rule and table already alluded to, all other rules and tables which can be required in estimating the cost of field draining will be found in the present work.

In many of the rules given, the steps in the process of the calculations, as they succeed in logical order, have been bridged over, and the rule reduced to its most concise form, to arrive at the result of its purpose. This, as well as not giving mathematical demonstration of the truth of some, may be deemed, at first sight, a defect in the work; but, when the object of the contents of the work—that of assistance to those who may not be proficient in, or who may be even wholly ignorant of, arithmetic—is for a moment considered, it will be at once perceived that conciseness is rather a merit than a defect, and that mathematical demonstration, under such circumstances, would be wholly useless and out of place.

Should the publication of a transcript from my private note book of the rules and tables given in the present work, for the most part of original construction, be of that use to proprietors of landed estates, land agents, or tenant occupiers of farms, in making estimates of the cost of so important an operation as draining, or in enabling contractors for the work to make correct and reasonable tenders, which, I must confess to the vanity of anticipating, it will be a matter of much gratification to the reader's

Very humble servant,

THE AUTHOR.

Newcastle-upon-Tyne, August, 1862.

THE LAND DRAINER'S CALCULATOR.

OPEN WATER-COURSES.

The best form for the vertical section of an open water-course is a semi-circle, because that figure contains the greatest area within the shortest bounding line; and, consequently, the bounding surface of the channel offers the least resistance, from friction, to the motion of the water. Such a form of water-course is very expensive to construct, and, on that account, very seldom adopted. The forms of open aqueducts most generally in use are those bounded by straight lines; and the best form in such case is when the bounding lines of the rectilinear figure are tangents to a semi-circle, of which the radius is equal to the depth of the water-course.

When the sides and bottoms of a water-course are tangents to a semi-circle of radius equal to the perpendicular depth, the sides, whatever the inclination of their slope may be, are each of them equal to half the breadth of the top. Thus, when the section is rectangular, the breadth will be double the depth; and, when the section is trapezoidal, the slope of the side will exceed the perpendicular depth to the same extent as the perpendicular depth is exceeded by half the breadth of the top; and the breadth of the bottom is always the excess of four times the perpendicular depth over the breadth of the top.