

A  
TREATISE  
ON  
SURVEYING,  
CONTAINING  
THE THEORY AND PRACTICE:  
TO WHICH IS PREFIXED  
A PERSPICUOUS SYSTEM  
OF  
PLANE TRIGONOMETRY.

THE WHOLE CLEARLY DEMONSTRATED AND ILLUSTRATED BY A LARGE NUMBER  
OF APPROPRIATE EXAMPLES,

PARTICULARLY ADAPTED TO THE USE OF SCHOOLS.

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when the stations are too distant to be seen from each other, will be noticed in the next chapter.

## PROBLEM VI.

*To measure the distance of a line.*

For convenience in marking the termination of the chain in measuring, *ten* iron pins should be provided, about a foot in length, and terminated at top by a small ring, to which a piece of red flannel or other conspicuous substance should be tied, in order that the pins may be readily found, when set up among high grass or in other situations where they would not otherwise be easily discovered.

Let the person who is to go foremost in carrying the chain, take nine of the pins in his left hand, and one end of the chain and the other pin in his right hand; then he moving on in the direction of the line, let another person take the other end of the chain and hold it at the beginning of the line. When the leader has moved on till the chain is stretched tight, he must set down the pin, per-

pendicularly, exactly at the end of the chain, the hinder chain-man taking care that the chain is in the direction of the line; which is readily determined by observing whether it is in a range with a stake previously set up at the far end of the line. When the leader has not his end of the chain in the direction of the line, the hinder chain-man can direct him which way to move, by a motion of his left hand. When the distance of one chain or half chain\* has been thus determined, the carriers, taking hold of the two ends of the chain, move on till the hinder one comes to the pin which was set up by the other; then the chain being stretched, the person at the fore end of it sets up another pin as before; the hinder chain-man then taking up the pin at his end, they proceed to a third distance of the chain; and so on. When the person at the fore end of the chain has set up all his pins, he still moves on another length of the chain, and then setting his foot on it to keep it in place, he cries "*out*." The hinder chain man then comes forward, and counts to him the ten pins; and he setting up one of them at the end of the chain, again moves on, dragging the chain after him, till he is checked by the hinder chain-man, who, getting the hind end of the chain, applies it as before to the pin set up. The number of outs should be carefully noticed; each *out* being ten chains, when a four-pole chain is used, but only five, when the measuring is done, with a two-pole chain. When arrived at the end of the line, the number of pins, which the one at the fore end of the chain has set up since the last *out*, and the number of links from the last pin to the end of the line, must be carefully noted. From these, and

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\* When a two-pole chain is used, one length of it may properly be called a half chain.

the number of *outs*, the distance measured is readily determined.

All slant or inclined surfaces, as the sides of a hill, should be measured horizontally, and not on the plane or surface of the hill. To effect this, the hind end of the chain, in ascending a hill, should be raised from the ground till it is on a level with the fore end, and, by means of a plummet and line, or when the hill is not very steep, by estimation, should be held perpendicularly above the termination of the preceding chain. In descending a hill, the fore end of the chain should be raised in the same manner, and the plummet being suspended from it will show the commencement of the succeeding chain.

### PROBLEM VII.

*To protract a Survey, having the bearings and distances of the sides given.*