

THE PERMIAN AND TRIAS.

SIR,—As my name has been alluded to by the Rev. A. Irving and by Prof. Hull in reference to the classification of these beds in Lancashire, I wish to point out that the former is correct in stating that I do not ascribe the Garstang sandstones, found by me north of Preston in 1869, to “Upper Permian Age,” but if he imagines I correlate them with the Trias, he is certainly in error, as I have always considered them the equivalents of the Collyhurst (Lower Permian) Sandstones of Manchester, and so described them in 1877.¹ No one, who has examined the country between Bedford Leigh and Manchester, can for one moment doubt the correctness of the twofold division of the Permian in that area, established by that most able field geologist Mr. Binney, and afterwards established in detail by Prof. Hull. Boring after boring has been made in this district, and the classification has never been shaken; I have since 1868, year by year examined every new section of importance in Lancashire, and since the establishment of the Underground Water Committee of the British Association in 1874, have visited every important boring whilst in progress, and I consider that the evidence afforded by these sections and borings establishes the conclusions of Messrs. Binney and Hull to be founded on fact.

1st. There is good evidence of the Triassic sandstones overlapping the various Permian beds, and occasionally extending beyond them, as between Warrington and Liverpool, as pointed out by me in 1879.

2nd. In the Manchester district there is a distinct twofold division of the Permian, the upper portion consisting of *marls*, with numerous beds of limestones, and the lower part of white, red and variegated sandstones.

3rd. These marls increase in thickness steadily in proceeding eastward from Manchester, being at Worsley 131 feet thick, at Ardwick Station 150, at Openshaw Bore-hole 205, while still further to the north-east they are 245 feet.

4th. The base of these marls are generally conglomeratic, and rest on the Lower Permian Sandstone. This was well seen at the Openshaw boring, which was visited whilst in progress, by Mr. Binney, and by myself; the lower 70 feet of these marls were teeming with fossils, of which I made a collection, now at Jermyn Street.

5th. The Collyhurst Sandstone obeys the same law, of westerly attenuation, being only 10 feet at Albert Bridge, 250 feet at Collyhurst, and no less than 752 at the Openshaw boring, the sandstone in each case resting unconformably on underlying Coal-measures.

6th. In the Openshaw boring, the details of which have been published by Mr. Atherton,² the boring was continued in the Coal-measures to a depth of 1300 feet, passing through the well-known Ardwick series of Upper Coal-measure Limestone, so that in this boring no possibility occurs of the Permian Limestones of Upper Permian age being confounded with the Ardwick Limestones.

¹ Report of Brit. Assoc., Third Report Underground Water Committee.

² Trans. Manchester Geol. Soc. vol. xv. 1878.

7th. In the Openshaw boring, the Upper Permian beds are overlaid by 36 feet of true Triassic Bunter beds.

8th. Looking to the westerly attenuation of these Permian beds, there is no matter of surprise in their comparative thickness at Bedford Leigh and Ashton, and their absence at Winwick and Farnworth.

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SIR,—Permit me to reply to Professor Hull's remarks in your last number on my paper on the so-called Permian Rocks near St. Helens (*GEOL. MAG.* Dec. II. Vol. VIII. 1881, p. 433).

In this paper I trace the range of these unfossiliferous rocks, showing that they are similar to the Lower Mottled Sandstone of the neighbourhood, and that they thin out without unconformity with this subdivision of the Bunter in those very directions, in which, had they been Permian unconformably overlapped, they might have been expected to develop. They are thus completely separated from those rocks which are referred to by Professor Hull as containing Permian fossils wherever they occur along the border of the Coal-field, and as being unconformably overlain by the New Red Sandstone. On these grounds I ventured to doubt the correctness of their determination as Permian; Professor Hull merely repeats his belief in its correctness, without offering any explanation of the difficulties which arise in the way of its acceptance.

I also defined an area (including the village of Winwick) in which I considered Permian to be absent. Professor Hull refers to a shaft at Abram, in which these rocks have been proved, as being near Winwick, and as not being described by me. Abram is nearly six miles from the village of Winwick, and about half that distance from the town of Wigan. It is not only outside the area I defined as being devoid of Permian, but is more distant than the Edgemoor section, to which I alluded for the purpose of showing the nearest known occurrence of these rocks.

To defend myself from the charge of presumption in forming an opinion opposed to that of the late Mr. Binney and Professor Hull, I may mention that since Mr. Binney's original examination of this locality and Professor Hull's subsequent survey, when a brewery well and a quarry were the only sources of information, seven shafts at three collieries and three bore-holes have been sunk, all throwing light on the true relations of these rocks, and showing, among other points, that shales equal in thickness to the so-called Permian Marl of St. Helens are not unknown in the Lower Mottled Sandstone of that neighbourhood. My visit was not a flying one, as suggested by Professor Hull; my repeated examinations of the district resulted from instructions, officially received, to make a detailed survey of the whole area in question.

A. STRAHAN.

MARKET RASEN, Nov. 11, 1882.