ART. XII.—*The Roman Mile calculated from the Milestones found south-east of Carlisle.* By PERCIVAL ROSS, A.M.Inst.C.E.

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THE four Roman milestones found on the road south-east from Carlisle give an opportunity to calculate the length of the Roman mile adopted in road measurement and also to test the mileage of the stations or forts.

The milestones found in order from Carlisle are as follows:—the Petterill milestone found in the river Petterill a little above the bridge in 1894; this presumably marked the first mile from Carlisle. Scalesceugh milestone found in 1915 is the next; it was found on the north side of Scalesceugh farm buildings between Carleton hill and the river Petterill; it presumably marked the fifth mile from Carlisle. The standing milestone between Templesowerby and Kirkbythore is the next; it is presumed to have marked the twenty-sixth Roman mile from Carlisle and the milestone found in 1914 at Hangingshaw near Appleby near to the Roman road is presumed to have marked the thirty-first mile from Carlisle.

The distance from the Petterill milestone to the Templesowerby standing milestone is 23 miles 1494 yards, equal to 25 lengths of 1679 yards each. The separate distance from the Petterill milestone to the Scalesceugh milestone is 3 miles 1485 yards, or 4 lengths of 1691 yards each. The separate distance from the Scalesceugh milestone to the Templesowerby standing milestone is 20 miles 9 yards or 21 lengths of 1677 yards each. There is no knowledge of the position on the road where the Hangingshaw milestone stood. When discovered by the writer it

was built into the north corner of the front of the farm house about 300 yards north-east of the Roman road from the point where it is intersected by the highway leading from Appleby to Long Marton and Dufton; at this point there is a quarry on the roadside next to Hangingshaw, and the farm house is at right angles from here. If it was found near the quarry the distance from the Templesowerby standing milestone is 4 miles 1521 yards or 5 lengths of 1712 yards each. If it was found 176 yards nearer Kirkbythore then the length would be 1677 yards and the distance of 5 lengths would be 4 miles 1345 yards. I am inclined to think that the Petterill milestone was found where it was erected and that the ground on which it stood has been washed away by the action of the river which has varied its course. The starting point for the measurements in Carlisle appears to have been near Bush Brow or the street opposite the Gretna Tavern or near the Gretna Tavern. The distance from these places to the Petterill milestone site is 1677 yards.

Iter. 2. The itinerary distances may now be considered, presuming 1677 yards to equal a Roman mile as calculated between the Scalesceugh milestone and the standing milestone near Templesowerby. The distance from Scalesceugh to the centre gateway at Voreda (Plumpton) is 7 miles 1133 yards equal to 8 Roman miles 37 yards, to which add 5 miles, the Roman distance from Carlisle to Scalesceugh, and the total equals 13 Roman miles 37 yards from Carlisle to Voreda. Iter. 2 distance is 14 miles from Luguvallium, a difference of one mile.

The distance from Voreda to the Templesowerby milestone is 12 miles 636 yards equal to 12 Roman miles 1632 yards; to this add 1 mile 240 yards or 1 Roman mile 323 yards further to Kirkbythore, making a total of 14 Roman miles 278 yards from Voreda to Brovonacæ

(Kirkbythore). The distance in Iter. 2 is 13 miles, and the total distance Carlisle to Kirkbythore of 27 miles appears as correct, but Voreda should be 13 miles from Carlisle and not 14, and Kirkbythore (Brovonacæ) should be 14 miles from Voreda and not 13, a transposition of 1 mile.

The distance from Kirkbythore to Brough (Verteræ) is 12 miles 800 yards equal to 13 Roman miles 119 yards. The distance in Iter. 2 is 13 miles, the same.

Iter. 5. The distance from Voreda to Brocavum (Brougham) is 6 miles 1251 yards equal to 7 Roman miles 72 yards. To this add 13 Roman miles 37 yards from Carlisle to Voreda and the total is 20 Roman miles 109 yards from Carlisle to Brocavum. The distance in Iter. 5 is 22 miles, an evident error of 2 miles.

The distance from Brougham to Kirkbythore is 6 miles 1385 yards equal to 7 Roman miles 206 yards. To this add 13 Roman miles 119 yards, the distance from Kirkbythore to Brough (Verteræ), and the total is 20 Roman miles 325 yards, the distance from Brocavum to Verteræ. The distance in Iter. 5 is 20 miles, the same.

The calculations based on the 4 milestones thus give 40 Roman miles from Carlisle to Brough for both Iters. 2 and 5.

All the itinerary distances in these calculations have a number of yards over, therefore I conclude that as far as they go the Roman mile in this locality may be considered to be about 1680 yards in length. This is more than the mile calculated from the standard Roman foot of 11.65 inches which is 1618 yards for a thousand paces. 1680 yards equals 5040 English feet of 12 inches. If the distances were measured by pacing a thousand paces* then I think that 5 feet is too short a distance

* The length of a pace, one thousand of which constituted a Roman mile, I take to be two strides which equalled the distance stepped by either of the feet separately. All our knowledge of the Roman mile agrees with this length more than with any other definition. The varying lengths of

for the average pacer. Strict accuracy was perhaps not considered necessary and the measurements would be paced and the milestones fixed as near enough.

The whole of the measurements are horizontal measurements, therefore if measured up and down hill on the ground they would be longer and the Roman mile would be longer. The distances from the river Petterill to Hangingshaw are taken from the 6 inch ordnance map and have been supplied to me by the Director General of the Ordnance Survey, Southampton, and to whom my thanks are hereby acknowledged. The distance from Hangingshaw to Brough I have taken from the 1 inch ordnance map.

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the mile as revealed when the different iters are checked, seem to support the idea that a correct standard of measurement for the pace was not in use to mark out the positions for the milestones. A standard was probably not kept for that special purpose, perhaps it was considered a waste of time to use a standard pace rod for military measurements. The soldier deputed to fix the milestones would take as regular steps as possible, and count a thousand left foot steps or right foot steps as he chose to adopt for counting, and so mark the mile and cause the stone there to be fixed up. No two soldiers would measure the mile alike, hence the variation of the length of a Roman mile throughout the country.