

THE
Surveyor's Guide:
 OR, A
 New INTRODUCTION
 TO THE
Whole Art of Surveying Land,
 Both by the CHAIN and all
 Instruments now in Use.

Now first Publish'd from an Original M.S.

To which is Added,

All the useful *Geometrical Definitions, Axioms, Problems and Theorems*, which relate to this Art. As also the Method of Casting up the Dimensions of Artificers Work. Very useful for all Gentlemen and Others. There is also added, by way of APPENDIX, a new Way of Surveying large Tracts of Land, according to the Learned Mr. *Wbiston's* and Mr. *Ditton's* New Method of Surveying ENGLAND by *Explofion*. The manner of making up and preparing Transparent Colours for Beautifying Maps, Charts, Pictures, &c. The Tables of Artificial Numbers, Sines and Tangents, to every Degree and Minute of the Quadrant. All which is very much Improved and Corrected.

By EDWARD LAURENCE, Surveyor.

The THIRD EDITION.

L O N D O N,

Printed for LAMES, JOHN, and PAUL KNAPTON,
 at the Crown in Ludgate Street. 1736.

These two articles are from "The Surveyor's Guide", Third Edition, printed in 1736. This book was salvaged from papers being destroyed during the flooding of the St. Lawrence Seaway, and was probably brought to Canada by United Empire Loyalists.

Our thanks to L. P. Stidwell, B.Sc.,
 O.L.S., of Cornwall.

*A new Method of Surveying
 Countries, or large Tracts of
 Land.*

THE common Method of performing this Problem, is by taking and protracting inaccessible Distances, which has been treated of (*in general*) already; and therefore, supposing that the Ingenious Surveyor cannot be incapable of applying it to this particular, I shall wholly omit this, and give you a new Method, invented by those Learned Mathematicians Mr. *Wbiston* and Mr. *Ditton*, in order to which, let us premise the following Lemmata.

I. All Sounds are propagated almost evenly, and are observed to move 8 measured Miles in 37 Seconds.

This is well known from the last and most accurate Observations about the Velocity of Sounds, which are those of Mr. * *Derbam*. * *Philo. Trans.* No 247.

II. An ordinary Mortar is easily able to cast a Projectile about a Mile in Perpendicular Height; and the Sound thereof may be heard near 20 Miles.

The Truth of both these Propositions have been sufficiently proved by divers Experiments made by Mr. *Wbiston* for that purpose.

III.

III. A Projectile may be filled with Combustible Matters, to take Fire as soon as discharged, and continue burning till it comes to the Ground.

This all that deal in Rockets, Bombs, and Mortars, do very well know, and is found to be true upon Tryal.

IN. Fire, or Light about a Mile high will be visible in the Night time, when the Air is tolerably clear, about 70 Miles.

This also hath been made manifest by many Experiments made on purpose.

The Solution of the Problem.

Let a Shell that will take Fire as soon as discharged, and continue burning till it comes to the Ground, be shot perpendicularly about a Mile high out of a Mortar at any convenient Place in a clear Night; and this Discharge will by the Bearing, and Interval of the Flash and Sound, give the Distance and Bearing of an Observer within the Hearing and Sight thereof, according to the foregoing Lemmata.

Example.

Fig. 2. Let the Bearing of a Shell discharged out of a Mortar at C, and also the Interval of the Flash and Sound thereof to be observed by Persons sent to A. B. E. F. G. H. I. D.

H.I.D. Places within 20 Miles round C, who must be furnished with an Instrument to measure Angles, for taking the Bearing of the Shell; and a Thread 39.2 Inches long, with a Plummer fastened to one end, which being suspended by the other end to a Pin, or Nail, and made to swing, will vibrate Seconds, by which the Interval between the Flash and Sound may be nicely measured, and let their Observations be as follows.

Places of Observations	Interval between the Sound and Flash in Seconds of Time.	Bearings of the Shells.	Seconds turned into Miles according to the Proportion of 37 to 8 Miles.
D.	63 $\frac{1}{2}$	S.E. 33	14
A.	74	30	16
G.	55 $\frac{1}{2}$	87	12
E.	83 $\frac{1}{2}$	S.W. 40	18
F.	51	90	11
I.	55 $\frac{1}{2}$	N.E. 6	12
H.	78 $\frac{1}{2}$	50	17
B.	69 $\frac{1}{2}$	NW 60	15

To protract which, through the point C, draw the Meridian N. S. and lay off

off the Angles NCD. 3°, NCA. 30°, NCG. 37°, from the North towards the West. The Angles NCE. 40°, NCF 90°, from the North towards the East. The Angles SCI. 6°, SCH 50°, from the South towards the West. *Lastly*, Lay off the Angle SCB 60° from the South towards the East. Then set off their Distances from the Mortar at C. viz. DC = 14 m. AC = 16 m. &c. according to the Observations. So will you have an exact Map of the Place A. B. C. D. E. F. G. H. I. L. and the Situation of the Villages about each Station may be easily taken by the Observer thereof after the common Method of taking inaccessible Distances.

COROLLARIES,

I. If each Observer were to let off a Rocket at his own Station, and take the mutual Bearing of each others, it would be a great Check to any Error that could possibly happen

II. If a great Gun were discharged near the Mortar, and the Sound thereof used instead of that of the Mortar, it would be heard much farther, and consequently a much larger Tract of Land might be surveyed at once.

4

A ready

A ready Way to find a true Meridian-line by the Pole-Star.

The right Ascension of the Pole-Star for this Year (1716) is 37 Minutes of Time; and it increases one Minute 16 Seconds every ten Years: Therefore having at any time this Star's right Ascension, and the right Ascension of the Sun both in Time, if you subtract the latter from the former, adding 24 Hours to the right Ascension of the Pole-Star, when it is less than the Sun's, the Remainder will be the Time of the Star's coming to the Meridian; at which Time hang up two Pendulums between your Eye and the Pole-Star, and a Right-line drawn through them, will be a true Meridian-line.

In the Survey just now treated of, you may use the Sights of a good Circumferentor, or any other Surveying Instrument, having one of the Sights long enough to take in the Pole-Star.

If you would know what Angle the Pole-Star makes with the true Meridian at other Times, the following Table will shew.

Sidereal Hours.	Distance from North above the Pole.	Sidereal Hours.	Distance from N. below the Pole.
12	0' 00"	6	3° 41' $\frac{1}{3}$
$\frac{1}{2}$	0 30 $\frac{1}{2}$	$\frac{1}{2}$	3 38
1	1 00 $\frac{1}{2}$	$\frac{1}{2}$	3 31
$\frac{1}{2}$	1 29 $\frac{1}{2}$	$\frac{1}{2}$	3 20 $\frac{3}{4}$
10	2 1 56 $\frac{1}{2}$	$\frac{1}{2}$	3 6 $\frac{5}{8}$
$\frac{1}{2}$	2 20 $\frac{1}{2}$	$\frac{1}{2}$	2 50 $\frac{1}{2}$
9	3 42 $\frac{1}{2}$	$\frac{1}{2}$	2 31
$\frac{1}{2}$	3 00	$\frac{1}{2}$	2 9 $\frac{3}{4}$
8	4 16 $\frac{1}{2}$	10	1 46
$\frac{1}{2}$	3 28 $\frac{1}{2}$	$\frac{1}{2}$	1 21
$\frac{1}{2}$	3 36 $\frac{1}{2}$	11	0 54 $\frac{1}{2}$
7	5 45 $\frac{1}{2}$	$\frac{1}{2}$	0 27 $\frac{1}{2}$
$\frac{1}{2}$	3	12	0 00

F I N I S.

Sidereal